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PLANNING WITHOUT OVERVIEW

On how Munich's planners plan for cycling, complexity and the baroque

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This dissertation explores how planners plan for cycling in Munich. Though it all began in Amsterdam where I followed one course in urban sociology taught by Olga Sezneva, as part of an external semester. At the time, I was mainly interested in one specific question, namely how to think about 'the city'. But I still remember how during the first lecture I introduced myself as a student in Innovation Sciences from the Technical University of Eindhoven, only to be told by Olga that perhaps the course was not exactly my cup of tea. Still, it was Olga who introduced me to Latour's and Hermant's *Paris Invisible City* (2006) as well as the work of my now doctor father Ignacio Farías. By the end of Olga's course, I not only had an answer to the question that I started with but also a research trajectory that has kept me occupied for the last five years. I am also indebted to Saurabh Arora who offered to supervise my master's thesis, even though he had just exchanged his job in Eindhoven, where I still studied, for one in Brighton, England. His support allowed me to start exploring the fascinating worlds of Deleuze, STS, and Actor-Network Theory that are fundamental to this dissertation. But, of course I am most indebted to Ignacio Farías, who ultimately gave me the opportunity to master those theories and to put them to use in an actual institutional ethnography. I have particular good memories of the late afternoon meetings and phone calls during which we explored the most audacious intellectual ideas. And I am particularly grateful for the enormous freedom I have been given to translate those ideas into a work of my own. In that respect, I also have to thank Sabine Maasen, who joined the project as my second supervisor at a relatively late stage and encouraged me to "just go for it" as I slowly made it to the top of the metaphorical hill that a PhD is. I, of course, want to express my gratitude to all my wonderful colleagues from the MCTS, past and present, particularly Carlos, Claudia, Felix, Hannah, Indrawan, Laurie, Melina, Sarah and Tomas. It has been a true pleasure to work amongst groups of such curious, kind and caring individuals. I am also particularly indebted to my partner Anna who has listened for endless hours as my ideas took form over the course of the last few years. You have supported me in so many ways, that I cannot even begin listing them here.

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[1] For the same reason, all the names of the administration's employees that appear in this dissertation are fictional.

ABSTRACT

ENGLISH

This dissertation explores how planners plan. Based on an ethnographic study of cycling planning by Munich's transport planning department, it sheds light on the methods and practices of transport planning and the issues Munich's planners are dealing with. But most importantly, it theorizes what it means to plan without overview.

Planning without overview may sound as a *contradictio in terminis*. Planning indeed has a long history of seeing overview as a prerequisite for the organization of urban life. It is only when the city is seen and understood as a coherent whole that planning becomes possible, at least this is the idea. The establishment of such a view, however, demands that different ways of valuing and knowing the city add up to a singular perspective. It is assumed that good planning demands that maps, numbers, goals, and regulations are all aligned.

This dissertation demonstrates that even at the heart of a key planning institution, such as Munich's planning department, such alignment is a seldom achievement. Different methods and practices of planning do often not add up to singular perspectives. For many, this may feel like a failure or sound like a critique. However, a central thesis of this dissertation is that such noncoherence is something we, scholars and practitioners, need to learn to appreciate.

Positively appreciating the role of inconsistencies, however, demands a shift in thinking about planning and its relation to the world it seeks to plan. In technical terms, it demands a shift from a romantic to a baroque conception of complexity. The former sees planning as aimed at the establishment of a singular overview of a complex urban world 'out there'. The latter, by contrast, sees planning as a practice that articulates the world through a variety of modes of planning that may not add up. As such, baroque complexity foregoes the possibility of overview but, as this dissertation shows, not just better defines how planners plan in practice but also opens up new insights for improving it.

GERMAN

Diese Dissertation untersucht, wie Planer planen. Basierend auf einer ethnografischen Studie der Radverkehrsplanung im Münchner Planungsreferat werden Methoden und Praktiken der Verkehrsplanung beleuchtet und die Anliegen, mit denen sich die Münchner Planer befassen herausgearbeitet. Vor allem aber wird theoretisiert, was es bedeutet, ohne Übersicht zu planen.

Planung ohne Übersicht mag wie ein *contradictio in terminis* klingen. Planung hat in der Tat eine lange Geschichte, in der Übersicht eine Voraussetzung für die Organisation des städtischen Lebens gesehen wird. Nur wenn die Stadt als zusammenhängendes Ganzes gesehen und verstanden wird, kann geplant werden, so zumindest die Idee. Die Etablierung einer solchen Sichtweise erfordert jedoch, dass sich unterschiedliche Arten der Wertschätzung und Kenntnis der Stadt zu einer einheitlichen Perspektive addieren. Es wird davon ausgegangen, dass eine gute Planung die Übereinstimmung von Karten, Zahlen, Zielen und Vorschriften erfordert.

Diese Dissertation zeigt, dass eine solche Übereinstimmung selbst im Herzen so einer wichtigen Planungsinstitution wie dem Münchner Planungsreferat ein seltener Erfolg ist. Unterschiedliche Planungsmethoden und -praktiken ergeben oft keine einheitlichen Perspektiven. Für viele mag sich das wie ein Misserfolg anfühlen oder wie eine Kritik klingen. Eine zentrale These dieser Dissertation ist jedoch, dass wir als Wissenschaftler und Praktiker lernen müssen, diese Nichtkohärenz zu schätzen.

Um die Rolle von Inkonsistenzen wertzuschätzen, bedarf es jedoch eines Wandels im Denken über Planung und ihr Verhältnis zur Welt, die sie zu planen versucht. Fachlich ausgedrückt, erfordert dies eine Verschiebung von einem romantischen zu einem barocken Komplexitätsbegriff. Ersterer sieht das Ziel von Planung darin, eine einheitliche Übersicht über eine komplexe urbane Welt „da draußen“ zu schaffen. Letzterer sieht Planung hingegen als eine Praxis, die die Welt durch eine Vielzahl von Planungsmethoden artikuliert, die sich möglicherweise nicht summieren. Die barocke Komplexität verzichtet daher zwar auf die Möglichkeit der Übersicht, definiert aber, wie diese Dissertation zeigt, nicht nur besser, wie Planer in der Praxis planen, sondern eröffnet auch neue Einsichten für deren Verbesserung.

1. THE COMPLEXITY OF INSTITUTIONALIZED PLANNING

I still vividly remember the summer of 2015. Having just started the research project of which this dissertation is the result, I had to find a case. There was only one thing that I knew for sure; I wanted to study planning practices using insights from the interdisciplinary field of Science and Technology Studies[2] (STS) and particularly Actor-Network-Theory (Latour, 2005). After several weeks of informative interviews, reading newspapers, and searching the internet, I finally found a promising topic. On August 7, 2015, the online edition of the Guardian, a British newspaper, published an article titled "Munich plans an 'autobahn for bikes'" (Perry, 2015). Planning and constructing a cycling highway through one of Germany's most dense cities seemed ambitious and was likely to spark some controversies. This, plus the fact that Munich was the city in which I lived and worked, meant that I had found what I had been looking for. To study how planners plan, I would follow the cycling highway in-the-making, that is, as it was being planned.

To study how planners plan this infrastructure I decided, in line with a long-standing STS tradition[3], to conduct an ethnographic study of the project from within one of the key institutions involved. Over the following weeks, I established contacts and arranged field access. Thanks to the employees of Munich's transport planning department—who I do not name to protect their privacy—I was able to conduct an ethnographic study over several months. Between November 2015 and March 2016, I visited the transport-planning department multiple days a week and participated in everyday activities.

Such institutionalized planning processes are often imagined as a rational, procedural, and systematic activity. As I will discuss in detail later on, social theorists, including STS scholars, indeed often assume that planning involves a reduction in complexity. However, after joining the department, I quickly realized that things are not that straightforward. Rather I found out that the world inside the planning department was just as complex as the world outside of it. Take, for example, the cycling highway project that I had planned to shadow. On the outside, newspapers announced that 'the city of Munich' planned its construction. However, on the inside, I quickly learned that there was no guarantee that the project would still exist even a month from now. My informants told me that, perhaps at the next meeting, scheduled in three weeks, things would become clearer, but there was no guarantee the project would continue afterward. This uncertainty about the project's future was not self-evident. Of course, every infrastructural project may potentially fall apart, but I quickly learned that the planners' reservations about the cycling highway's future was linked to other events in complex ways.

I soon discovered that only just prior to initiating my study, the city council had stopped the implementations of all cycling projects, thereby indirectly contradicting earlier plans for the construction of a cycling highway. As I tried to understand why all projects were stopped, the situation quickly became more and more complex. My informants, who all worked for the city administration, explained that the stopping of the cycling highway project had been motivated by yet another event. A few months earlier the city administration had constructed a cycling lane in the *Gabelsbergerstraße*, a so-called *Hauptverkehrsstraße* or main artery in the center of Munich, at

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[2] STS is an interdisciplinary field located at the intersection of philosophy, sociology, and anthropology and focusses on the relationships between science, technology and society.

[3] I am referring to the tradition of 'laboratory studies' in which STS scholars went to the heart of modern science, the laboratory, to study how scientific facts are 'constructed' in practice (Knorr-Cetina, 1995; Latour & Woolgar, 1979). The power of such an approach is that it allows one to identify and work with materials that lie at the center of modern institutions such as science, or planning in my case, and create surprising accounts that speak to its practitioners. This strategy not only informs my own inquiry but also of other STS scholars such as Annemarie Mol (2002) or Karen Barad (2007).

the cost of a general traffic lane. However, once the cycling lane was built, the city government had protested and stopped all cycling infrastructure projects. One may wonder why the city government objected on the project's outcome *after* the cycling lane had been physically realized. Had they not permitted for the construction at an earlier stage? Well, yes and no. At the time existing regulations, written up under a previous government, allowed the city administration to build cycling lanes under its responsibility as long as they would not hamper traffic flow. Based on capacity calculations, the planners had concluded that building a cycling lane was indeed possible, without a significant reduction in the road's capacity. However, after the bike lane was completed, traffic jams had formed. For the local government, this was an unwarrantable result. In their view, the traffic jams demonstrated that the construction of a cycling lane constrained the road's capacity too much. The planners to whom I spoke however told a different story. In their understanding, it was not the newly built cycling lane, but rather the temporary construction works in the area had caused the traffic jam. Those construction works were not taken into account by their calculations, but, they argued, the traffic jams had disappeared once the project had been finished. Nonetheless, one of the effects of the whole episode was that the regulation allowing the administration to build cycling lanes on its own authority was revoked. From then on the construction of a cycling lane at the cost of a general traffic lane in main arteries needed the explicit permission of the city council (Kreisverwaltungsreferat, 2016). In my attempt to follow the cycling highway into the planning department to understand how planners plan, I quickly ended up with a situation that was far more complex than the one I had started with.

1.1. IS INSTITUTIONALIZED PLANNING COMPLEX?

That planning is complex is perhaps hardly surprising to anyone who has ever engaged with planning processes. However, theoretical conceptions of planning often suggest the opposite. Planning, especially institutionalized planning, is indeed often seen as a practice that holds a simplified view on a complex urban reality 'out there'. While such simplification is widely seen as that what makes planning possible, it is also heavily criticized. Famous in this respect is the work of James. C. Scott who links the emergence of 20th-century modernist planning to the invention of what he refers to as "state simplifications" such as maps and bureaucratic methods. On the one hand, Scott argues that such devices were what made modern planning possible, but on the other hand, he argues they offer an overly simplified understanding of a highly complex world. For Scott, many of the failures of what he refers to as 'high modernist' planning can be ascribed to its overly simplified conception of how the city functioned. At the time, it was thought that planning should be based on singular and coherent (scientific) frameworks in order to uncover the structures underlying urban life. However, as Scott argues, this approach failed to appreciate complexity.

The recent 'complexity turn' in planning forms an important break with the modernist tradition in planning (de Roo, Hillier, & Wezemael, 2012; Innes & Booher, 2010; Portugali, Meyer, Stolk, & Tan, 2012). Drawing on insights from the complexity sciences (Prigogine & Stengers, 1984), planning scholars increasingly acknowledge the complex, emergent, and non-linear nature of planning problems and processes. However, while such work has been successful in rethinking cities as complex adaptive systems, the complexity of institutionalized planning practices and processes remains little understood. That cities are complex systems that consistently defy attempts at planning and ordering them is widely accepted by now. However, this cannot be said for planning processes, especially not for those that are institutionalized. Planning theorists, Batty and Marshall have indeed recently noted that the planning community has found it much easier to conceive cities as complex systems, than to articulate planning processes in this way.

> "It has proven much easier to see cities as tangible physical artefacts in terms of the elements of complex adaptive systems than it has been to articulate the processes of their planning in this way." (Batty & Marshall, 2012, p. 42)

An important goal of this dissertation is to demonstrate how insights from STS and particularly post-(ANT) (Gad & Bruun Jensen, 2010; Law, 1999) scholarship, can contribute to addressing the problem that Batty and Marshall are pointing at, namely how to articulate the complexity of (institutionalized) planning processes. But, before coming to this, I first want to highlight that planning theorists have explicitly rejected the idea that institutionalized planning can be complex. In their book, *Planning with Complexity*, prominent planning scholars Judith Innes and David Booher (2010) for example argue that bureaucratic planning institutions cannot address complex planning problems—I come back to bureaucracy and complexity in chapter 6.

> "Bureaucratic agencies are hierarchical in structure, routinized in their practices and each designed to fulfill a limited mission. They are unable to address the multiple goals of their constituencies, much less deal with rapid change. They cannot address the interdependencies among their missions to achieve sustainable management of natural resources. They are not set up to look at cities or regions as wholes, nor to address complex, rapidly changing problems." (Innes & Booher, 2010, p. 3)

Planning theorists Luuk Boelens and Gert de Roo (2016) make a similar argument. They argue that while planning theory has increasingly incorporated insights on the complex interrelationships between meaning and matter from post-structuralist social theory, "mainstream [state] planning is still structuralist" (Boelens & de Roo, 2016, p. 59).

Although I agree with these authors that planning professionals have yet to adopt post-structuralist insights, in my opinion, criticizing institutionalized planning for its failure to acknowledge insights of complexity[4] is of little help to practitioners who seek to incorporate such insights into their work. In this light, this dissertation aims to move beyond the idea that complexity and state planning are incommensurable. If planners working in state institutions are to use insights from complexity sciences into their work, social theorists should first appreciate and articulate the complexity of such institutionalized activities. It should be acknowledged that Boelens and de Roo (2016) are also pointing in this direction. They explain how over the past 15 years or so, they experimented with complex planning 'outside' state institutions. However, reflecting on their endeavors, they have come to realize that institutionalized planning is often not moving in the same direction, let alone with the same speed as the processes in which they collaborate. Addressing this issue, they suggest, requires "further elaboration … of adaptive and co-evolutionary *institutional* arrangements of becoming, precisely because they enhance restrictive 'lock-ins' for continued innovation." (Boelens & de Roo, 2016, *italics* original). Put simply, Boelens and de Roo (2016) thus call for a better understanding of *institutionalized* planning practice through a complex (post-structuralist) lens.

To develop a complex understanding of planning practice, I will draw on recent STS insights. Like planning theory, STS has also witnessed a complexity turn in recent years. Especially STS scholars working in the tradition of Actor-Network Theory (ANT) (Latour, 2005) have called for attentiveness to and a better understanding of complexity. As ANT scholar John Law already wrote in 1999, he and his peers were interested in questions such as "[h]ow to talk about complexity, to appreciate complexity, and to practice complexity?" (Law, 1999, p. 10) And this has remained the case ever since (Law, 2004; Law & Ruppert, 2016; Mol & Law, 2002). The body of work that has come out of this is today known as post-Actor-Network Theory or post-ANT (Gad & Bruun Jensen, 2010; Law & Hassard, 1999).

Unlike their names suggest neither ANT nor post-ANT is a single theoretical framework. Rather, both are a set of closely related concepts that carry a specific sensibility. For ANT this is primarily a sensibility for the *materiality* of social phenomena. Initially developed through ethnographic studies of scientific laboratories in the 1980s (Latour, 1987; Latour & Woolgar, 1979) ANT showed how the production of scientific facts was not simply an achievement of humans and their minds, but also crucially depended on materials and technological apparatuses. Meanwhile, ANT is also making a name for itself in planning (Boelens, 2010; Metzger, 2013; Rydin, 2014) and researchers now need to acknowledge that "planners operate in a material world during their daily practice" (Rydin, 2014, p. 592). That planners work in a material world might sound self-evident but has long been ignored by planning theory (Beauregard, 2015). In this dissertation, I will pay attention to materials, but they will not have the focus. Rather, as mentioned this monograph is primarily informed by a post-ANT sensibility, a sensibility for *complexity*.

Post-ANT scholarship is particularly productive for articulating the complexity of institutionalized planning practices for two main reasons. First, it has focused on articulating the complexity of governance (Law, 2002) and knowledge practices (Mol, 2002). Second, post-ANT scholarship is particularly productive for opening up that what seems closed and stabilized, such as institutionalized planning bureaucracies. In this way, it differs from earlier STS theories such as SCOT (Pinch & Bijker, 1987) or early-ANT. Those theoretical approaches focused on how things, such as facts and artifacts, stabilized over time[5]. Post-ANT, by contrast, offers a

[4] Another example of such a critique is the work of James C. Scott (1998) who argues that 'state simplifications' make planning possible, but ignore the city's complexity.

[5] This idea is for example central to the SCOT inspired studies of planning in Barcelona by Aibar and Bijker (1997) and in the Netherlands by Hommels (2005), as well as to the ANT inspired work on 'the planners gaze' by Söderström (1996).

conceptual toolkit for opening up that what appears closed, such as the state bureaucracies in which (transport) planning takes place.

It is crucial to realize that while planning and STS have both made a complexity turn, they draw on fundamentally different conceptions of complexity. Most planning theorists[6] have adopted a so-called *romantic* conception of complexity. Post-ANT scholarship, on the other hand, draws upon a *baroque* understanding of complexity (Kwa, 2002). I will further explain the meaning of these two terms and their differences in the next chapter. For now, I want to highlight one crucial aspect differentiating the two.

The most important difference between a romantic and a baroque conception of complex planning processes concerns the issue of *overview*. A romantic view is based on the idea that, at least in principle, it is possible to establish an overview of a complex whole, such as a city. In this way, romantic complexity neatly connects with planning theory as planning theorists have taken *overview* as crucial for making planning possible, throughout its history. As I will discuss in the next chapter, overview is widely seen as key for the coordination of different urban elements and into a coherent whole, into a city. Overview is what enables the resolving of conflicts and of the preventing fragmentation of different social groups in the city. However, the implicit assumption here is that achieving an overview is indeed possible and desirable. I will discuss all of this in detail in the next chapter, but for now, it is sufficient to grasp that a baroque approach to planning and complexity questions this.

A baroque conception of planning challenges the idea that it is possible to establish an overview of a complex whole such as the city (Bruun Jensen, 2007; Hillier, 2012). It suggests that different views do often not add up to a singular perspective, that is, an overview. As such, a baroque approach thus challenges one of the most fundamental ideas of modern planning theory, namely the idea that overview is what makes planning possible. It might be worth noting here that this is not just a theoretical point. As suggested by de Roo et al., also in planning practice today "no-one [is] able (anymore) to grasp all of the aspects of any one project" (de Roo et al., 2012, p. 1). In planning and social scientific theory more broadly, the inability to come to a singular view is often conceived as a result of disagreement or conflict between different (human) actors. Post-ANT scholarship by contrast foregrounds that singular perspectives might be impossible because of conflicting versions of reality itself (Mol, 2002).

This post-ANT insight brings me to the central question of this dissertation. I already briefly explained that planning is crucially concerned with the coordination of different elements, perspectives, or versions of urban reality into a coherent whole, i.e., a city. Achieving and maintaining such coherence is widely understood as premised on planning's capacity to establish an overview of the complex whole that the city is. A baroque approach, however, questions that such an overview is possible. It suggests that any attempt at establishing an overview of a complex whole, for example, through a master plan, is itself a partial perspective that requires coordination with other ones. It claims that no singular perspective can encompass all the others; no final overview can exist. It is in this light that I ask *how actors achieve coherence between different versions of urban reality in institutionalized planning practice without establishing an overview of the city as a whole.* To put it simply, I ask how planners plan but approach this question through a baroque conception of complexity, which rejects the possibility of overview.

I will argue that state planners do not hold or achieve a singular perspective on urban reality. Rather, drawing on an ethnographic study of Munich's transport planning department, I show that planners participate in several different *modes of planning*[7]. In other words, planners working in Munich's planning department plan urban

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[6] A notable exception here is the work of Jean Hillier (2008, 2012).

[7] My *modes of planning*, draws on John Law's, *modes of ordering* (Law, 1994) a concept which Law developed in a friendly critique of Michel Foucault's notion of discourse. The key innovation of Law's work is its move beyond the

realities by exploring those realities through multiple modes of planning. Those different modes allow them to comprehend and organize complex urban environments in ways that overlap but do not add up to a coherent whole or a singular perspective. They are partially connected but do not offer a final overview.

individual/society diad, the idea that there is *one* society (defined by an overarching 'discourse') in which individuals live. In contrast to this commonsense idea, Law argues that people variously participate in several *modes of ordering*.

1.2. THESIS OUTLINE

In the next chapter, chapter 2, I offer a deeper theoretical discussion of the claims I have just made. I will show that the idea of *overview* has been central to modern planning theory from the start and remains so up until today. More specifically, I will discuss the links between this idea and assumptions from the classic Newtonian sciences, particularly the idea that (urban) reality is fundamentally *simple* and *singular*. These ideas were especially influential during the 1950s and 60s when scientific objectivism formed the theoretical foundation of planning theory and practice. Already in the early 1970s, insights from the complexity sciences led some scholars to question the adequacy of these assumptions as foundations for urban planning and public policy (Rittel & Webber, 1973). However, such insights were simply ignored by the hugely influential 'communicative turn' in planning theory (Healey, 1992; Innes, 1995; Willson, 2001). While the communicative turn explicitly criticized objectivist planning, it retained two of its most fundamental assumptions, namely the idea that (urban) reality is ultimately *simple* and *singular*. As mentioned at the start of this chapter, the more recent complexity turn in planning has started to question such assumptions once again. This turn has largely focused on the complexity of the city and of non-institutionalized planning practices. That said, a central claim of this dissertation is that there is a need for better ways of articulating the complexity of institutionalized planning processes, such as those that can be found in Munich's transport planning department. To this end, the second part of the chapter will further elaborate on a baroque conception of complexity, especially as developed through post-ANT scholarship and explain how it can be used to come to such understandings. I will clarify how this requires moving away from the idea that urban reality and the planning practices that are part of it are *simple* and *singular* and towards the idea that they are *complex* and *multiple* (Mol, 2002). In the following chapters, I discuss the *multiple modes of planning* in which Munich's transport planners participate.

Chapter 3 will explore the first mode, *the networked-city*. Here I will first look at how this mode emerged in Munich from over the course of the 20th century and focus its links with the invention and construction of a network of main roads, *Hauptverkehrsstraßen.* As mentioned, the function of such roads was to integrate different urban building blocks into a coherent whole, the city. This mode and type of infrastructure are commonly associated with car-oriented planning. But, in the second part of the chapter, I will show that this modern planning ideal, the networked-city, also informs the planning of cycling. Since the 1980s, actors in Munich have successfully developed a citywide network of cycling lanes. Finally, I will elucidate how *the networked-city* ideal is related to the idea of *overview*. Social scientists often assume that such a networked understanding of the city as a whole fully defines planners' view of urban reality and allows them to organize it effectively. I will show that this is not the case. I argue that this networked ideal is not merely a perspective held by Munich's transport planner, but indeed a *mode of planning* deployed by planners but also by other actors including citizens in politicians. More importantly, I will show that planners need to consider several other modes simultaneously. Those modes partly overlap but are also partly conflicting with *the networked-city* mode.

Chapter 4 will explore a second mode, *capacity calculation*. I will discuss its invention in the US between the 1930s and 1960s as well as its use and further development in Munich today. But I will focus on how it both overlaps and conflicts with the plan to develop a *networked-city* for cycling. Capacity calculations allow planners to calculate the road capacity of specific roads or junctions. In this way, they overlap with ambitions to realize a networked city. This is sometimes understood as a merely technical and neutral activity, which generates objective information on a specific part of the city's transport system. The implicit assumption here is that such tools should offer an accurate representation of urban reality 'out there'. However, not surprising given their US origin the networked city inscribed into such calculation tools fails to consider cyclists, as well as other modes, and as such conflicts with the contemporary Munich version of the networked-city mode. Such tools, used throughout Germany, can only calculate road capacity for motorized traffic, but fail to consider other modes such as walking, public transport or cycling. Rather than simply criticizing this situation, I show that transport planning professionals are well aware of this, and address this issue in practice. Drawing on the distinction between romantic and baroque complexity, I will contend that planners do so in two distinct ways. First, between 2015 and 2018, the city of Munich collaborated in an EU (horizon-2020) project that sought to address this issue by developing a multi-modal capacity calculation tool. More specifically, the project sought to render

multi-modal capacity calculable by developing a *singular* frame of reference. This is a romantic approach. Second, I will show that even though planners use the 'old' formalized approach in practice, they nonetheless consider a variety of transport modes (walking, cycling, motorized, and public transport). In practice, there is no single frame of reference and seeking to subscribe to one would create undesirable effects; only motorized transport would be taken into account. In practice, planners do and should thus not seek to establish a singular perspective but rather a multiple one. The question that follows from this is how coherence between different versions is achieved, if not through the establishment of singular frames of reference, if not through the establishment of overview.

Chapter 5 will explore how the modes discussed in the previous two chapters are coordinated with one another in practice, focusing on the role of meetings. Meetings are both ubiquitous in planning practice and widely understood as sites of coordination work. Some scholars assume that meetings and the coordination work they perform are merely discursive activities; yet drawing on STS insights, I will foreground the role that material devices play in them. Drawing on a meeting that took place in Munich's transport planning department, I will specifically focus on the role of maps and discuss how they form an instantiation of the modern networked city ideal, discussed in chapter 3. Social scientist, including those working with actor-network theory (Söderström, 1996) have often suggested that such maps and other material devices offer planners a specific way of seeing the city (Scott, 1998). Such conceptualizations, including early-ANT, however, retain the romantic assumption that state planners hold one singular perspective of the city. In other words, they assume that an overview is possible. This conception of planning overlaps with the idea that meetings transform multiplicity into singularity (Brown, Reed, & Yarrow, 2017). By contrast, a baroque approach asks to resist this commonsense idea, the idea that planning meetings and materials produce singular perspectives. Furthermore, I will argue that doing this makes visible that planners consider even more modes of planning than the two identified so far; they also need to consider bureaucracy and Politics. For reasons, which I explain in due course, I explore only the first of the two, that is, bureaucracy, in greater depth.

Chapter 6 addresses the mode of *bureaucracy*. As I mentioned at the very beginning of this chapter state bureaucracies are sometimes seen as antithetical to complexity (Innes & Booher, 2010). Dismissing institutionalized planning practices in this way is problematic as it risks throwing the bureaucratic baby out with the bath water. Following theorist of bureaucracy Paul du Gay, I will argue that there are important reasons for retaining rather than simply abandoning bureaucratic practices. Rather than suggesting that bureaucracies are incapable of dealing with complex planning problems, I will seek to articulate bureaucracy as itself a complex activity. Another reason for focusing on bureaucracy is that, at least in liberal political theory, bureaucracy is seen as an ultimate arbiter in the case of conflicts, including conflicts over road designs. In this way, *bureaucracy* is thought to play a fundamental role in the achievement of coherence. However, it is precisely this idea, the idea that bureaucracy offers an overarching organizational framework, which baroque complexity questions, raising the question of how actors achieve and maintain coherence in practice. In chapter 6, I will argue that they do so through three further modes that can be found 'within' the mode of *bureaucracy*. This implies a complex conception of bureaucracy, one that sees bureaucracy not as singular but as multiple. Finally, chapter 7 will summarize, reflect and conclude the dissertation and offer suggestions for further research

2. THEORY

2.1. PLANNING IN A SIMPLE AND SINGULAR WORLD

Social scientific theory has long understood the city as a complex object. In 1903, the grandfather of urban sociology Georg Simmel indeed already spoke of the city as a "highly complex organism" (Simmel, 1969, p. 48). However, modern planning has a long history of conceiving such complexity as an apparent phenomenon. Especially during the 1950s and 1960s, planning theory was heavily influenced by scientific objectivism and firmly grounded in the classic Newtonian sciences[8]. In this view, the city might appear to be complex but is ultimately understood as being *simple* and *singular* underneath. As we will see later on, insights from the complexity sciences (Prigogine & Stengers, 1984) challenge such assumptions. A complex view suggests that urban reality is not fundamentally *simple* and *singular,* but instead *complex* and *multiple*. The meaning of these concepts and the implications for how we might think about planning are explored in the second half of the chapter. Here, particularly focus is made on how such insights challenge the idea of overview, that is, the capacity to see a complex whole from a centralized position. But before coming to this, I first explore how this idea entered modern planning theory and elucidate how it has remained absolutely central to it since. To do so, I discuss some of the most important theoretical positions that have informed planning between roughly the 1950s and today, namely objectivist, rationalist and communicative planning. This will then bring us to the recent turns to complexity within the fields of planning and STS.

The rational planner in the work of Alan A. Altshuler

The start of modern planning theory is often linked to scientific objectivism. Although certainly not the first, Alan A. Altshuler's book *The Planning Process* (Altshuler, 1965) offers a particularly strong and clear articulation of this position. Therefore it offers a great starting point for the inquiry. For Altshuler planning depended on two key aspects: *overview* and *detachment* from politics. For Altshuler, like many others, planning is fundamentally concerned with resolving the spatio-material conflicts defining a city. In contrast to what one would expect, for him resolving conflict is not a matter of (democratic) politics but rather a matter of *overview*. He argues that if there are conflicting views, and Altshuler is well aware that the city is full of conflict, the view of 'the planner' should prevail, as only planners "spend their days analyzing city problems from an overall point of view" (Altshuler, 1965, p. 328). It might be worth noting here that Alsthulers position also differs from a strictly technocratic one, that is from governance by 'experts'. For him, experts are people who have a detailed understanding of a specific subject area. Planners, however, are not experts because planners have an overview of the city as whole.

This overview also gives planners a unique role within society as, for Altshuler, it makes that they are particularly capable of comprehending "the public interest". This is the crux of the objectivist position, the idea that it is not citizens or politicians, but 'the planner' that should have the final say in planning decisions concerning the public interest. He suggests that neither politicians nor citizens can inform planners on what the public interest entails as they are too attached to personal and short-term interests. He argues that this makes that "comprehensive democratic planning is virtually impossible." (Altshuler, 1965, p. 311). Only planners, he argues, have the kind of perspective on the city that allows them to come to a well-informed understanding of the long-term public interest. Accordingly, planners should, therefore, have the final say in decisions concerning the city's

[8] This view assumes that "at some [basic] level the world is simple and is governed by […] fundamental laws" (Prigogine & Stengers, 1984).

development, decisions that should be based on the overview that can be achieved by synthesizing different forms of expert knowledge into a coherent plan or perspective.

The linear-rational model

Already before Altshuler published his book, others had criticized objectivist approaches to planning. An influential alternative view of planning that emerged out of such debates was the so-called 'linear-rational model of planning decision making', or simply 'the rational model' (Alexander, 1984; Meyerson & Banfield, 1955). The key difference between objectivist planning and the rational model is that the latter ascribes much more power to a democratically legitimate decision-making authority, i.e. the (city) government. Despite such differences, the linear rational-model maintains some of the key assumptions of objectivist planning. It maintains the idea that what the world planners are dealing with can be objectively represented and adequately understood through methods grounded in the Newtonian sciences.

An early and influential version of the linear-rational model is found in *Politics, Planning and the Public Interest* (Meyerson & Banfield, 1955). Like Altshuler, the authors, Meyerson and Banfield, distinguish between 'politics' and 'rational-planning'. However, in contrast to Altshuler, they suggest that goal setting is and should be fundamentally political. Inspired by American pragmatism, they propose that "[w]hen there is a conflict […] between the ends of different actors […] an issue exists and the actors whose ends conflict are parties to the issue" (Meyerson & Banfield, 1955, p. 304). Put simply, planning should for them be guided by politics. However, they maintain the idea that planning is not politics. For Meyerson and Banfield, it is only once goals are set and conflict has presumably been kept at bay, that planning begins. Planning needs to be 'rational' and to assure this they prose a three-step model—still highly influential in planning and policy up until today (Shore & Wright, 2011). These are the steps:

> 1) "the decision-maker considers all of the alternatives."
>
> 2) "he identifies and evaluates all of the consequences."
>
> 3) "he selects that alternative the probable consequences of which would be preferable."
>
> (Meyerson & Banfield, 1955, p. 314).

The idea that politically set goals should guide planning activity is a significant improvement over the technocratic approach advocated by Altshuler. Meyerson and Banfield's work indeed forms a strong critique of the objectivist position articulated by scholars like Altshuler. However, despite such critiques it also maintains several key aspects. First, and most important for the current discussion, it maintains the idea that 'the planner' is an actor who holds an overview of the whole and makes decisions from a centralized position. As can be read in the quote above, the planner is the one who makes "rational" decisions based on an overview of "all the alternatives" and "all the consequences" of the planning process. To be clear, Meyerson and Banfield do not think, and here they differ from Altshuler, that such a perspective is fully attainable. That said, they do present it as the ideal that planners should pursue:

> "Obviously no decision can be perfectly rational since no one can ever know all of the alternatives open to him at any moment all the consequences which would follow from any action. Nevertheless, decisions may be made with more or less knowledge of alternatives, consequences, and relevant ends, and so we may describe some decisions and some decision-making processes as more nearly rational that others." (Meyerson & Banfield, 1955, pp. 314–315)

Second, by separating decision making on how to reach goals (planning) from setting goals (politics), Meyerson and Banfield's rational-model offered a way of rescuing the planning methods and practices of objectivist planning. As planning theorist Gert de Roo (2012) argues a key innovation of the rational-model was the introduction of alternatives, and thus choice (de Roo, 2012). This offered a way around the practically unattainable demand of 'precise measurement' that people such as Altshuler advocated. Through generating alternative ways of reaching certain goals, 'rational planners' could opt for the 'best' alternative available if they lacked certain information. In this approach planning thus remains a matter of technical or 'rational' decision making on how to best reach politically defined goals on the basis of 'scientific' methods rather than public debate.

Communicative planning in a fragmented world

During the second half of the 20th century, the claim that the planner could be a rational and neutral decision-maker was increasingly questioned. In hindsight, it was especially the communicative turn of the 1990s (Healey, 1992, 1997; Innes, 1995) that ended the hegemony of such ideas. Scholars such as Judith Innes explicitly criticized objectivist planning and challenged the idea that the planner could be "a rational man operating at arm's length from the messy world of politics" (Innes, 1995, p. 184). They argued that planning needed other forms of knowledge to justify its claims and authority.

This rejection of scientific objectivism as the (sole) basis for planning was closely linked to another post-modernist concern, namely the social *fragmentation* of (western) societies. In her book, Collaborative Planning: Shaping Places in Fragmented Societies, Patsy Healy for example notes that: "[c]ontemporary social orders are often described as 'fragmented', reflecting a change from a 'modern' period of shared objectives, to a 'postmodern' time of lifestyle diversity and the celebration of difference" (Healey, 1997, p. 32). For Healy and her peers, social fragmentation posed a significant problem "with respect to the public realm, and specifically, for managing our relations of co-existence in shared spaces." (Healey, 1997, p. 42). Increasing recognition of the fact that different (groups) of people valued things in different ways, meant that the self-claimed 'neutrality' of planning became a less and less legitimate source of authority. As a result, planning not only needed new methods but also a new source of (democratic) legitimacy.

Communicative planning theorists found this alternative in Jürgen Habermas' idea of communicative rationality (Habermas, 1984, 1985). Habermas proposes that legitimate public action required establishing 'ideal speech situations', put simply, public debate. Central to his work is the idea that the outcomes of such debates are legitimate to the extent that they are 'rational', which is defined here by the degree to which public debate follows a specific set of (transcendental) principles.

By translating Habermas' work to a planning context, communicative planning theorists made an important contribution to their field. However, even though communicative planning implies a strong critique of objectivist planning, like the rationalist model, it maintains important assumptions of the classical sciences. An example of this is the assertion of the idea that the world is fundamentally *simple* and *singular*. Consider for example the following quote from Innes:

> "While there may be a reality or truth out there, it is hidden under the socially constructed understandings, theories, and assumptions shared in a society." (Innes, 1995, p. 186)

But more importantly, by drawing on the work of Habermas, communicative planning maintains the idealist assumption that planning can or should be based on a consensus, a singular perspective, or overview of the city as a whole. While it acknowledges that people have different views on reality, it ultimately assumes that, through public debate, those perspectives can be coordinated into a singular perspective. Or if not, that legitimate choices

can be made on the basis of a coherent set of overarching principles. It is such principles that consequently underpin a capacity for overview.

2.2. PLANNING THEORY AND ITS PROBLEMS, ARE THEY WICKED OR COMMUNICATIVE?

In 1973, Rittel and Webber (1973) made a major contribution to the field of planning theory by introducing a distinction between what they referred to as 'tame' and 'wicked problems'. A distinction that maps on to the distinction between the *classical (Newtonian) sciences* and the *complexity sciences* (Prigogine & Stengers, 1984). However, during the aforementioned communicative turn in planning theory, scholars largely ignored the insights that Rittel and Webber developed. As de Roo (2012) argues, "[today] we see planners acknowledging problems not as 'wicked' but as 'communicative'" (de Roo, 2012, p. 147). Put simply, the 'wickedness' or complexity of planning problems got lost.

Like communicative planning theorists, Rittel and Weber concerned themselves with the problems an increasingly diversifying society posed to modern institutions, such as planning. Also, like communicative scholars, they criticized the idea that technical expertise could form the only basis of political decision-making.

> "The professionalized cognitive and occupational styles that were refined in the first half of this century, based in Newtonian mechanistic physics, are not readily adapted to contemporary conceptions of interacting open systems and to [planning's] contemporary concerns with equity." (Rittel & Webber, 1973, p. 156).

However, unlike communicative planners, they argued *against* the idea that there could be *one* approach for dealing with this—as advocated by the work of Habermas.

> "One traditional approach to the reconciliation of social values and individual choice is to entrust *de facto* decision-making to the wise and knowledgeable professional experts and politicians. But whether one finds that ethically tolerable or not, we hope we have made it clear that even such a tactic only begs the question, for there are no value-free, true-false answers to any of the wicked problems governments must deal with. To substitute expert professional judgment for those of contending political groups may make the rationales and the repercussions more explicit, but it would not necessarily make the outcomes better. The one-best answer is possible with tame problems, but not with wicked ones." (Rittel & Webber, 1973, p. 169)

Using one approach was possible, as long as problems were *tame*. Those were problems of which it was ultimately possible to define "whether or not the problems have been solved" (Rittel & Webber, 1973, p. 160). Wicked problems, by contrast, were problems that were never solved; rather, "[a]t best they are only re-solved over and over again." (Rittel & Webber, 1973, p. 160) And there was no definitive way for defining nor for approaching them. Planning, they argued, only dealt with complex or wicked problems.

> "We are thus led to conclude that the problems that planners must deal with are wicked and incorrigible ones, for they defy efforts to delineate their boundaries and to identify their causes, and thus to expose their problematic nature." (Rittel & Webber, 1973, p. 167)

Rittel and Weber thus made an early and important contribution to translating the insights from the complexity sciences into planning theory and practice. However, as their work challenges liberal-rationalist forms of governance, it is perhaps not so surprising that they lost out against those who advocated the communicative approach.

2.3. PLANNING AND COMPLEXITY: ROMANTIC VS. BAROQUE

Over the last two decades, planning theorists have re-turned to complexity (de Roo et al., 2012; de Roo, Silva, Gert de Roo, & Silva, 2010; Innes & Booher, 2010; Portugali et al., 2012). As complexity questions the very idea of singular perspectives, it should be no surprise that these authors conceptualize it in different ways. In *Planning with Complexity*, Innes and Booher (2010) link insights from the complexity sciences with the Habermassian framework of communicative planning (Innes, 1995). Portugali and co-authors (Portugali et al., 2012; Portugali & Stolk, 2016) draw on insights from the complexity sciences to model urban development. Finally, authors such as Jean Hillier (2008, 2012) and van Joris van Wezemael (2012) approach issues of complexity and planning through the work of Deleuze and Guattari (1987).

I do not claim to offer a full overview of this debate, but want to focus on the distinction between *romantic* and *baroque* conceptions of complexity (Kwa, 2002). As mentioned previously, the romantic approach to complexity has been successful for rethinking cities as complex adaptive systems. However, it has been less successful in articulating the complexity of planning practices, and it is precisely here that the power of baroque complexity lies. More specifically, later in the chapter, I will argue that post-ANT (a baroque approach) is particularly well suited for articulating the complexity of institutionalized planning practices.

A critical difference between the two approaches is how they understand the possibility of comprehending complexity. First, a romantic approach assumes that this requires establishing an *overview*. It attempts to comprehend all the different parts of a complex whole, such as all the elements constituting the city, as well as the interactions between them. In this view, complexity is an *emergent* phenomenon. It emerges out of the interactions between a system's heterogeneous parts, whose parts are, at least at their most fundamental level, understood as simple. The implicit implication here is that romantic complexity "sees an underlying unity in a world of heterogeneous objects and phenomena" (Kwa, 2002, p. 24). Second, baroque complexity does not make this assumption, it takes every part as a complex whole in itself (Kwa, 2002; Law, 2004, 2012). In other words, it foregrounds that we do not know, for sure, what to take as a part and what as a (emergent) whole. Or, in the words of philosopher and STS scholar, Isabelle Stengers:

> "As for the notion of [baroque] complexity, it sets out problems - we don't know a priori what "sum of parts" means - and this problem implies that we cannot treat, under the pretext that they have the same "parts," all the "sums" according to the same general model." (Stengers, 1997, p. 12)

In consequence, a baroque complexity denies the possibility of an overview. As planning scholar Jean Hillier notes: "[a]lthough there may well be some higher order level (e.g. a city), it is impossible to describe and explain it fully from a baroque viewpoint." (Hillier, 2012, p. 58). Where a romantic approach seeks to establish an overview to comprehend complexity, a baroque approach zooms in or 'looks down' (Kwa, 2002) at the individual parts. It explores how parts are reciprocally connected (or not) but without ever achieving an overview of the whole.

For example, when transport planners calculate road capacity they, as we will see in chapter 4, implicitly assume that individual vehicles are the 'most fundamental parts' of the complex whole (the city) they are dealing with. In that case, they adopt a romantic conception of complexity. Complexity is rendered comprehensible by making an assumption on what is part (cars) and what is whole (the city). This is not 'wrong'. In chapter 4, we will see that such romantic assumptions are necessary to calculate in the first place. However, a baroque sensibility would zoom in on the 'fundamental parts' and explore how they are related to other ones. Most importantly, it opens up the possibility of calling parts and wholes into question. In a baroque approach planning needs to accept that "[humans and nonhumans] 'do not naturally live anywhere in particular' […] as there is no transcendent context in which beings, things or events naturally arrange or order themselves." (Hillier, 2012, p. 62)—also see Callon and Law (2004). Acknowledging this asks for a different complex way of conceiving urban

reality, but before coming to this, the next section will first discuss how Actor-Network theorists have thought about complexity.

2.4. COMPLICATEDNESS AND COMPLEXITY IN STS

Complexity has been central to ANT from the start but was initially defined in negative terms. Actor-networks, collective actors made up out of human and nonhuman entities, were precisely not *complex* but rather *complicated*. Latour (1996) defined complexity as: "the obligation to take into account a large number of variables at the same time" (Latour, 1996, p. 228). The notion of 'variables' can also be read as 'objects' or 'relationships'. Complication, by contrast, refers to the "the successive presence of discrete variables, which can be treated one by one, and folded into one another in the form of a black box." (Latour, 1996). Put simply, for Latour the difference between complexity and complicatedness thus depends on whether different types of relations need to be considered simultaneously, or one by one.

The idea of *complicatedness* entered the ANT canon through Bruno Latour's cooperation with primatologist Shirley Strum (1987). Drawing on Strum's work on baboon 'societies' the authors argued that human societies were not more but less complex than those of baboons. This was not so much an argument about baboons but rather a way to challenge the idea that industrialization and modernity generated an ever-increasing degree of complexity. The capacity of one human society to rule over another, or over those of baboons was, Latour and Strum suggested, due to the fact that things became less rather than more complex. Or, in the words of Strum and Latour: "the skills in an industrial society are those of simplification making social tasks less complex rather than making them more complex by comparison with other human and animal societies" (Strum & Latour, 1987, p. 792). Reducing complexity was, however, not a matter of making things simpler but rather making them complicated.

The idea of complicatedness in ANT is closely linked to romantic complexity. Indeed as John Law has argued: "in some of its earlier versions actor-network theory also reflects and carries the torch of scientific romanticism. It looks up and centres in order to discover the emergent." (Law, 2004, p. 4). Using the idea of complicated relationships (or its synonym 'black-box'[9]) ANT scholars sought to explain how the state, a macro-actor who holds an (over)view from above, is constructed in practice.

> "macro-actors are micro-actors seated on top of many (leaky) black boxes. They are neither larger, nor more complex than micro-actors; on the contrary, they are of the same size and, as we shall see, they are in fact simpler than micro-actors." (Latour & Callon, 1981, p. 286)

Drawing on those early-ANT insights, Ola Söderström's (1996) *Paper Cities: visual thinking in urban planning* offers a fascinating account of the invention of modern planning and what he refers to as the 'planners gaze'. That is, the capacity to see and thereby manipulate the city as a whole from a centralized position—akin to Latour's (1987) 'centers of calculation'. Söderström asks how this view is achieved and argues that it depends on a series of planning techniques such as maps and social statistics that "enables one to pass from one complex [urban] reality to its simplified figuration" (Söderström, 1996, p. 252). In this way, planning methods:

> "…synthesize the city in terms of material objects, or individuals who are treated as objects, that is, reduced to social types, operators of functions (living, working, travelling, recreating) or of standard needs (norms of comfort, of noise, of household goods)." (Söderström, 1996, p. 275)

[9] Early ANT concepts such as the 'black-box' and 'immutable mobile' are synonymous to the idea of complicatedness. All these concepts ultimately seek to explain how actor-networks construct centralized and macro perspectives in practice.

We may recognize early-ANT's romantic style of reasoning here—which, to be sure, I take as highly insightful. Confronted with the issue of complexity it seeks to understand how actors establish an overview of a complex whole such as the city, and asserts that planning methods are crucial here. Such instruments are thought to enable their users to translate complex realities into complicated one, in which problems can treated one by one (Latour, 1996). This reduction in complexity enables actors to 'grow in size' and dominate others from a centralized position.

The problem with this view is that it reifies the state (or 'the planner') as a centralized actors and fails to appreciate that planners themselves might be situated in highly complex realities as this dissertation aims to demonstrate. To start acknowledging this inspiration might come from the work of STS scholar Susan Leigh Star (1990), who already in the early 1990s criticized ANTs romantic tendencies.

Star criticized ANT for focusing too much on the stories of the most powerful (male) actors—as in the work of (Callon, 1984; Latour, 1987, 1993; Law, 1997). Besides this, Star also problematized ANTs incapacity to appreciate complexity on its own terms. She highlighted how actors might hold multiple identities at the same time, and argued that ANT scholars tended to overlook this 'high tension zone', that is, the "complexity of the relationships involved in simultaneous multiple membership" (Star, 1990, p. 51). It may be noted that this definition is very close to Latour's definition of complexity. In both cases, complexity refers to situations in which actors are simultaneously engaged with a multiplicity of issues. Yet, while Latour defined it negatively, Star's work offers a positive definition of complexity. Her work on boundary objects (Star & Griesemer, 1989) indeed suggests that complexity can be productive in itself.

2.5. ARTICULATING COMPLEXITY, THE MULTIPLE CITIES AND MODES OF PLANNING

Susan Leigh Star's emphasis on complexity contributed to a broader effort to rethink ANT in this light. This has resulted in a new version of ANT that fully embraces complexity, known as post-ANT (Gad & Bruun Jensen, 2010; Law & Hassard, 1999). As also mentioned in the previous chapter, questions such as "[h]ow to talk about complexity, to appreciate complexity, and to practice complexity?" (Law, 1999, p. 10) have been central to those developments. This, plus its steadfast commitment to ethnographic research, makes that post-ANT scholarship offers a great point of departure for addressing the problems that planning theorists are currently struggling with. Namely, how to articulate the complexity of situated planning processes themselves (Batty & Marshall, 2012). Beyond that, post-ANT scholarship has another specific quality. In my eyes, it is particularly well equipped to articulate the complexity of *institutionalized* planning practices. Planning scholars who have engaged with complexity so far, have mostly done so outside and in a critique of state bureaucracies (Boelens & de Roo, 2016; Innes & Booher, 2010). I will come back to this issue in chapter 6, but for now, I will discuss how post-ANT scholarship can be used to open that which seems closed. This, I argue, requires appreciating the *complexity* and *multiplicity* of that what appears *simple* and *singular*[10].

Complexity

Things are complex when their development is emergent, non-linear, and unpredictable. But, how to make sense of this? The work of Susan Leigh Star and Bruno Latour, discussed earlier, already offered some suggestion. First, Leigh Star associates complexity with *tension* and *simultaneous multiple membership*. In other words, for Star things are complex when they are simultaneously part of several conflicting wholes, collectives, or identities. For the case of planning, we may, for example, consider a planner who is simultaneously involved in two conflicting versions of a plan or a road used by several different transport modes. Second, Latour also associates complexity with simultaneity. As mentioned, for Latour situations are complex when actors need to consider a large number of relationships simultaneously. But, why is this complex? Latour:

> "Since each actor's every action is interfered with by others, and since succeeding in one's aims is mediated by continual negotiation, one can talk of this in terms of complexity—that is to say in terms of the obligation to take into account a large number of variables at the same time" (Latour, 1996, p. 228)

Another critical aspect of a complex (post-ANT) understanding of the world is the absence of an overarching or underlying space or context. Consider for example the following quote from Mol and Law:

> "But what is complexity? One way of starting is with a simple definition. There is complexity if things relate but don't add up, if events occur but not within the processes of linear time, and if phenomena share a space but cannot be mapped in terms of a single set of three-dimensional coordinates." (Mol & Law, 2002, p. 1)

[10] In his review of Annemarie Mol's (2002) *The Body Multiple,* Malcolm Ashmore indeed suggests that Mol's strategy of recursively opening more and more layers of multiplicity is particularly productive for demonstrating how the seemingly finished and stable is not so stable at all. Or in his words, Mol's work elucidates "the (not so) cold side of (un)finished, (un)settled [knowledge practices]" (Ashmore, 2005, p. 830).

This is an important point. Not in the last place because it goes against commonly held assumptions. For Mol and Law, things are complex if they are related but don't add up. But, most importantly they insist that there can be no overarching context, no singular space and thus no overview. Because if there was, the world would be fundamentally simple again. It would suggest that complexity is apparent or takes place within a simple and singular world. This, as we have seen, has been a key assumption of planning theory. Nevertheless, it is also a belief that Mol and Law ask us to resist.

Multiplicity

What needs to be resisted is the idea that complexity disguises an underlying singular and simple world, or is situated within it. To resist simplifying tendencies, post-ANT scholarship[11] has incorporated the Deleuzian[12] notion of *multiplicity*[13]. In her book, *The Body Multiple*, Mol puts this concept to work in fascinating and ground-breaking ways. Drawing on an ethnographic study inside a Dutch hospital, she shows how Deleuze's thought does not only have relevance in the abstract world of philosophy but can also be deployed to rethink actual situated knowledge practices. In her case, these are medical practices involved in the diagnosis of Atherosclerosis, a vascular disease. Notably, a crucial insight from her work is that those different practices 'enact' different versions of the body, that do not always add up but clash. Having identified a clinical and a pathological enactment of atherosclerosis, she shows how "[sometimes] the [disease] enacted in the clinic and in the pathology department don't map. They clash. One atherosclerosis is severe while the other isn't." (Mol, 2002, p. 46). The key argument Mol makes is that these are not different perspectives on a *single* body, an underlying reality, but rather different enactments of a body that is "more than one and less than many" (Mol, 2002, p. 82).

The multiple modes of planning the city multiple

To be sure, planning has long acknowledged that its object 'the city' is variously valued and understood. Acknowledging that different people live different lives and might, therefore, have different ideas on how to plan a city and its infrastructures, are nothing new. As mentioned earlier, the communicative turn in planning (Healey, 1992; Innes, 1995) precisely advocated this idea. It challenged 'objective', 'rational', and 'technical' knowledge as the only legitimization for public intervention. Communicative theorists stressed that planners

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[11] Insights on (ontological) multiplicity have entered STS through a wider conversation with scholars from the adjacent fields of Anthropology and Philosophy. Within such discussion the idea of ontological multiplicity is closely related to terms such as *fractiverse, pluriverse, or multinaturalism* – for a recent overview see Jensen, Ballestero, de la Cadena, Fisch, and Ishii (2017). Despite their differences, all those authors insist on acknowledging the *multiplicity* of the real.

[12] Due its notorious inaccessibility, Deleuze's work might be off-putting to some. But, especially for those I think it is important to recognize him as a philosopher of *complexity*. Deleuze has greatly contributed to translating insights on complexity from the natural to the social sciences. As Eugene W. Holland writes while commenting on *A Thousand Plateaus,* one of Deleuze's most important philosophical works: "*A Thousand Plateaus* is best understood as providing the metaphysics appropriate to contemporary science – a science based on non-linear mathematics, and sometimes referred to as complexity theory or dynamic systems theory – in much the same way that Kant provided a metaphysics appropriate to the science of his day, Newtonian physics." (Holland, 2003, p. 16)

[13] Providing a single definition of this concept is to miss the point. Still, it might be helpful to establish some common ground. Therefore, let me offer you the 'definition' provided by Jonathan Roffe: "A multiplicity is, in the most basic sense, a complex structure that does not reference a prior unity. Multiplicities are not parts of a greater whole that have been fragmented, and they cannot be considered manifold expressions of a single concept or transcendent unity. On these grounds, Deleuze opposes the dyad One/Many, in all of its forms, with multiplicity. Further, he insists that the crucial point is to consider multiplicity in its substantive form – a multiplicity – rather than as an adjective – as multiplicity of something. Everything for Deleuze is a multiplicity in this fashion." (Roffe, 2005, p. 181)

also had to consider another mode of valuing the city, and seek to translate them into a coherent plan by means of a communicative approach. However, as discussed earlier, for communicative planning and social constructivism more broadly, these still concern different *perspectives* on a singular reality 'out there'. STS scholars such as Mol, however, challenge this idea, because it maintains the assumption that there is one singular reality, and that an overview of this reality is possible, at least in theory.

> "Perspectivalism broke away from a monopolistic version of truth. But, it didn't multiply *reality*. It multiplied the eyes of the beholders. It turned each pair of eyes looking from its own perspective into an alternative to other eyes. And this in turn brought *pluralism* in its wake. For there they are: mutually exclusive perspectives, discrete, existing side by side, in a transparent space. While in the centre the object of the many gazes and glances remains singular, intangible, untouched." (Mol, 1999, p. 79 emphasis original)

As I mentioned earlier, communicative planning was proposed as a mode of governing to resist the fragmentation of society. Through communicating, urban communities would establish consensus on a singular plan to regulate an increasingly heterogeneous collective.

> "In recognition of the fragmenting tendencies in contemporary urban regions, such alliances tend to recognise the importance of collaborative consensus-building among key urban region players, to overcome the conflictual interest bargaining of much traditional pluralist local politics" (Healey, 1997, p. 236)

The implicit assumption here is that *singularity* is necessary to resist fragmentation and maintain coherence. But, it is precisely this assumption that baroque complexity and the idea of multiplicity calls into question.

> "Atherosclerosis enacted is more than one - but less than many. *The body multiple* is not fragmented. Even if it is multiple, it also hangs together. The question to be asked, then, is how this is achieved." (Mol, 2002, p. 55).

Mol here argues that complex wholes (the body in her case) may be coherent (non-fragmented) without being singular. The crucial question then becomes how such coherence is achieved, if not through establishing a single perspective, consensus, or overview. In other words, Mol asks how different views are coordinated in a way that achieves "coherence-in-tension" (Mol, 2002, p. 84). That is, a coherence that is *complex* rather than *simple*. Her answer is that this is achieved through different styles, forms or modes of coordination (Mol, 2002). "The drawing together of a diversity of objects that go by a single name involves various modes of coordination" (Mol, 2002, p. 83). I will come back to this in a moment.

Urban STS theorist, Ignacio Farías (2009) has translated those insights from Mol's *body* to *the City*. He points out how most urban scholars conceive the city through the one/many dyad, problematized by the Deleuzian notion of multiplicity (Roffe, 2005), "cities are [understood as]bounded or fragmented, singular or dual, one or many " (Farías, 2009, p. 9). Farías also shows that from this perspective, the noncoherence of cities not-being-one is conceived as a failure: "[t]he city, it seems, can be one or simply not be." (Farías, 2009, p. 11). The alternative is a city, the object of planning, that is neither one nor many, neither singular nor fragmented. A city that hangs together not in a fundamentally simple, but in a complex way. The crucial question then again is how such coherence is achieved. That is, how is coherence between different enactments of urban reality achieved?

As we saw earlier, the answer of social theorists, including ANT scholars, has been that planning establishes a singular (romantic) perspective on the city as a whole, which can then be used to reorganize the city accordingly. But it is precisely this assumption, so fundamental to a conventional understanding of planning, that a baroque

sensibility calls into question. It suggests that also planning, or the state more broadly, does not establish a *singular* view. Rather it suggests that planning is achieved through maintaining coherence-in-tension. The crucial question then is no longer how actors, such as planners, coordinate different perspectives into a singular view. But, rather how planners and other actors *achieve coherence between different versions of urban reality in (institutionalized) planning practice without establishing an overview of the city as a whole.* To start answering this question, I will in the next chapter first describe how the idea of overview made its way into planning practice in Munich alongside the invention and development of its main road network.

3. RE-CYCLING THE NETWORKED CITY

The 30th of July 2003 forms an essential date in Munich's recent planning history. On that day, the city government issued six directives in support of cycling development. Initially drafted by Munich's Green Party, those directives aimed to increase cycling levels "from 13 to 20 percent". To reach this goal, the party proposed several measures, including improving cycling parking, opening one-way streets to cyclists, and "closing cycling network gaps along main traffic arteries" (Bündnis 90 / Die Grünen / Rosa Liste, 2003, p. 1).

The latter proposition, to close 'cycling network gaps' along main traffic arteries, is particularly interesting for three reasons. First, it further challenged the status of private motorized mobility in the city of Munich. In 2003, while many of Munich's main roads—Hauptverkehrsstraße in German—already had cycling lanes, some did not. Especially those roads, in which their construction required taking away space from motorized traffic, potentially constraining traffic flow, often missed cycling lanes. The 2003 directive targeted precisely those roads. Second, the proposal also broke with the approach that had preceded it. During the 1990s, Munich saw the rollout of an extensive citywide cycling network. However, these infrastructures had often been built away from main traffic arteries, and the politicians challenged this approach:

> "With the [existing cycling plan] there is now a detailed template for the future cycling routes. However, so far, the emphasis was placed on leading main cycling routes of cycling through green and open spaces or ... side roads ... However, the necessity of cycle paths along major roads follows from the high motorized traffic load. For many cyclists, such main roads form important connections to get from one point of the city to the other as fast as possible." (Bündnis 90 / Die Grünen / Rosa Liste, 2003, p. 1)

Third, and most importantly, the government planned to develop one infrastructure network, the cycling network, at the cost of another one, the (primary) road network. This focus on network development is relevant as it connects with a long-standing tradition in modern planning, but challenges how urban and planning theorists have described it. The development of infrastructural networks is widely understood as a critical aspect of modern planning and governance. Urban and planning scholars have a term for this: the so-called 'modern networked-city ideal' (Choay, 1969; Graham & Marvin, 2001). This idea emerged towards the end of the 19th century[14]. Urbanization and industrialization had led to increasing social, functional, and spatial fragmentation of urban life. Not only did various urban activities such as living, working, and recreation became located at distinct locations, capitalist modes of production also engendered economic inequalities which the new urban condition made explicitly clear.

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[14] An early and famous real world example is the so-called *Hausmannization* of Paris (Choay, 1969). From 1853 onwards, Georges-Eugène Haussmann destroyed large parts of medieval Paris to construct a number of grand *boulevards* that would introduce light and air into the city, and make it easier to travel and govern the city. Other, more utopian, examples include the English Garden City Movement of the early 1900s (Howard, 1902), the functionalist planning of Le Corbusier and CIAM in the 1920s and 1930s, and the *Autogerechtestadt* in the 1950s and 1960s in Germany (Reichow, 1959). Central to all these visions was the separation dwelling from working integrated by roads and other networked infrastructures.

In this light, the modern network-city ideal emerged as an attempt at integrating different social and spatial elements into a properly functioning urban society (a city) through the construction of networked infrastructures:

> "The modern urban planning ideal, from the early 1900s to the 1960s and 1970s, was thus to integrate, either explicitly or implicitly, coherent networks of transport, energy, water and communications grids with the public spaces, and industrial zones, of the functionally planned physical city" (Graham & Marvin, 2001, p. 60)

The three words that compose this concept, all refer to a defining characteristic of planning at the time. First, the word 'modern' refers to the idea that planning and design of infrastructures is a merely technical activity. As discussed in the previous chapter, planning was widely understood as effectively grounded in scientific objectivism. The assumption was that urban life could be effectively organized by rational inquiry into its underlying structures, detached from politics. Second, the word 'network' refers to the assumption that the city could be integrated into a functioning whole through the planning and design of networked infrastructures such as water, electricity, and roads. People assumed that such infrastructures would offer universal access to those essential public services and support urban life more broadly. However, as we will see in a moment, this was not always the case. Third and finally, the word 'city' also points at a specific phenomenon. At the time, urban planning and design became increasingly understood as practices that needed to consider themselves with 'the city as a whole'—ordering and planning the city required overview. To be sure, cities obviously existed long before the emergence of this ideal. However, as we will see later on, until the end of the 19th century, Munich's neighborhoods and roads were designed as individual urban building blocks (Groß, 2008). New to the networked city ideal was the idea that an effective organization of urban life required planning and designing it. Urban life became defined as something that needed to planned, designed and managed as 'a whole', that is, as a city.

The common understanding amongst scholars is that the modern network-city ideal came to an end around the 1970s. From then onwards, at least this is the argument, each of the constituent elements of the networked-city ideal, lost out in popularity. Prominent urban scholars Graham and Martin, for example, point out how the idea that infrastructure planning was a merely technical matter became increasingly insupportable during in the second half of the 20th century.

> "[a]s a result of wider shifts in urban planning and its social context, it was becoming increasingly untenable by the late 1970s to maintain that infrastructure networks were simply technical, engineered systems existing somehow separate from society which operate to 'impact' on society." (Graham & Marvin, 2001, p. 105).

It furthermore became clear that such infrastructures and roads, in particular, did not just support urban life in a uniform way as expected but also engendered undesirable effects and inequalities. The ever-increasing volumes of traffic that urban roads supported, for example, produced health and safety risks and undermined the interest of people cycling—things I will come back to later on in the chapter.

Finally, some scholars claim that the combination of the two previous disillusionments also ended planning's capacity to plan the city and its infrastructures as a totality. Graham and Marvin, for example, argue that because planning no longer formed a merely technical (i.e., politically neutral) activity and because infrastructures were no longer seen as universally supporting urban life:

> "…urban planning [needed] to retreat systematically from the notion of comprehensive urban and infrastructural planning, effectively ditching the idea that the development of

> cities could be somehow orchestrated and shaped as a whole" (Graham & Marvin, 2001, p. 112).

An important question here is what happened once the modern-network city ideal came crumbling down. One common answer to this question suggests that it resulted in the social fragmentation or what Graham and Marvin refer to as the 'splintering' of urban life. While this may apply to the US context inspiring the work of these scholars, I argue that this diagnosis fails to capture the Munich case adequately.

A crucial difference between American and western European cities such as Munich is that in the latter case the 1970s marked the end of the car era and the revival of cycling[15]. Don't be mistaken, many of Munich's citizens still drive to work up unil today. However, the 1970s certainly ended a period of virtually unquestioned development of motorized mobility. As early as 1973, Munich's city government argued in favor of "a restrictive treatment of individual [motorized] traffic in favor of public transport and pedestrians/cyclists" (Landeshauptstadt München, 1973, p. 25).

In this chapter, I will show how planning in Munich has since then shifted from a single to a multi-modal network-city approach. It has moved from a sole focus on the motorized traffic network to a focus on networks for motorized and public transport, walking, and cycling. However, before I come to this, I will first discuss the long history of the modern-network city ideal for the case of Munich. Focusing on the road network, I will describe how the idea arrived in Munich around the turn of the 19th century and how subsequently materialized between the 1930s and 1970s. In the second part of the chapter, I will show that, even though planning in Munich was undeniable car-oriented during those times; the authorities retained a certain degree of attention for cycling. This finding may also explain why, once the modern (car-oriented) network city ideal fell apart during the 1960s and 1970s, Munich was relatively quick to re-prioritize cycling, as I will discuss in the chapter's third section. Finally, in the fourth section, I address the revival of cycling as a mode of transport in Munich and the city's turn towards multi-modal transport development.

[15] For a great account of those developments in cities across Europe, see Oldenziel and Bruhèze (2011).

3.1. MUNICH AS A NETWORK CITY

Modern planning arrived in Munich in the early 1800s with the abolishment of its medieval city walls[16] (Groß, 2008). Until then, because the capital needed to be defensible, its development had been necessarily confined by its fortifications, resulting in the narrow and windy street patterns that still characterize Munich's old town up until today. The demolition of those walls created an unprecedented opportunity to expand the city into its surrounding fields and to plan and design such developments from scratch.

The invention of the Hauptverkehrsstraße

Besides constructing new neighborhoods such as Isar-Vorstadt and Max-Vorstadt, Munich's rulers also took the opportunity to build grand boulevards. The 19th century Kings of Bavaria Ludwig II and Maximilian I respectively commissioned the Ludwigstraße (1808 to 1830) and Maximilianstraße (1850 to 1890, also see fig. 1). Given that, these two roads are long, straight and extremely wide, respectively 40 and 80 meters, they clearly qualify as Munich's first main roads. Today, these two roads indeed still function as two vital traffic arteries leading in and out of the city center.

This episode shows that some of the long, wide, and straight roads accommodating car traffic today were constructed long before the invention of motorized vehicles. However, there is a crucial difference between the 19th-century design approach expressed in these two boulevards, on the one hand, and the approach materialized in the main roads built in Munich over the 20th century, on the other. This difference concerns the absence of a 'network' function. The Ludwig and Maximilianstraße start at either side of the royal palace connected by a narrow street only. In the 19th century, this was hardly a problem as the boulevards were first and foremost material-aesthetic expressions of aristocratic power (Fisch, 1988). However, it should need little explanation that linking two grand boulevards with an ordinary narrow road makes little sense from a modern perspective, concerned with traffic flow. Such a view would quickly identify the narrow road as a 'bottleneck' constraining the flow of vehicles through a wider *network* of streets.

[16] Aibar and Bijker (1997) tell a similar story about Barcelona. Like in Munich, modern planning took shape when the cities medieval fortifications lost their function allowing the urban development beyond them.

Figure 1 - Maximilianstraße between ca. 1890 and ca. 1900. Source: Library of Congress (n.d.)

Munich as a networked city

The idea of a road network first emerged in Munich towards the end of the 19th century. Look at the plan below (fig. 2). It is probably Munich's first (unofficial) modern transport development plan. Drafted in 1889 by a general contractor named Jakob Heilmann, it represents his plan "for the development of a road network and primary traffic arteries" (Heilmann as quoted in Fisch, 1988, pp. 198–199). Hence, in contrast, to the boulevards constructed in the preceding decades here, the interconnectedness of the different road, i.e., their network function, was central.

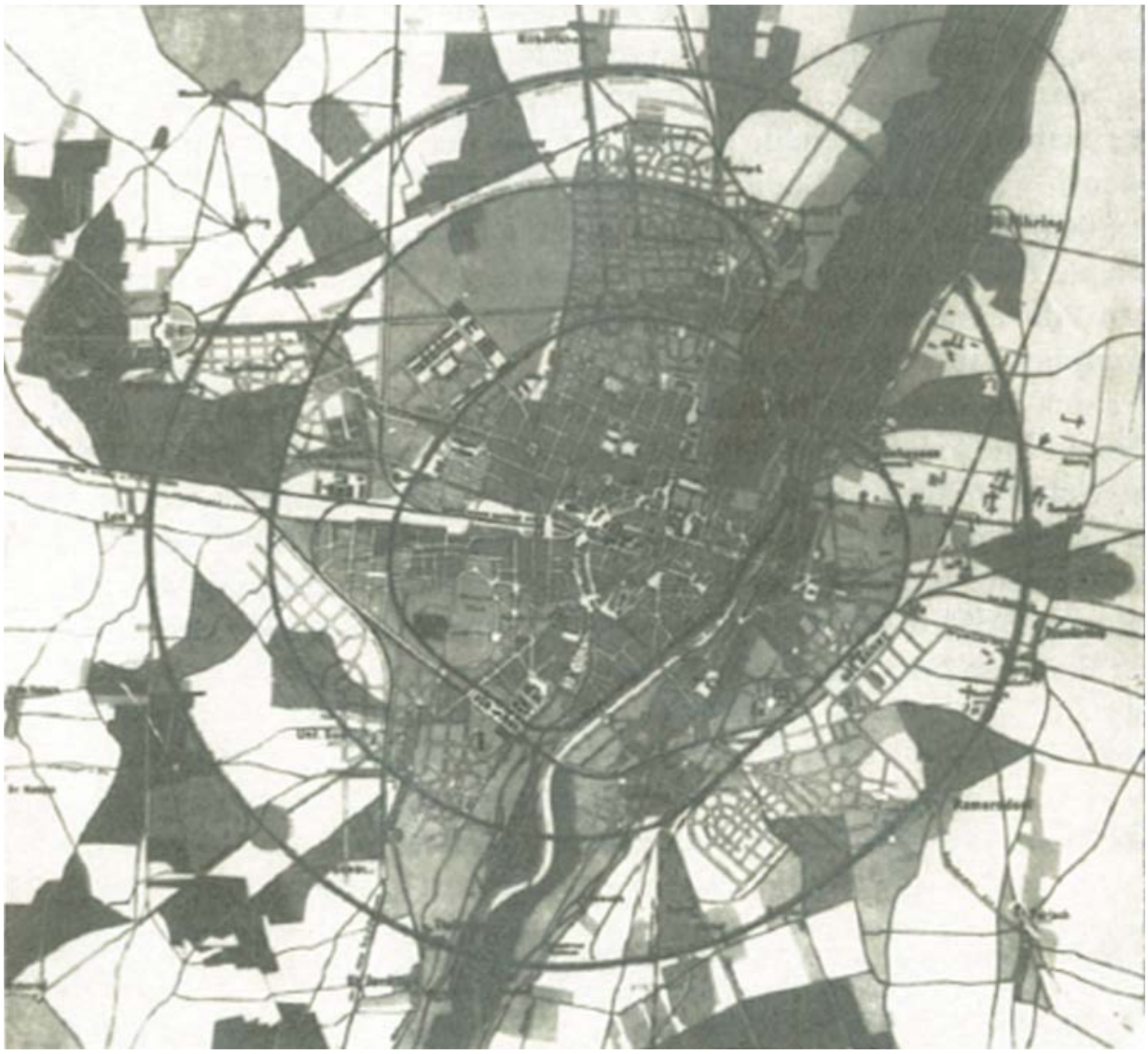

Figure 2 - Heilmann's traffic rings, 1889. Source: Fisch (1988)

Heilmann's plan also helps to illustrate another critical aspect of modern planning: its concern for the city as a whole. Heilmann did not draft everything you can see; he only drew the three rings onto an already existing plan. It is precisely the difference between the original and the adapted version that is of interests here. The original represents the existing city and several planned neighborhoods, visible on almost every side of Munich. As historian Gerhard Groß (2008) argues those 19th-century neighborhoods and their roads were planned as "individually designed city building blocks" (Groß, 2008). Heilmann's rings break with this approach in a

surprising way. His rings encircle the city and most importantly cut right through existing neighborhoods without much attention for what is there. Constructing wide roads through existing areas makes little sense from the perspective of the local community. Such interventions only make sense when done in the name of something bigger, such as the city as a totality. The turn of the 20th century thus saw the invention of a new object of governance: the city 'as a whole' integrated by networked infrastructures, including, a network of main arteries or Hauptverkehrsstraße.

Making space for cars

The first significant efforts to construct this road network came in the 1930s when Munich became the so-called *Hauptstadt der Bewegung,* the capital of the Nazi movement. An interesting aspect of this period, in regards to road and cycling planning, is that despite low numbers of cars roads were still primarily built for them. During the first half of the 20th century, many more people cycled than there were people driving cars. Still, the authorities often (re)designed roads for motorized vehicles. According to cycling historians Adri Albert de la Bruhèze and Ruth Oldenziel (2018), around 1900 cycling accounted for 30 percent of trips[17] in Munich and rose to about 60 percent around 1945. Car-oriented road construction thus started during a period that cycling levels in Munich doubled.

However, during the 1950s cycling levels dropped rapidly, to below 10 percent by the end of the 1960s. Simultaneously, car use exploded. After the Second World War ended the number of cars registered in Munich rose from around 45.000 vehicles in 1950 to more than 300.000 in 1962 and this rapid growth continued in the decades following (Landeshauptstadt München, 1963). One could think that cycling lost in popularity simply because people preferred the car. Yet, transport historians challenge this idea. They foreground that road construction often preceded the arrival of automobiles, which in turn catalyzed their use. Transport historian Barbara Schmucki (2001) has, for example, studied these developments in Munich, and she highlights how:

> "[i]t is noticeable in the pictures of the early 1950s that almost no vehicles can be seen on the streets [of Munich]. The road space is oversized; almost empty streets have obviously been converted prospectively for the [motorized] traffic of the future." (Schmucki, 2001, p. 220).

Planners, Schmucki argues, held a specific vision of what the future should and would become, namely an autogerechte Stadt (Reichow, 1959), a 'car-oriented city.' Similarly, Oldenziel and de la Bruhèze (2011) suggest that not just planners in Munich, but in the whole of Europe were convinced of this ideal:

> "European traffic engineers and urban planners shared the modernist notion of uninterrupted traffic flows. In short, what is most remarkable about the interwar period is that policymakers, traffic engineers, and urban planners were all convinced, that even though bicycle use was booming in most cities, cars would inevitably be the dominant mode of transport in the future." (Oldenziel & Bruhèze, 2011, p. 37)

Reasons for this were: the image of cycling being 'lower-class,' already much higher levels of car use in other Western countries[18], and the introduction of U.S. inspired mathematized traffic modeling ignorant to cyclists (Bruhèze & Oldenziel, 2018). I will come back to these models in the next chapter.

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[17] Excluding pedestrians.

[18] A key measure at the time was the so called 'motorization index', which defined the number inhabitants per car. By 1950, Western Germany had a motorization index of 97 and Munich 42 inhabitants per car. By comparison in the same year Great-Britain's index was 21, France's 31 and North-America's index was as low (or high) as 4 inhabitants per car, a number that Western-Germany would reach only 20 years later, in 1970 (Schmucki, 2001).

Nazi propaganda from the 1930s gives a sense of the scale of such interventions and the rationale behind them. During the 1930s, Munich's authorities significantly widened several roads[19]and bridges including the Ludwigsbrücke (fig. 3), the Donnersbergerbrücke (fig. 4), the Rosenheimer Straße (fig. 5 and 6), and the Elisenstraße (fig. 7). The Donnersbergerbrücke was widened from 8.65 to 24.5 meter (Fiehler, 1937) and regarding the Rosenheimer Straße, propaganda proudly announced how the removal of existing cycling infrastructure, allowed making space for motorized vehicles: "[t]he for the East-West traffic very important Rosenheimer Straße was widened between Orleanstraße and Rosenheimer Platz, thereby almost 7 meters was won for the carriageway. The [separated] cycling path was removed…" (Fiehler, 1937, p. 102) (see fig. 5 and 6).

[19] The included the Rosenheimer straße, Schwantaller Straße, Elisen Straße, Nymphenburger Straße, and Landsberger Straße.

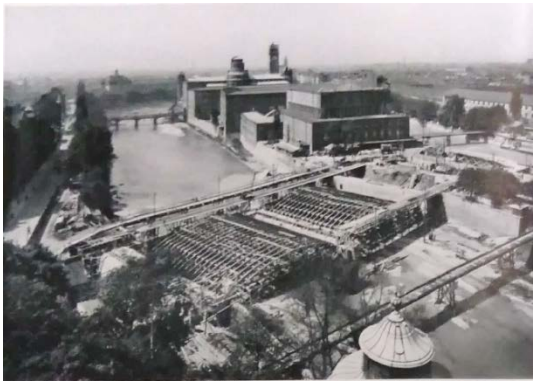

Figure 3 – Widening of the Ludwigsbrücke

Figure 4 – Widened Donnersbergerbrücke

Figure 5 – Rosenheimer Straße (before)

Figure 6 – Rosenheimer Straße (after)

Figure 7 – Widened Elisenstraße

Figure 8 – Widened Landsberger Straße

3.2. SUSTAINING CYCLING IN THE ERA OF CARS

As mentioned, cycling levels in Munich plummeted from 60 percent around 1945 to below 10 percent by the end of the 1960s. Existing transport and cycling histories of Munich largely explain this drop and the later revival of cycling as an outcome of the visions that Munich's transport planners held. By contrast, the rival of cycling is ascribed to the efforts of citizens and specifically activists. Barbara Schmucki (2001) for example argues that 'planners', or 'the city of Munich', sequentially pursued three different visions, namely that of the *autogerechte Stadt* (car-oriented city), the *stadtgerechte Verkehr* (city-oriented transport), and most recently the *menschgerechte Stadt* (human-oriented city). In line with this, cycling historians Bruhèze and Oldenziel foreground the role of citizens, activist, and cycling lobby groups in challenging the autogerechte Stadt: "By 1962 already, Munich activist embraced the bicycle as a symbol against automobility" (Bruhèze & Oldenziel, 2018, p. 36). By contrast, planners are figured as a coherent group opposing such developments:

> "the experts felt theirs was the only rational choice. Automobility had surpassed public transit and cycling. To them, wide roads and parking lots were the only sensible way to solve Munich's congestion—even though the planners reluctantly came to admit their costly measures could not solve congestion if automobility kept growing." (Bruhèze & Oldenziel, 2018, p. 34)

The suggestion here is thus that the authorities supported motorized traffic, while citizens supported cycling. While there can be no doubt that planning was extremely car-oriented during most of the 20th century, I wish to complicate this binary understanding of Munich's transport planning history. As I will show now, Munich's authorities maintained interest in cycling and cycling infrastructure throughout the 20th century, at least to some degree. This argument is important as it reminds us that the state is not a single and coherent actor. It may also explain why the authorities were relatively quick in putting cycling back on policy agendas, once the negative externalities of motorized mobility became pressingly visible—something I revisit to later on.

Between the 1930s and the 1970s, Munich's authorities seem to have supported cycling, albeit in a somewhat piecemeal fashion. The 1930s interventions, implemented under Nazi rule discussed earlier, offers an early example here. As mentioned, during this time authorities widened a significant number of roads and bridges, in some cases even at the cost of cycling lanes. However, pictures from the same publication show how the authorities built a segregated cycling path in the Landsberger Straße, a traffic artery west of Munich's old town (see fig. 8).

A second example is the so-called Meitinger plan (Meitinger, 1982). This plan is widely seen as a critical episode in the modernization and motorization of Munich. After the second world war, during which allied bombs had damaged large parts of the city, many saw the city's reconstruction as an opportunity to finally realize modernist ideals (Harlander, 1998). Reviving the propositions made by Jakob Heilmann about half a decade earlier, Meitinger proposed constructing a network of ring and radial arteries and presented his plan to Munich's city council on August 9th, 1945 (Pfeil, 2014). The plan's centerpiece was a 50 to 70-meter wide "parking and traffic ring" around the city's old town which, in Meitinger's words, was "probably the most important urban development" (Meitinger, 1982, p. 26) of his plan (see fig. 9).

Figure 9 – Old-town ring, Meitingerplan, 1945/1946. Source: Meitinger (1982)

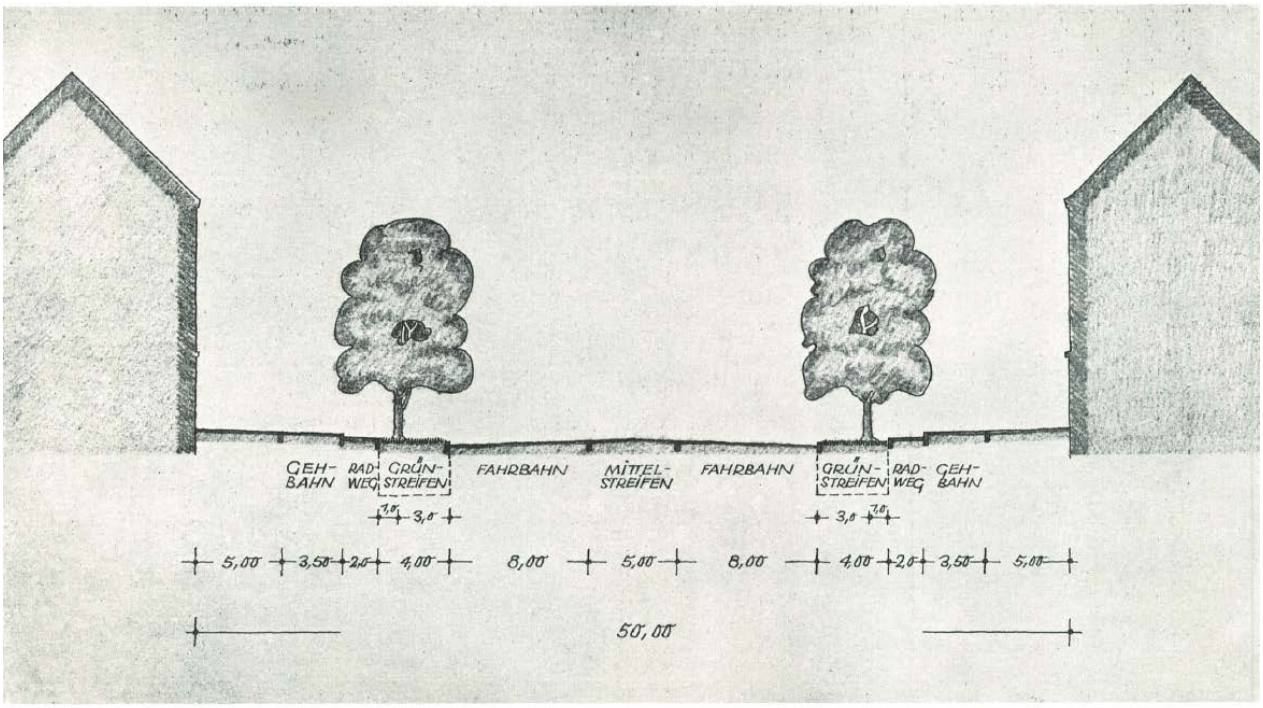

Figure 10 – Cross-section of city ring, including cycling lanes (Radweg)

However, despite Meitinger's clear commitment to car-oriented development, his plan *also* evidences concern for cycling. The cross-sections of the ring and radial roads, central pieces of his plan, all included segregated cycling lanes (see fig. 10). While the extent to which those cycling lanes were actually built remains an open question, the fact that cycling lanes appear at the heart of Meitinger's reconstruction plan reveals that the authorities were not entirely ignorant towards non-motorized forms of mobility. Even during the period that Munich and Bavaria fell under American jurisdiction, concerns for cycling remained alive.

Technical drawings from the early 1950s, retrieved from the city administration's internal archives, also demonstrate that the authorities continued to develop cycling infrastructure at the time. The drawings below represent the redesign of the Ehrwalder Straße and show that separated cycling lanes where an essential element of its design—'R.W.' is the abbreviation of Radweg or cycling lane. As can be seen in the cross-section, the plans included 1.75 meter wide segregated cycling lanes on either side. Again, this is not to deny the city administration's investment in infrastructures for motorized vehicles but shows how in Munich the administration *also* kept supporting cycling.

Probably, the most prominent case of car-oriented development with cycling at its heart is Munich's Neuperlach district. Built from the 1960s onwards Neuperlach is a paramount example of *Autogerecht* urban development. Encircled and crossed by several roads with highway like proportions, the suburb is designed to guarantee a free flow of motorized traffic. Nevertheless, original drawings from these roads show that cycling lanes (abbreviated by R.W.) were an integral part of this design from the start; planners integrated them alongside many of the neighborhood's main roads (see fig. 11, 12, 13 and 14).

The 1960s were also the time that Munich discussed the so-called Sternlosung or 'star solution.' This plan proposed leading the three highways around Munich into the city center over elevated American style expressways and connecting them at an underground junction close to the city center[20] (Gabriel & Wirth, 2013). Amidst heated debates planning scholars who consulted the city for its 1963 transport development plan, argued in favor of this audacious plan (Steiner, Guther, & Leibbrand, 1960). These 'experts' considered, leading "Stadschnellstraße" or 'urban speedways' right into the heart of the city crucial for its development. They also explicitly opposed cycling development, arguing that "given the increasing motorization restraint is required by the construction of new bike lanes" (Steiner et al., 1960, p. 87). When put in this light, it becomes evident that infrastructures actually built during the 1960s often were far less 'car-oriented' then what some actors proposed. Again, this is not to deny that the authorities accommodated the proliferation of cars, but it shows that this was not their only concern. In the end, the American-style Sternlosung was never built, but cycling lanes were and not just in Neuperlach. By the end of the 1970s, Munich already had around 650km of cycling lanes (Social Data GmbH, 1989).

[20] An early version proposed locating the junction near the *Donnersbergerbrücke* (AGAB, 1955) and a later version below the *Sendlinger-Tor-Platz (Gabriel & Wirth, 2013).*

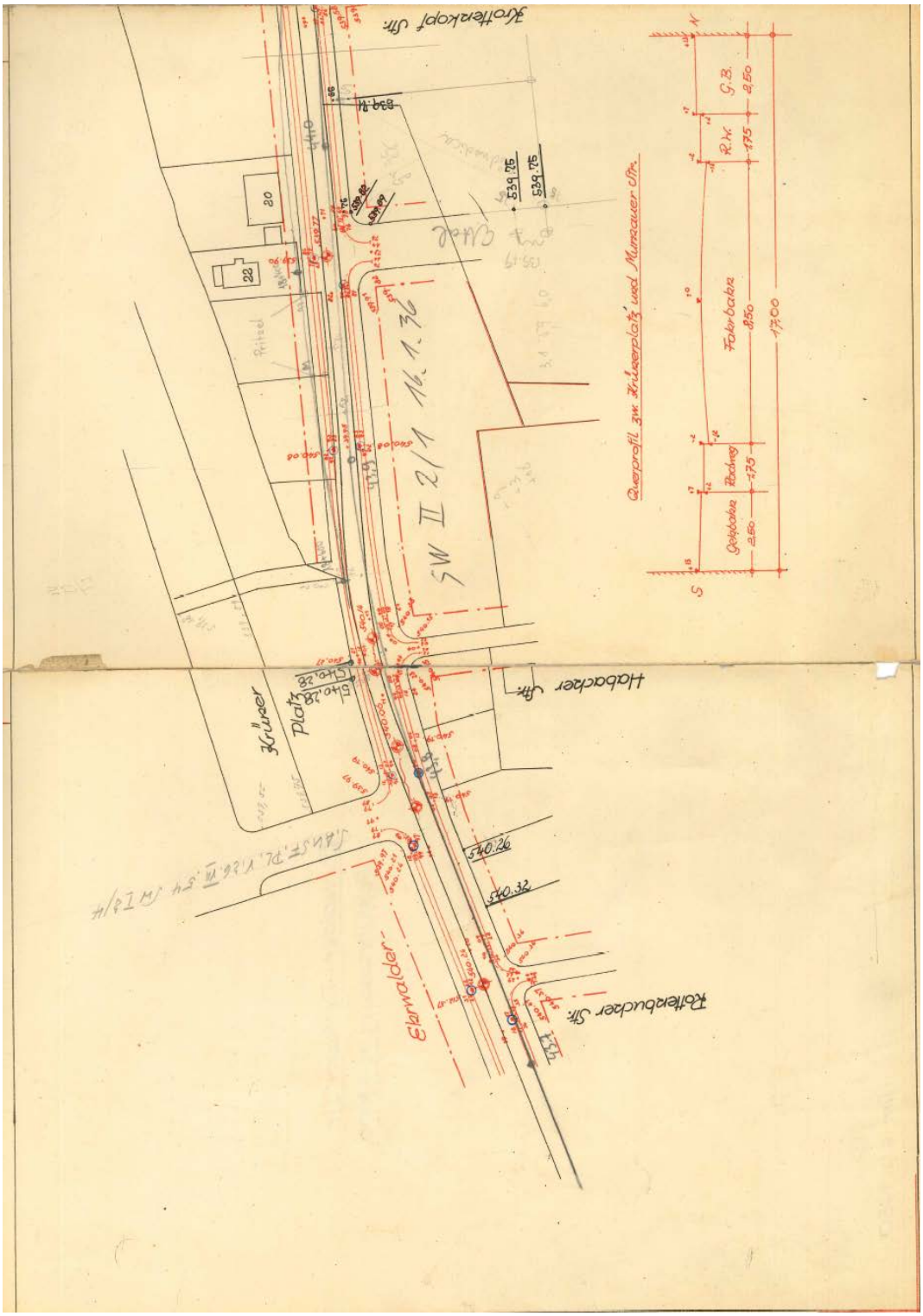

Figure 11 – plans for the reconstruction of the Ehrwalder Straße (1950s).

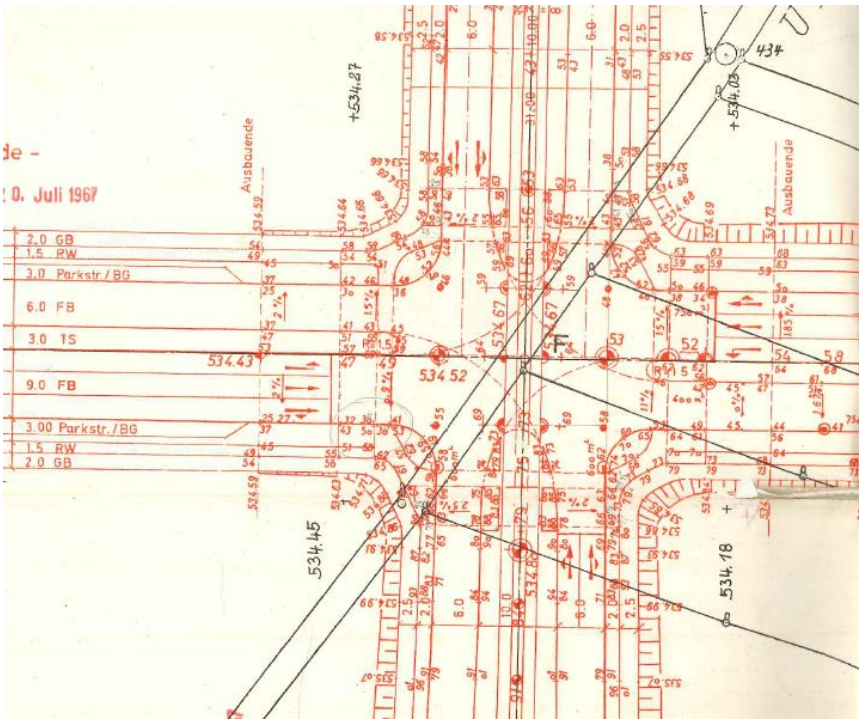

Figure 12 – Junction with cycling lanes (RW or Radweg), probably Quiddestraße / Albert-Schweitzer-Straße (1966)

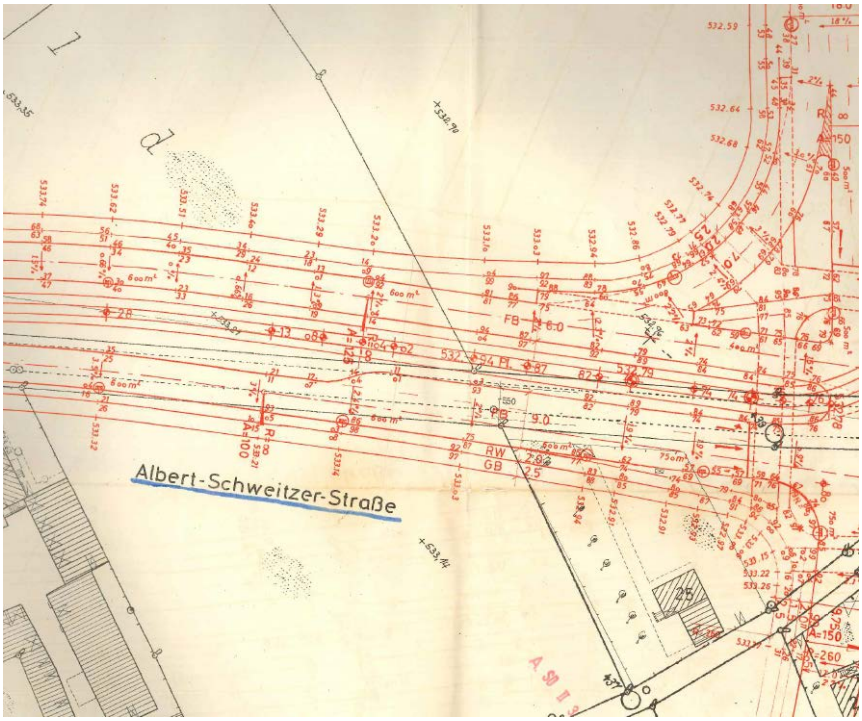

Figure 13 – Junction in Neuperlach with cycling lanes (RW or Radweg) (1966)

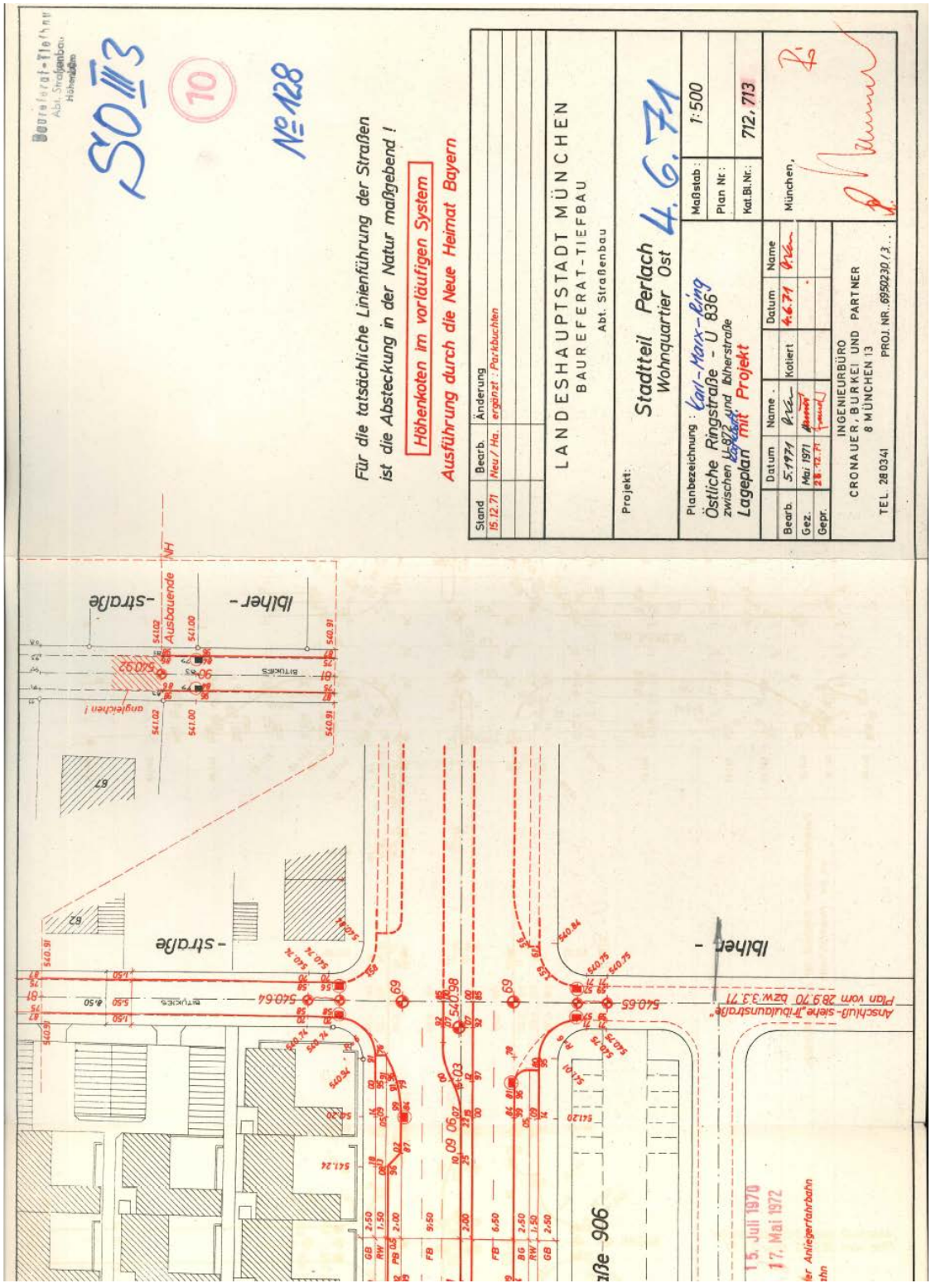

Figure 14 – Design of Karl-Marx Ring (Neuperlach) with cycling lanes (RW or Radweg) (1971)

3.3. FROM A CAR TO A CYCLING ORIENTED NETWORKED-CITY

From the 1960s onwards, the issues surrounding car-oriented planning became increasingly clear, ultimately resulting in a resurgence of cycling as well as walking and public transport. One of the earliest concerns articulated by official policy was the threat automobility posed to cultural heritage. After the end of the Second World War, a great deal of effort had been put in meticulously rebuilding many of Munich's buildings, especially in the medieval center, back to their old form. Other buildings were however just as quickly demolished to make space for Hauptverkehrsstraße such as for the ring roads proposed by the Meitinger plan. Citizen protests however made this approach increasingly indefensible. In line with this, the 1963 transport development plan emphasized that "the land use of traffic is to be kept in appropriate limits [to prevent] disproportionately high sacrifices of material and non-material values" (Landeshauptstadt München, 1963, p. 31). It argued that "in the center […] and especially the historic old town traffic infrastructures have to be adjusted to material conditions" (Landeshauptstadt München, 1963, p. 31). Demolishing existing buildings could no longer be part of road infrastructure development.

Issues articulated in the 1973 transport development plan were even more acute. By then the safety and environmental issues engendered by private motorized transport had become pressingly clear. The plan's authors warned that in the year 1971 alone, 11987 individuals were involved in an accident in Munich, of which 3121 persons were severely injured and 248 killed. This meant that "every second to third citizen [of Munich] has to expect to be injured or killed in a traffic accident during the course of their life" (Landeshauptstadt München, 1973, p. 11). To be sure, this was not just an infrastructural issue, cars themselves were highly unsafe, yet it made the negative effects of (private) motorized transport pressingly clear. Besides safety, the plan also explicitly problematized environmental impacts. Two years earlier, the city had published its first 'environmental protection plan' (Landeshauptstadt München, 1971). The issues raised in this report were introduced into Munich's transport policy with the publication of the 1973 transport development plan. The authors of the transport development plan articulated their concern with vehicle noise, air pollution, and specifically the links between exhaust fumes, smog, cancer, and fine dust. It was reported that in preceding years, "60 - 70 % of those living on busy roads complained about traffic noise" (Landeshauptstadt München, 1973, p. 11).

Re-prioritizing non-motorized mobility

I argue that because Munich's planning department maintained a concern for cycling from the 1950s, through to the 1970s, it was quick to prioritize cycling once the negative consequences of automobility became clear. Already in 1973, the administration problematized its own approach to cycling. The transport development plan published that year stated that: "the hitherto unequal treatment of individual transport, public transport, and pedestrians/cyclists, as well as the preferential treatment of traffic wishes against other needs of the population, has led to serious problems." (Landeshauptstadt München, 1973, p. 25) To address this issue, it proposed: "a restrictive treatment of individual traffic in favor of public transport and pedestrians/cyclists" (Landeshauptstadt München, 1973, p. 25).

The city's transport plans thus problematized the safety and environmental issues associated with car-oriented planning, and to address those issues it prioritized public and non-motorized traffic modes, including cycling.

Ten years after the 1973 plan, the typical interval between the publication of plans, the 1983 urban development plan repeated the argument. Its authors argued against the prioritization of the car: "[t]he de facto privilege of the car before non-motorized traffic should be limited." (Landeshauptstadt München, 1983, p. 31). It was even suggested that the interest of public and non-motorized forms of transport, thus including cycling, was now to be *prioritized over* private automobility:

> "[w]here conflicts arise between motorized traffic and the types of traffic that need to be supported, the interests of public and non-motorized transported should be given careful attention. This can also lead to the dismantling of existing roads." (Landeshauptstadt München, 1983, p. 31)

Between 1979 and 1988, 264 kilometers of cycling lanes were built (Social Data GmbH, 1989).

A network for cycling, away from main roads

However, until the late 1980s, the city developed cycling infrastructure in a piecemeal fashion. This changed in the early 1990s when the city developed a plan for a citywide cycling network., adopting a networked approach. "For the entire city of Munich; however, a coherent network of bicycle routes must be planned, since the attractiveness of individual, independent routes is usually limited." (Landeshauptstadt München, 1992, p. 4). One of the main functions of this network was to accommodate the "[cycling] through traffic" (Landeshauptstadt München, 1992, p. 2). Cycling infrastructure thus acquired a status similar to that of the road network. Its function was to offer a connection between different parts of the city as a whole.

However, even though Munich's 1983 transport development plan argued in favor of prioritizing cycling over private motorized transport, actually building cycling lanes at the cost of general traffic lanes on Hauptverkehrsstraße proved a step too far. Although the 1983 transport development plan argued in favor of "dismantling of existing roads" (Landeshauptstadt München, 1983, p. 31) to support and prioritize cycling, cycling became defined as a recreational activity that should be led away from main roads.

An episode from the year 1990 may illustrate this. In the summer of that year, the young section of Munich's socialist party (SPD) proposed the construction of a 'cycling route North' (Münchener Jungsozialisten in der SPD, n.d.) and gained the support of the two districts through which it would run (Bezirksausschuß 26, 1990; Bezirksausschuß 27, 1990). They demanded the construction of a "generous" cycling route to connect main sites in the neighborhoods to the city center (see fig. 15) and prioritization of cycling over other modes. This also meant taking away space from motorized traffic. The route followed several main roads, including the Sonnenstraße, a main road in the center of Munich. The 'adult' SPD, at the time a member of the city government, however, disagreed. They insisted on building the cycling routes "separated from the traffic road network" (SPD München, 1991, n.p.).

During the 1990s Munich's authorities defined cycling as a leisure activity that needed to be located away from main roads and justified this by stressing the health and safety risks of cycling on main arteries. The 1983 transport development plan already contained a paragraph articulating this way of framing things:

> "The focus here [in cycling planning] is on closing network gaps and eliminating accident-prone sections of the route. When new paths and cycle lanes are created, care must be taken to protect against emissions from motorized vehicles." (Landeshauptstadt München, 1983, p. 30)

A report, drafted by a transport-engineering firm in preparation of the 1990 cycling development plan, further articulated this approach. Its authors highlighted that "just as in most [German] cities cycling accidents are concentrated at the main arteries" (Social Data GmbH, 1989, p. 6) and they articulated those roads as barriers to 'cycling' (see fig. 16). However, they did not propose to redesign those roads but rather suggested leading people cycling along back street routes as it would support individuals "who feel unsafe on main arteries or who want to avoid the highly traveled routes, the increased noise and exhaust pollution (less stress, health issues)" (Social Data GmbH, 1989, p. 10). The consultants furthermore advised leading the routes through "attractive

urban or rural surroundings" (Social Data GmbH, 1989, p. 9) and "avoiding routes through monotonous industrial areas" (Social Data GmbH, 1989, p. 9). A fortunate side effect of this approach was of course that building bike lanes on side routes avoided taking away space from motorized traffic, which meant that the cycling network could expand without significant political controversies. During the 1990s, Munich's cycling network grew with another 100km, to a total of around 900km in 2002 (Landeshauptstadt München, 2002).

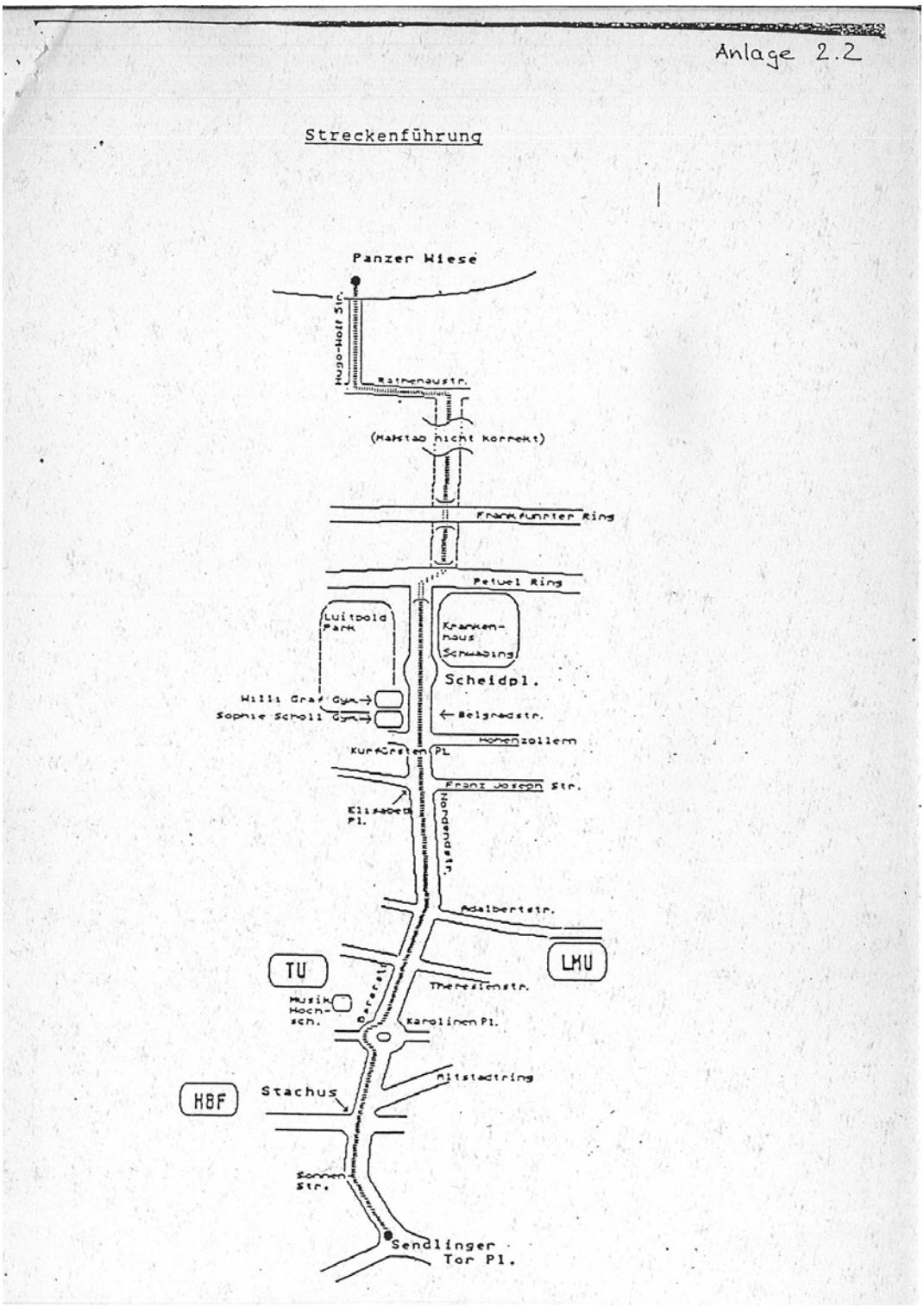

Figure 15 – Proposal for a cycling lane along Hauptverkehrsstraße, Source: Münchener Jungsozialisten in der SPD (n.d.)

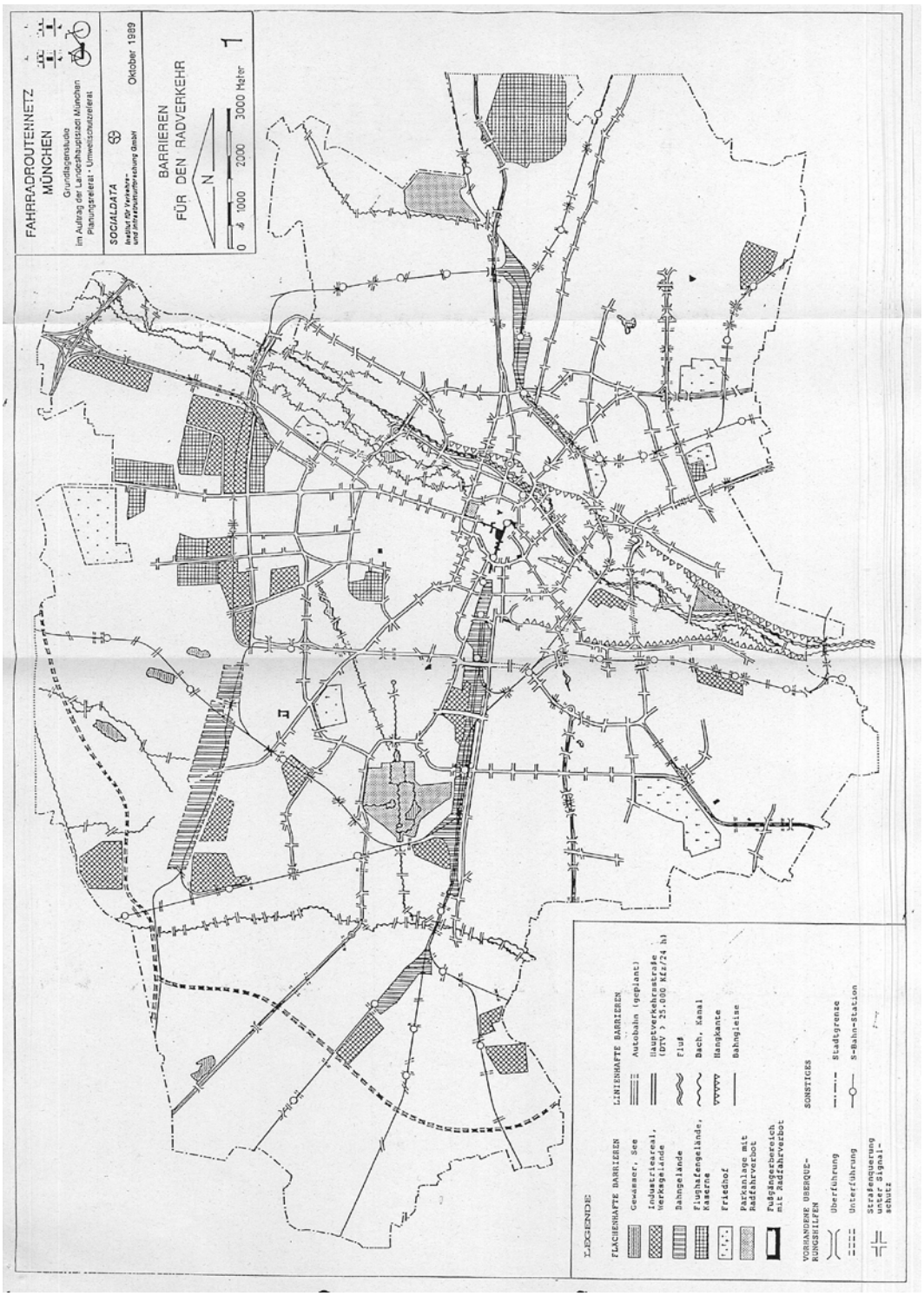

Figure 16 – Map produced by Social Data GmbH, the city as a barrier to cycling, Source: Social Data (1989)

3.4. MULTI-MODALITY, THE NEW MUNICH APPROACH

As mentioned at the very beginning of this chapter, the avoidance of main arteries ended in 2003. Directives initiated by the city's Green Party[21] instructed the administration to construct and widen cycling lanes at main arteries[22]. What I have not yet mentioned, but is interesting nonetheless, is that those interventions were not just portrayed as being in the interest of cyclists. Rather, the directive's authors stressed how their proposals would also benefit other modes and the city as a whole. They argued that the expected increase in cycling levels would, in turn, reduce "the share of individual motorized traffic and [thereby ensure] the city's permeability to essential traffic (such as economic traffic, bus, and tram traffic)." (Bündnis 90 / Die Grünen / Rosa Liste, 2003, p. 2).

This way of framing cycling development fits with a broader shift towards a widely shared consensus for a multi-modal approach to transport planning, that emerged in Munich around the early 2000s. I am not the first to notice this shift. In their recent historical work on cycling development in Munich, Adri Albert de la Bruhèze and Ruth Oldenziel (2018) also make this observation. They suggest that transport planning in Munich is today defined by a broad consensus that all transport modes (private, public, walking, cycling) are relevant, and they refer to this as 'the new Munich approach': "This consensus articulated the new Munich approach: serve all and offend none. All traffic modalities would thrive" (Bruhèze & Oldenziel, 2018, p. 48).

A consensual multi-modal approach to the planning of roads is a fragile equilibrium. Especially in a dense city like Munich, it is the densest city of Germany, integrating different forms of mobility and the interests attached to them in a limited amount of space forms a challenging task. As discussed in the previous chapter, planning theory has long concerned itself with how to achieve and maintain consensus between different parties or coherence between different urban elements such as transport modes.

For a long time, planners thought that to achieve coherence, they needed to uncover the fundamental underlying structures presumably governing urban life. As mentioned earlier, this is what was 'modern' about the modern networked city ideal. However, since the 1970s, both planning theorists and practitioners have abandoned this conviction. In chapter two, I explained how planning theorists subsequently turned to the Habermasian idea of 'communicative rationality' (Habermas, 1985; Innes, 1995; Willson, 2001).

Communicative planning assumes that resisting the fragmentation of the city requires reaching a consensus through public debate. It thus draws attention to the role of language and spoken discourse often in a critique of the role of technical planning methods and the objectivist assumptions underpinning them. However, due to this focus on spoken dialogue, planning theory has mostly failed to develop an understanding of how technical planning methods continue to mediate planning processes. As explained in the previous chapter, it furthermore maintains the romantic idea that planning depends on the establishment of a singular perspective; the idea that planning requires overview. However, in the next chapter I will show that once technical calculation methods, which planners use to coordinate multi-modal road designs, are brought back into the picture, the idea of overview starts to fall apart.

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[21] In Germany the Green party is formed out of a merger between *Bündnis 90* and die *Grüne,* in Munich they form a so-called *Fraktionsgemeinschaft*, a political alliance together with *Rosa Liste* (the LBGBT party). For the sake of readability, I refer to this alliance as 'the Green Party'.

[22] Those roads included the Rosenheimer Straße between Rosenheimer Platz and Orleansstraße, the Kapuzinerstraße between Baldeplatz and Kapuzinerplatz, the Belgradstraße between Destouchesstraße and Kurfürstenplatz, and the Schleißheimer Straße.

4. MAKING ROADS IN/QUALCULABLE

During the time I conducted the fieldwork for this study, Munich's transport planning department was involved in an EU funded (Horizon-2020) project named FLOW. This project sought to address an issue that links back to some of the things discussed in the previous chapter, so let me briefly revisit those. As I mentioned, over the last decades, transport planning in Munich has become increasingly concerned with multi-modality. There is today a widely shared that all modes (motorized vehicles, public transport, walking, and cycling) should have their place in the city albeit actors may disagree on how much space should be given to either one of those modes especially when making space for one mode requires taking away space from others.

To make such design decisions, transport planning professionals use a specific method that offers them insights into a road's capacity. This method enables them to calculate the relationship between a road design number (including things such as traffic lights) and the number of vehicles that design can handle. However, and this brings me back to the FLOW project, existing formalized methods only enable its users to calculate road capacity for motorized vehicles, but do not consider other modes such as walking and cycling. In that sense, there is thus a gap between the goals (multi-modality) and the methods of planning (motorized vehicles only) in Munich. The FLOW project was precisely set up to address this gap. As explained by participants in the FLOW project

> "A fundamental problem has been the lack of widely-accepted methods for analyzing the impact of walking and cycling on transport network performance. By trying to put walking and cycling on an equal footing with motorized transport, the FLOW multimodal urban road transport network performance analysis methodology (the FLOW methodology) aims to contribute to a more informed debate on the role of walking and cycling on transport network performance." (Rudolph & Szabo, 2016, p. 5)

In the previous chapter, we already saw how transport planning in Munich has shifted from a single, car-oriented approach, to a multimodal one. Later on in this chapter, I again delve into Munich's planning history but rather than focusing on the history of the road network, I will zoom in on the history of the method used to calculate the capacity of those roads instead. As I will show, the fact that such methods only consider motorized vehicles has everything to do with the place and time of their invention, namely 20th century America. This focus on one particular mode of transport makes clear that the development of such tools was far from neutral, even though this was exactly what its inventors claimed. It is this claim of 'scientific neutrality', sometimes still associated with technical planning methods, that particularly interests me. I will specifically focus on how the inventors of capacity calculations *neutralized* their activity by drawing on specific epistemic (statistics) and material (photo cameras) innovations that allowed them to obscure their own politics.

That calculations methods, such as capacity calculations that Munich's planners use, are not neutral but value-laden is meanwhile a well-established argument. Especially the communicative turn in planning theory, more extensively discussed in chapter 2, has significantly contributed to challenging this idea. In this view, technical methods are far from the neutral tools they have long been thought to be. Rather it defines such methods as tools that people use to advance certain political agendas.

The problem with this social constructivist explanation is that it implicitly sees planning methods and their outcomes as fully determined by the (political) interests of human actors. For the current case, this would suggest that the fact that formal capacity calculations only consider motorized vehicles can be fully ascribed to the intentional actions of human actors, such as those who have a vested interest in the car industry. While I do not want to deny that such interest may play a role, this approach overlooks that humans are never fully in control.

As I already mentioned, and describe in more detail later on, particular types of objects, such as multi-modal road capacity may simply be impractical or even impossible.

To better understand how this work it is necessary to move beyond the so-called called 'facts-versus-stories distinction' in planning (de Roo, Hillier, & Wezemael, 2012): the idea that calculative methods produce either facts or fiction. This move will be the topic of the next section and I will also explain how (post-)ANT insights on calculation (Callon & Law, 2005) can help to make this move. Following Callon and Law (2005) I will introduce a distinction between *calculation* and *qualculation*. The former refers to the conventional idea of calculation, in which separation of facts and values, rational and irrational, and quantitative and qualitative are deemed crucial. The latter is less interested in such classic dichotomies but suggest that it is far more important to focus on what is calculable and what is incalculable. The incalculability of multi-modal network capacity offers a great case in this respect.

The chapter's third and fourth sections explore how planning professionals deal with this incalculability. Section 3 will focus on the FLOW project and how it seeks to address the issue 'in theory'. Drawing on a policy document published as part of the project I will describe how its authors imagine that multi-modal capacity can be rendered calculable and I will argue that they do so be drawing on a classic 'calculative' approach. By contrast, section 4 will ethnographically explore how capacity calculations are performed in practice and I will argue that in practice calculation is qualculative. Rather than seeing this as a problem or simply as the infiltration of political power into otherwise rational conduct, I will argue that this demands we understand the role of calculation in planning differently, namely as a qualculative rather than calculative activity.

In the fifth and final section of the chapter, I link the insights from this chapter back to the broader discussion on romantic and baroque conceptions of planning, which runs through this dissertation. By the end of the chapter, it will have become clear that planners do indeed not plan by synthesizing everything into a coherent (romantic) perspective but rather act in ways that are better defined as baroque. In section five, I discuss the question this opens up.

4.1. BEYOND THE FACTS-VS-STORY DISTINCTION IN PLANNING

There are two extreme positions in the ways of thinking about calculation in planning theory. The first grounds calculation in scientific objectivism. In this view, calculative methods are scientific tools that allow human actors to produce neutral and objective facts about urban reality. It thus suggests that such methods should and can be entirely free from political values. As such, the existence of a gap between methods and goals of planning is seen as a gap between 'facts' and values'. As discussed in chapter two, scientific objectivism was particularly influential in planning until the 1970s, but it became heavily criticized from then onwards. This insight also gave rise to an alternative conception of calculation.

This second view grounds calculation in social constructivism. It suggests that calculations and their outcomes are far from neutral, but rather that powerful actors use them to neutralize their politically motivated planning agendas. In this view, calculative methods are tools that human actors use to persuade others. A gap between methods and goals of planning is in this view, an effect of social forces, power differences, and persuasive capacities of different actors. The implications of this view have been explored by James A. Throgmorton (1992, 1996). Drawing on social-constructivist insights, Throgmorton argues that we should "embrace the idea that planning is scientific and political, technical and persuasive, and that the "tools" planners use act as tropes (persuasive figures of speech and argument) in the planning stories that they tell" (Throgmorton, 1996, p. 5 emphasis original).

It, however, remains hard to think these two positions together. As some planning theorists have argued, planning remains stuck in a 'facts-versus-stories' distinction (de Roo, Hillier, & Wezemael, 2012). It remains stuck in the idea that calculations either produces facts, imposing a rational logical on its users, or fictional figures that human actors fully control in the pursuit of their political goals. How to appreciate the fact that facts and values are mixed, however, remains an open question. Coming to such an understanding, these authors suggest, requires identifying "theoretical ideas that appreciate dynamics, flows and uncertainty" (de Roo et al., 2012, p. 2)—in other words, theories that appreciate complexity—"and to carefully consider possible bridges and linkages between these theoretical ideas and both planning theory and practice." (de Roo et al., 2012, p. 2)

I argue that STS and specifically (post)ANT work on calculation offers a way out of this impasse. It appreciates complexity and offers the conceptual tools and insights for moving beyond the facts-versus-stories distinction in planning. Although STS work on calculation has primarily focused on economic markets, I argue that its insights are also highly insightful in a planning context.

First, ANT grounds calculation in material-constructivism. It sees calculative methods, such as capacity calculations, not as tools in the hands of human actors, but as dynamic socio-material constellations in which humans participate. In other words, it suggests that the capacity to calculate is materially distributed:

> "Calculative agencies are not human individuals but collective hybrids, 'centres of calculation' (Latour 1987). These agencies are equipped with instruments; calculation does not take place only in human minds, but is distributed among humans and non-humans" (Callon & Muniesa, 2005, p. 1236)

In this view, calculation methods are not simply neutral tools (scientific objectivism) or persuasive devices (social-constructivism) fully controlled by human actors. Rather, they are arrangements that afford humans with the capacity to calculate, but whose capacities and effects lie partly outside of human control. The fact that current methods allow planners to calculate the capacity for motorized vehicles, but not, as they might desire, of public and non-motorized ones, is a perfect example of this. In the next section, I describe how this arrangement was invented and inscribed in standards, still used in Germany today.

Second, (post)ANT scholarship on calculation reject classic dichotomies such as those between facts vs. values, quantitative vs. qualitative, and rational vs. irrational as adequate for judging calculation work (Callon & Law, 2005). Rather, they propose the notion of *qualculation* to capture that such aspects are almost always intertwined. Initially coined by Franck Cochoy[23], qualculation refers to quality-based rational judgments (Cochoy, 2008). This is a crucial insight for moving beyond the facts-versus-stories distinction in planning as it "establishes a continuum between qualitative judgement and quantitative (or numeric) calculation." (Callon & Muniesa, 2005, p. 8).

Third, to actually move beyond the facts-versus-stories distinction STS scholars propose a positive conception of calculation that works across such dichotomies. Callon and Law (2005) indeed suggest that: "we can think in the same terms about (quantitative) calculations and (qualitative) judgments. That they are all about arraying and manipulating entities in a space in order to achieve an outcome, a conclusion." (Callon & Law, 2005, p. 719). Or, in other words, that calculation "is better understood as a process in which entities are detached from other contexts, reworked, displayed, related, manipulated, transformed, and summed in a single space." (Callon & Law, 2005, p. 730). What this exactly entails is something I come to in due course.

Fourth, and finally, having moved beyond the fact-versus-stories distinction these authors suggest focusing on the distinction between the *calculable* and the *incalculable*: "the most appropriate dividing line is no longer between judgment [stories] and calculation [facts], but between arrangements that allow calculation (either quantitative or qualitative) and those that make it impossible." (Callon & Muniesa, 2005, pp. 8–9). In the words of Callon and Law:

> "we are interested in the boundary, inscribed in social theory, between the rational and the nonrational. Our argument is that this makes little sense. If there is a boundary at all then it is not between the rational and the nonrational but rather between what, following Cochoy, we have called the qualculable and the nonqualculable." (Callon & Law, 2005, p. 730)

Put simply, the suggestion here is that it is better to focus on what is calculable and what is incalculable, rather than whether calculations are rational or irrational.

As mentioned earlier, current formal methods, used throughout Germany, afford actors to calculate the road capacity for motorized vehicles—they are qualculable—but not for public transport, walking and cycling—they are inqualculable. In the next section, I describe how this has come about and in the later sections how planning professionals deal with such incalculabilities in practice today.

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[23] In addition to *qualculation*, Cochoy (2008) also proposes the notion of *calqulation* to refer to the collective dimension of calculations. As the idea the calculations are made by rational *individuals* is more prevalent in economic theory than in planning theory, I will not develop this insight in this chapter.

4.2. ROADS MADE CALCULABLE

Today, capacity calculations are a relatively straightforward procedure, but at the beginning of the 20th century, no one knew how to calculate the relation between a road's design and its capacity. However, increasing car numbers made that in the United States congestion became a serious issue on inner-city and rural roads as early as the 1920s (Cron, 1975). In consequence, planners and engineers became increasingly concerned with road capacity, which in turn drove efforts aimed at rendering road capacity calculable.

Given the time of its invention, it should hardly be a surprise that its inventors grounded capacity calculation in scientific objectivism—the idea that planning and calculation need to be scientific, objective, and neutral. Two key figures often credited with this epistemic invention are A.N. Johnson, who was the Dean of the University of Maryland, and Bruce D. Greenshields, a traffic engineer, and scholar who worked for the University of Michigan. Today, their work is still praised for being the first truly empirical, objective, and factual approach to traffic engineering. Transport historian Frederick W. Cron (1975) for example portrays Johnson as the father of traffic engineering because he was "one of the first engineers to advocate the widespread and systematic use of traffic research to collect *factual data* on which to base highway decisions" (Cron, 1975, p. 96, italics added). Similarly, historians Roess and Prassas (2014) praise Greenshields because "Greenshields was the first to take a fully *empirical approach*." (Roess & Prassas, 2014, p. 138, italics added).

However, it important to realize that the method invented by people such as Johnson and Greenshields did not simply offer a *neutral representation* of urban reality. Rather, they contributed to making a highly specific version of reality calculable. The formula below, which A.N. Johnson proposed to calculate the capacity of a single lane road, may illustrate this.

$$N = \frac{5{,}280\ V}{D}$$

The formula defines road capacity as a relation between *number of vehicles* (N), *speed* in miles per hour (V) and the *center-to-center spacing* between these vehicles (D). As such, it defines and limits the objects to be considered, which is crucial to make *things* calculable. ANT scholarship assumes that the world is fundamentally relational. Everything relates to everything else. The proliferation of relationships, however, renders things incalculable, therefore "[calculation] depends on a rather strict material and discursive framing which limits that proliferation." (Callon & Law, 2005, p. 728). Relations thus need to be transformed into stabilized objects to become calculable[24]. This is referred to as a process of *objectification*, the process through which things (webs of relations) become "stabilized, delimited and definable" (Callon & Muniesa, 2005, p. 1233). In this case, the objects and relations defined by the formula are single lane roads, individual cars, gaps between cars, and the speed of cars in relation to the stationary road.

[24] This is a departure from objectivist conceptions of calculation, which draw on a correspondence theory of truth and assume that calculative devices (should) offer an accurate *representation* of an independent world. Implicit here is the assumption that urban reality is made up of already bounded entities (cars, cyclists, buses, roads, people, etc.) that merely need to be represented.

By defining what to take into account and what not, calculation necessitates the making of value judgments. In the current case, the formula only considers individual motorized vehicles, speed, and the spacing between them. Crucial to realize here is that this specific framing is not neutral. This might become evident when considering some of the entities not taken into account here, such as cyclists, pedestrians, safety, or CO^2. Contemporary efforts to develop multimodal capacity calculation—something I discuss later in the chapter—can precisely be understood as an attempt at reconfiguring the value judgment inscribed in them.

It should thus be clear that the invention of capacity calculation was not neutral, as is sometimes assumed. By contrast, constructivist insights such as those offered by authors like Throgmorton help to understand that the formula above is not just a neutral 'scientific method' but also carries persuasive capacities. It carries neutralizing capacities. Together with his status as a scholar, Johnson's use of mathematical formula's allowed him to invoke a sense of neutrality widely associated with modern science (Shapin & Schaffer, 1989). It portrayed the limited car-oriented versions of reality that it sought to render calculable as neutral and universal.

The story of the second key figure associated with the invention of capacity calculation, Bruce D. Greenshields, offers an even better example of how capacity calculation was 'neutralized'. More importantly, it demonstrates the central role that material devices played in this respect. An insight that risks being overlooked when planning and calculation are seen as a form of 'persuasive storytelling' (Throgmorton, 1992, 1996).

‚For his Ph.D. Greenshields invented a "photographic method for the study of traffic behavior" (Greenshields, 1934) and developed this into an approach for calculating road capacity (Greenshields, 1935). He used a tripod-mounted camera (see fig. 17) equipped with a motor to make it fire at regular intervals, and put a timer within the camera's frame. The analysis consisted out of projecting two photos onto a white screen ruled with vertical lines (see fig. 18). In this way, both the spacing and speed of two vehicles could be determined and noted down in a table. Using this method, Greenshields supervised a study that collected data on 118,000 vehicles at locations on major roads across Ohio.

Using a camera did not just enable Greenshields to capture vehicles in motion but also supported him in articulating his approach as neutral. At the time, the photo camera was still a relatively young invention. Yet for many, "the machine seemed to offer images uncontaminated by interpretation" (Daston & Galison, 2007, p. 139). The hope was that the machine, the camera, could effortlessly accomplish what could only be achieved by humans with iron self-discipline. Even though this was never achieved, it did not prevent the camera from being an important neutralizing entity "for the machine seemed at once a means to and a symbol of mechanical objectivity" (Daston & Galison, 2007, p. 139).

Besides cameras, Greenshields also used statistics. More specifically, he used epistemic innovations from the fields of probability theory and mathematical statistics (Dhingra & Gull, 2011). Such methods allow one to test whether more or less randomly occurring phenomena can be transformed into coherent patterns (Hacking, 1990). The foundations of these methods were laid between 1890 and 1930, only decades before the first efforts at calculating road capacity (Porter, 1986). It allowed Greenshields to translate all the data he collected in a singular diagram, a single calculative space, which is today known as 'the fundamental diagram' of traffic engineering (US National Research Council, 2011) (see fig. 17). Greenshield's diagram represents the relationship between 'density' (the number of vehicles on a given stretch of road), their speed, and the total capacity, which according to this diagram lies at approximately 2180 vehicles per hour per lane for a 2-lane highway.

Like the photo camera, these statistical methods and diagrams acted as neutralizing devices. In the decades before Greenshields developed his method, the statistical insight on which he drew were actively translated from their fields of origin to other sciences and societal issues more broadly. An important figure here was Karl Pearson; it was "Pearson's drive to universalize statistics" which resulted in "the widespread incorporation of more advanced statistical methods into a variety of sciences during the early decades of the nineteenth century." (Porter, 1986, p. 314) And as evidenced by the work of Greenshields, these efforts also contributed to the

invention of traffic engineering and specifically the calculation of capacity. But, more importantly, Pearson fervently advocated the neutrality of those techniques. Historian of science Ian Hacking, for example, describes Pearson's 'practical positivism' as an attempt "apply 'value-neutral' science and statistical techniques to the issues of the day."(Hacking, 1990, p. 182). Similarly, Porter argues that Pearson insisted on the association between objectivity and neutrality, rather than truth: "[o]bjectivity as impersonality is often conflated with objectivity as truth. Pearson, a firm positivist, made no such mistake. He emphasized its moral values even more than its epistemological ones." (Porter, 1995, pp. 74–75).

To briefly sum up, people such as A.N. Johnson and Bruce Greenshields thus made important contributions to the field of traffic engineering, by inventing a method that rendered road capacity calculable. However, the way in which these scholars defined and limited the entities taken into account, a necessity to render things calculable, also meant that a specific set of objects and values became inscribed into this method. Partly due to their work, to participate in capacity calculations meant becoming concerned with motorized vehicles traveling at speed. The use of statistics and other neutralizing devices, however, supported the idea that designing for motorized transport was scientifically objective and value-free. This also made it easier to transport such methods to Germany, where they still define standardized planning methods, as we will see next.

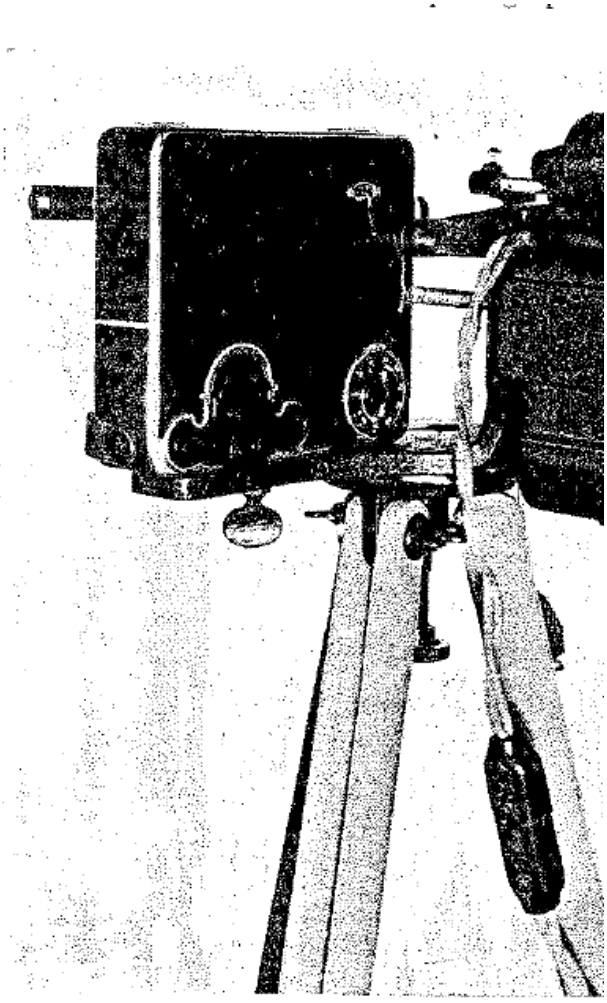


Figure 17 – Greenshield's camera with motor. Source: Greenshields (1934)

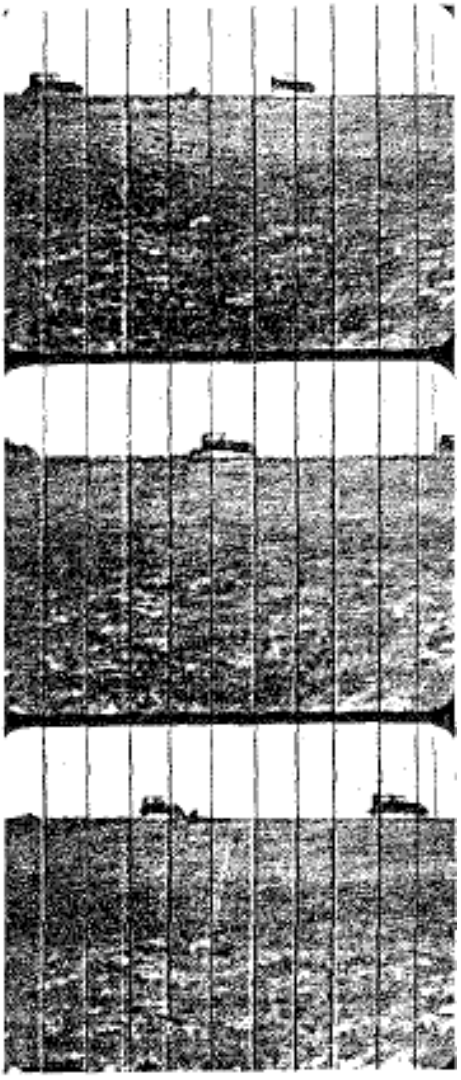


Figure 18 – photos projected onto grid to determine spacing. Source: Greenshields (1934)

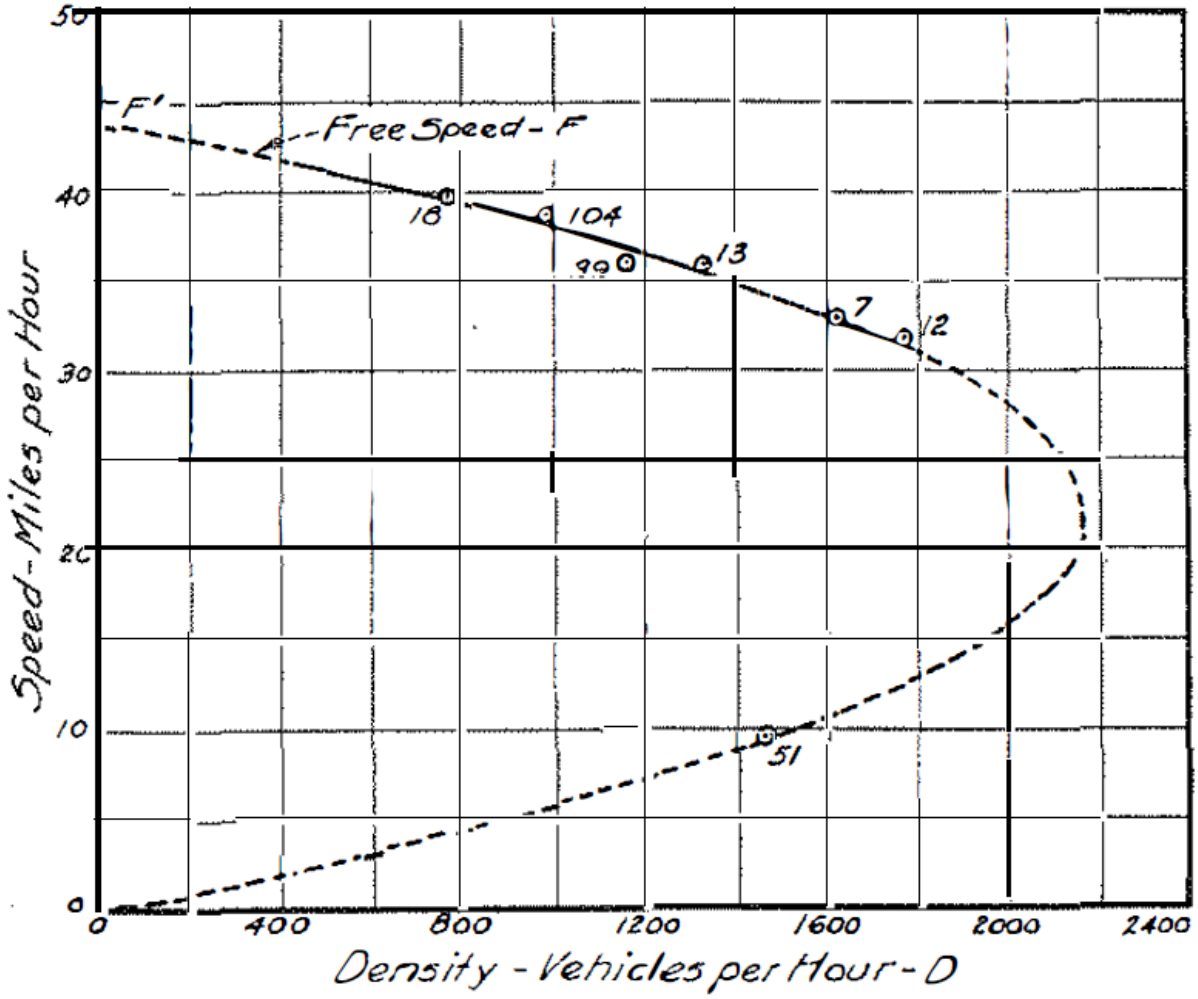


Figure 19 – 'The fundamental diagram'. Source: Greenshields (1935)

Standardization and technological transfer

The ground laying work of people such as Greenshields and Johnson culminated in the American Highway Capacity Manuals (HCM) developed in the US in the 1950s and 1960 (Bureau of Public Roads, 1950; Transportation Research Board, 1965). Those policies prescribed a standardized capacity calculation method that became the standard for the US and, in a slightly altered form, for Germany. With the publication of the HCMs, capacity calculation moved beyond identifying a road's maximum capacity. Rather than defining a maximum it introduced a method for differentiating different 'levels of service' (LoS). The first edition proposed to differentiate capacity as basic, possible, and practical capacity. Basic capacity referred to the maximum capacity, possible capacity sought to incorporate "prevailing roadway and traffic conditions" (Roess & Prassas, 2014, p. 31), and practical capacity referred to the capacity that could be attained without causing "unreasonable delay, hazard, or restriction to the drivers' freedom to maneuver" (Roess & Prassas, 2014, p. 31). With the publication of the 2nd edition of the HCM, the three-grade scale was further differentiated into a six-grade alphabetic scale (A, B, C, D, E, F) modeled on the grading used in American education.

This very scale still informs German national standards[25] up until today and, as we will see later on, planners in Munich still draw on them. The German standard defines the levels as following (numbers in seconds):

$0 \leq A \leq 20$;

$20 \leq B \leq 35$

$35 \leq C \leq 50$

$50 \leq D \leq 70$

$70 \leq E \leq 100$

$100 \leq F \leq \infty$

For example, when the expected average waiting time at a traffic light is 40 seconds, that set of lights has an LoS of 'D'. The two traffic lights represented by the top two rows, for example, have a B in the morning rush hour (morgens) and a B and C in the evening rush hour (abends). The percentages in the 'Reserve' column give planners an indication of how much reserve there is before a B turns into a C, or a C into D, etc.

It is crucial to realize that only motorized vehicles are calculable here. This standard, used throughout Germany, allows one to calculate the level of service offered to motorized vehicles but other traffic modes such as cycling, walking, and public transport are not taken into account. They are incalculable. This is a direct result of the historical trajectory of this tool, that is, of the fact that had has been invented in the US and never significantly altered since. However, today, this shortcoming poses a problem as there is by now wide shared support for multi-modal transport development. Formal capacity calculations methods can, however, not account for this. There is thus a gap between the methods and goals of transport planning in Munich.

Now, to come back to the question I raised earlier, why does this gap between the methods and goals of planning exist in the first place? The answer to this question depends on the view of planning methods that one adopts. On the one hand, an objectivist view, which takes methods as technical tools suggest that such a gap is an effect of the difference between (subjective) values and (objective) facts. On the other hand, a social-constructivist view, which takes methods as persuasive tools, suggest that such a gap is an effect of power differences between

[25] This standard is the *Handbuch für die Bemessung von Straßenverkehrsanlagen* (HBS), or handbook for the assessment of road facilities.

social actors. In the current case, it would argue that the exclusion of public and non-motorized transport modes is due to the persistent power of the automobile industry. It would suggest that those who have an interest in the circulation of motorized traffic use those tools strategically to enroll others into their political agendas.

An STS analysis shows that things are more complex than that. As I have just shown, the idea that facts and values can be held separate is untenable. Despite the claims of neutrality by those who made road capacity calculable, they needed to make value judgment by necessity—making things calculable demands that the number of entities needed to be limited somehow. It would go too far, however, to suggest that capacity calculations are mere tools in the hands of those who value automobility. That the methods used by Munich's planners up until today fail to account for other modes is partly a historical contingency.

Still, it remains the fact that there is a gap between the goals of planning, on the one hand, and calculative tools used for the realization of those goals, on the other. At the beginning of this chapter, I showed that this is already an important concern amongst planning professionals. The EU-funded FLOW project was set up precisely to address this incongruity. Therefore, rather than simply criticizing this situation, the next two sections will explore how planning professionals go about addressing it. In the next section, I will discuss how some of the actors involved in the project imagined addressing this gap by developing a multimodal capacity calculation tool. My analysis will be based on a specific policy document and the new formal approach to capacity calculation it proposes.

However, the main goal of the final two sections of this chapter is to explore the difference between a classic *calculative* and a *qualculative* approach to (capacity) calculation. In the next section, I will show how the formal articulation of capacity calculation in the FLOW policy document subscribes to a *calculative* approach. It acknowledges that calculative methods need to be aligned with shifting planning goals—the increased appreciation of multimodality—and seeks to achieve this by inventing a *single quantitative* measure. In the final section, I will explore how capacity calculations are done in practice and argue that this is better defined as *qualculative*. In this view, quantitative and qualitative elements are mixed.

4.3. MULTIMODAL CAPACITY MADE CALCULABLE?

I now pick up the story with which I opened this chapter, the EU funded (Horizon-2020) project named FLOW to explore how aimed to address this gap between the methods and goals of transport planning. Launched in 2015, the FLOW project gathered transport modeling experts and walking and cycling experts to collectively develop a "user friendly-tool" that would make it possible to calculate the 'level of service' offered to a variety of transport modes (walking, cycling, public transport, motorized transport). Between 2015 and 2018 several "partner cities" including Munich tested the tool. Those five cities, in turn, collaborated with nine "exchange cities" and 25 "follower cities" (European Commission, 2015).

The technical report on which I focus here, claims that the project aims "to create a single multimodal KPI." (Rudolph & Szabo, 2016, p. 22), a single Key Performance Indicator. While the notion of KPI, and other words in the report such as 'indicators', 'analysis', 'performance', and 'objective' may suggest a sense of neutrality, it is important to acknowledge that the method developed by the FLOW project is not neutral. By contrast, the very aim of the project is reconfiguring existing tools in line with shifting values. Those adjustments go beyond simply incorporating additional modes into the existing method. The project also proposed changing the unit 'vehicles' with 'persons':

> An important innovative aspect of the FLOW methodology is also using the unit "person" for all modes for the KPI 'delay' following the principle "moving people, not vehicles". This provides a common numerical basis for comparing the efficiency of different transport modes." (Rudolph & Szabo, 2016, p. 9)

This is a break with the existing standards, which since their invention have taken vehicles rather than people as the units of analysis. Especially in the valuing of public transport modes, which carry dozens of people at once, this is a crucial difference.

It is also important to realize that many other values are maintained. Just like their American predecessors who invented capacity calculation, Rudolph and Szabo (2016) for example, maintain a concern for speed, delay, and circulation. They also maintain the idea that *traffic volume* is what should limit capacity and not things such as the levels of safety, CO^2, or PM10. This in itself is not a problem as long as it is acknowledged that such tools do not offer a neutral representation of reality out there.

However, the main thing I seek to foreground here is the *romantic* nature of this method. As extensively discussed in chapter two, romantic complexity sees urban reality as complex and assumes that it is possible to come to a *singular* coherent perspective on this reality. The authors of the FLOW report explicitly subscribe to these two assumptions. They acknowledge that "[t]he interaction of different transport modes within the same space is highly complex" (Rudolph & Szabo, 2016, p. 35) and insist on the need to create a single quantitative measure to render such complexity calculable.

A great benefit of the romantic is that it seeks to render complexity and its calculation explicit (Law, 2004). This makes it easy to trace how Rudolph and Szabo propose to render multimodal capacity calculable. First, as mentioned earlier, to render complex realities calculable, objects need to be defined and limited. The FLOW approach does not simply calculate the capacity of different transport 'modes' such as walking, cycling, and driving. Rather, the authors propose a very specific set of entities defining the objects to be rendered calculable. They, for example, propose a different approach for calculating multimodal capacity at junctions and along a stretch of road. At junctions, they propose a similar measure for all modes, namely average or maximum delay in seconds per vehicle. But, for a stretch of road, they propose a different measure for every mode, namely vehicle density (veh/km) for motorized traffic, travel speed (km/h) for public transport, pedestrian density (pers/m2) for people walking, and something they refer to as 'disturbance rate' (D/cycle/km) for people cycling (Rudolph & Szabo, 2016, p. 21). Such extreme specifications of what to consider (and what not) is what Callon

and Law mean by a "strict material and discursive framing" (Callon & Law, 2005, p. 728) necessary to render complex realities calculable.

Second, calculation requires that all entities considered are *translated* into a single frame of reference, or a 'single space' as Callon and Muniesa call it:

> "in order to be calculated, the entities taken into account have to be detached. A finite number of entities are moved, arranged and ordered in a single space […] then compared and manipulated on the basis of a common operating principle." (Callon & Muniesa, 2005, p. 6)

To establish such a single measure, all mode specific measurements are expressed in a so-called 'utility score' between 0 and 120. Interestingly, these scores are subsequently translated into the alphabetical scale (A, B, C, D, E, F) expressing Level of Service (LOS) (see fig. 20). *'A' expresses the highest utility score (101-120) and F to the lowest score (1-20*). In this way, it becomes possible to express the complex reality we started with—multiple transport modes interacting with one another in the same space—in terms of a single (quantitative) measure for a multimodal transport network.

> "FLOW is developing a single multimodal measure of transport network service quality by aggregating individual mode-specific measurements. In order to provide a common basis for the aggregation, the six LOS classes are converted into utility points using a discrete utility function that ranges from 0 to 120." (Rudolph & Szabo, 2016, p. 22)

LOS	car	public transport	cycle	pedestrian
	car mean delay (s/veh)	PT mean delay (s/veh)	cycle max delay (s/veh)	pedestrian max. delay (s/ped)
A	≤20	≤5	≤30	≤30
B	≤35	≤15	≤40	≤40
C	≤50	≤25	≤55	≤55
D	≤70	≤40	≤70	≤70
E	>70	≤60	≤85	≤85
F	-	>60	>85	>85

Figure 20 – Translation of mode-specific measures into Levels of Service for a stretch of road

In sum, to address the gap between the methods and goals of transport planning the project thus proposes a formal procedure that expresses multimodal capacity in a singular KPI. This is a classic and romantic approach to the calculation of capacity. Achieving singularity is a key characteristic of romantic complexity. The implicit assumption here is that this offers its users (planners) a coherent perspective or overview of the complex whole—see chapter 2 for a more extensive discussion of this claim. However, as I have shown, achieving such a perspective requires defining an extremely limited set of entities. Cyclists are, for example, defined only in terms of the 'disturbance rate'. While this may render capacity calculable, in practice transport planners often have to consider a whole variety of other concerns. I now turn to how capacity calculations are made in practice. The tendency to resist here is to see this shift from theory to practice as a shift from calculation to judgment or from 'fact' to stories.

4.4. QUALCULATING MULTIMODAL CAPACITY IN PRACTICE

In early 2016, four transport planners, two traffic engineers, and one ethnographer gathered for a meeting in Munich's transport planning department. They met to discuss the intermediary results of a so-called 'Verkehrstechnische Untersuchung' (VTU*), a traffic engineering study. This VTU concerned the redesign of a main road and a junction in the center of Munich. There was a plan to construct a new parking garage under the main road and several actors saw this as an opportunity to redesign the road and reduce the space allocated to motorized vehicles. To district council, for example, saw it as a "long-awaited opportunity" to improve the "for years lamented situation" in the area. They specifically problematized the large amount of space allocated to motorized traffic and the fact that it cut right through the neighborhood. To improve the situation, they demanded reducing the number of traffic lanes from three to two per direction. Figuring out if this was possible was one of the questions with which the meeting's participants concerned themselves.*

Interestingly, answering this question took only about ten minutes. During my time in Munich's transport planning department, I learned that the main factor defining a road's capacity are its junctions rather than its straights. Based on this insight, Mark, one of the transport engineers, explained the others that the capacity of one of the junctions in the area was lower than the capacity of the road they were dealing with. The junction's capacity was even lower than the capacity of a road with two lanes, which meant that the number of lanes could easily be reduced from three to two per direction.

However, the planners did not only want to narrow the road, but also the junction adjacent to it. By removing some of the lanes at the junction, they hoped to create more green space and more space for walking and cycling. The meeting's main goal was to figure out which junction design was the most feasible one. To answer this question, Munich's transport planning department had commissioned an external traffic-engineering bureau to conduct a capacity calculation. The engineers had been given five different designs, the existing design, and four alternatives, and they had conducted a so-called 'Leistungsfahigikeitsberechnung' or 'capacity calculation'. During the meeting, the outcomes of this calculation were represented through a series of tables (see fig. 21 to 25).

Bestand

Zufahrt	Fahrtrichtung	Signalgruppe	morgens		abends	
			Reserve	QSV	Reserve	QSV
	GR	FV 02	+ 25%	B	+ 11%	B
	GL	FV 02	+ 117%	B	+ 28%	C
Zwischensignal	G	FV 03	+ 231%	A	+ 317%	A
	G	FV 05	+ 721%	A	+ 314%	B
	R	FV 05	+ 118%	A	+ 69%	A
	L	FV 06	+ 0%	D	- 7%	F
Zwischensignal	L	FV 04	+ 0%	D	- 7%	F
	G	FV 07	+ 272%	B	+ 264%	B
	L	FV 07	+ ´6%	B	+ 15%	B
(Zwischensignal)	G	FV 08	+ 398	A	+ 287%	A
	G	FV 01	+ 181%	B	+ 117%	C
	GR	FV 01	+ 33%	B	+ 14%	C
	R	FV 01	+ 23%	B	+ 14%	B
Knotenpunktbilanz	_	_	+ 4%	B	4%	C

Figure 21 – Capacity calculation of existing situation

Variante 1

Zufahrt	Fahrtrichtung	Signalgruppe	morgens		abends	
			Reserve	QSV	Reserve	QSV
	GR	FV 02	+ 25%	B	+ 11%	B
	GL	FV 02	+ 117%	B	+ 28%	C
Zwischensignal	G	FV 03	+ 231%	A	+ 317%	A
	G	FV 05	+ 721%	A	+ 325%	B
	R	FV 05	+ 118%	A	+ 69%	A
	L	FV 06	+ 0%	D	- 7%	F
Zwischensignal	L	FV 04	+ 0%	D	- 7%	F
	R	FV 09	+ 9%	D	+ 108%	B
	G	FV 07	+ 21%	B	+ 32%	B
	L	FV 07	+ 17%	B	+ 25%	B
(Zwischensignal)	G	FV 08	+ 384	A	+ 287%	A
	G	FV 01	+ 181%	B	+ 117%	E
	R	FV 10	+ 19%	D	+ 14%	B
Knotenpunktbilanz	_	_	+ 9%	B	0%	C

Figure 22 - Capacity calculation of alternative 1

Variante 2

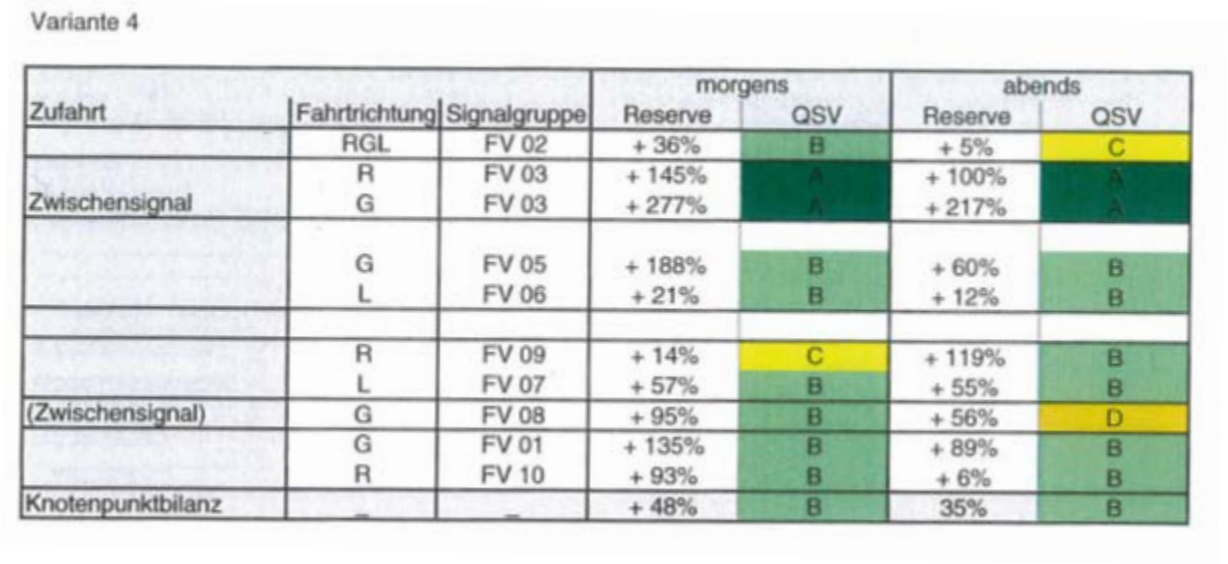
Zufahrt	Fahrtrichtung	Signalgruppe	morgens		abends	
			Reserve	QSV	Reserve	QSV
	RGL	FV 02	- 2%	F	- 46%	F
	GR	FV 05	+ 124%	A	+ 79%	A
	G	FV 05	+ 323%	A	+ 125%	B
	L	FV 06	- 21%	F	- 26%	F
	R	FV 09	-2%	E	88%	B
	GL	Fv 07	+ 8%	D	+ 15%	D
	L	FV 07	+ 2%	E	+ 11%	D
	G	FV 01	+ 170%	B	+ 117%	B
	R	FV 10	+ 93%	B	+ 68%	B
Knotenpunktbilanz			- 10%	D	-22%	F

Figure 23 - Capacity calculation of alternative 2

Variante 3

Zufahrt	Fahrtrichtung	Signalgruppe	morgens		abends	
			Reserve	QSV	Reserve	QSV
	RGL	FV 02	-34%	F	- 62%	F
	GR	FV 05	+ 331%	B	+ 139%	B
	L	FV 06	- 21%	F	- 26%	F
	R	FV 09	-2%	E	+ 88%	B
	GL	Fv 07	- 7%	E	+ 0%	E
	L	FV 07	- 10%	F	- 2%	E
	G	FV 01	+ 170%	B	+ 127%	B
	R	FV 10	+ 83%	B	+ 59%	B
Knotenpunktbilanz			- 21%	F	-33%	F

Figure 24 - Capacity calculation of alternative 3



Variante 4

Zufahrt	Fahrtrichtung	Signalgruppe	morgens		abends	
			Reserve	QSV	Reserve	QSV
	RGL	FV 02	+ 36%	B	+ 5%	C
	R	FV 03	+ 145%	A	+ 100%	A
Zwischensignal	G	FV 03	+ 277%	A	+ 217%	A
	G	FV 05	+ 188%	B	+ 60%	B
	L	FV 06	+ 21%	B	+ 12%	B
	R	FV 09	+ 14%	C	+ 119%	B
	L	FV 07	+ 57%	B	+ 55%	B
(Zwischensignal)	G	FV 08	+ 95%	B	+ 56%	D
	G	FV 01	+ 135%	B	+ 89%	B
	R	FV 10	+ 93%	B	+ 6%	B
Knotenpunktbilanz	–	–	+ 48%	B	35%	B

Figure 25 - Capacity calculation of alternative 4

Each table represents one of the design alternatives, and every row in the table refers to a different set of traffic lights (FV 01 to FV 08). Using the tables, one can quickly identify the most feasible result. Note the color-coded letters (A, B, C, D, E, F) in column QSV[26]. A quick glance over the tables should make clear which design is most feasible. The fact that version four (Variante 4) has no red and most green makes it easy to identify it as the most feasible option. The other columns, from left to right, provide information on the names of the streets leading into the junction (Zufahrt), the direction of travel across the junction (Fahrrichtung), single group number (Signalgruppe), and 'reserve' a measure that gives planners a sense of how much slack within the depicted category.

Furthermore, as the letters A to F suggest, the information represented in these tables is directly informed by Germany's capacity calculation standards, discussed earlier. Those formal methods underlie the information the tables present and afford the meeting participants to quickly calculate the 'best' junction design. However, it is crucial to keep in mind that these formal methods only consider motorized vehicles while omitting other modes, including cycling.

Had the transport planners and engineers simply applied this method to the situation they were dealing with, those modes would have been ignored. Had they based their decision solely on the information presented in the tables (A, B, C, D, E, F) then the design choice would have been based solely on the capacity offered to motorized vehicles. Given the broad consensus in Munich, that all those modes require equal attention (multimodality), merely following the outcomes of standardized methods would go directly against this broadly shared ideal.

The meeting participants, however, *did* consider other modes, aspects, and values. A bus line crossing the junction meant that the design could not include sharp turns. The planners considered the subway exits, and they paid attention to whether or not road users, including cyclists, would behave as the road design prescribed. Two of the layouts, for example, demanded that car drivers coming from the West would not turn left, as this would interfere with the flow of oncoming traffic. However, as making this turn was physically possible, there were no actual barriers, the planners spend several minutes on figuring out of this could be prevented somehow. They concluded they could not.

The crucial point here to resist the idea that those discussions articulate 'mere' values whilst the tables represents 'facts'. The calculation did not stop once the participants moved beyond the information in the tables. Rather, tables and discussion are part of the same qualculative activity.

But what does it mean to calculate when qualitative and nonformalized aspects are taken into account? To understand this, I draw on Callon and Law (2005), who suggest that qualculation (quantitative and qualitative) involves three steps:

> "First, the relevant entities are sorted out, detached, and displayed within a single space. Note that the space may come in a wide variety of forms or shapes: a sheet of paper, a spreadsheet, a supermarket shelf, or a court of law—all of these and many more are possibilities." (Callon & Law, 2005, p. 719)

The first step is thus the defining and limiting of the entities taken into account and placing them in a single 'space'. What counts as 'a space' is, however, intentionally, left open. It is a question that needs to be posed anew in every case. So, what could qualify as this space in the current case? The meeting room is perhaps an obvious candidate. It indeed limits the entities to be taken into account. It would be far harder to collectively

[26] *Qualitätsstufen des Verkehrsablaufs* or Levels of Service (LoS).

qualculate a junction in an open office space. The meeting room is, however, not the only element defining the space. The tables printed above also enact a particular spatiality. They represent a singular junction in the city of Munich and, even more specifically, only enact the road network and the motorized vehicles using it.

Here we have the contours of the calculative space that the meeting participants were dealing with, a space limited to a single junction in the road network, used by cars. Rather than speaking of this arrangement as a *space*, I will define it as a specific *mode of planning*. This allows me to compare it to the networked-city mode discussed in the previous chapter. An important difference between these two modes of planning, the networked-city, and capacity calculation is the scale that they are dealing with. The former defines urban space 'as a whole', a city, while the latter focusses on a single element, a junction.

Despite this difference is important to realize that there were also overlaps between the networked-city mode and the mode articulated during the meeting. During the meeting, participants focused on networked infrastructures and articulated a concern for a variety of transport modes (cars, public transport, walking, and cycling). This overlaps with the concern for multimodality that, as discussed in chapter 3, informs the planning of transport networks in Munich today.

That the planners considered a variety of transport modes has at least two important implications. First, it demonstrates that in practice, the difference between the various modes I identify is not always very clear-cut. Different modes may appear in a single meeting—an insight I come back to in the next chapter. Second, and most importantly, it demonstrates that planners do not simply draw on or seek to achieve a single perspective when calculating a junction. While the participants used a formal and coherent method to calculate capacity, they did not attempt to translate every matter of concern into this frame of reference. By contrast, the participants considered the formally calculated capacity offered to motorized vehicles *and* the effects different junctions designs had on other modes (cars, public transport, walking, and cycling).

Here we are thus leaving romantic territory, which suggests that planning demands singular perspectives, and moving into the baroque, which does not make this claim. But if making good calculations is not just a matter of following formalized procedures, how do planners calculate then? To answer this question, I again draw on the suggestion of Law and Callon.

This brings me to the second aspect these authors foreground, namely that qualculation requires that entities are related, manipulated, and transformed.

> "Second, those entities are manipulated and transformed. Relations are created between them, again in a range of forms and shapes: movements up and down lines; from one place to another; scrolling; pushing a trolley; summing up the evidence." (Callon & Law, 2005, p. 719)

During the meeting, the five different designs (the existing design, and four alternatives) were represented through CAD printouts (see fig. 26). Those different visualizations differed from one another in minute ways. Each design omitted specific infrastructural elements in comparison to the others. The first design removed one car lane and created more green space. The second alternative took away that lane plus one of the six roads leading into the junction. Version number 3 maintained the road removed in version 2 but removed another one. Version 4 shifted the center of the junction about 20 meters to the east, which reduced the overall size of the junction and could reduce the time cars needed to pass the junction, possibly increasing its capacity.

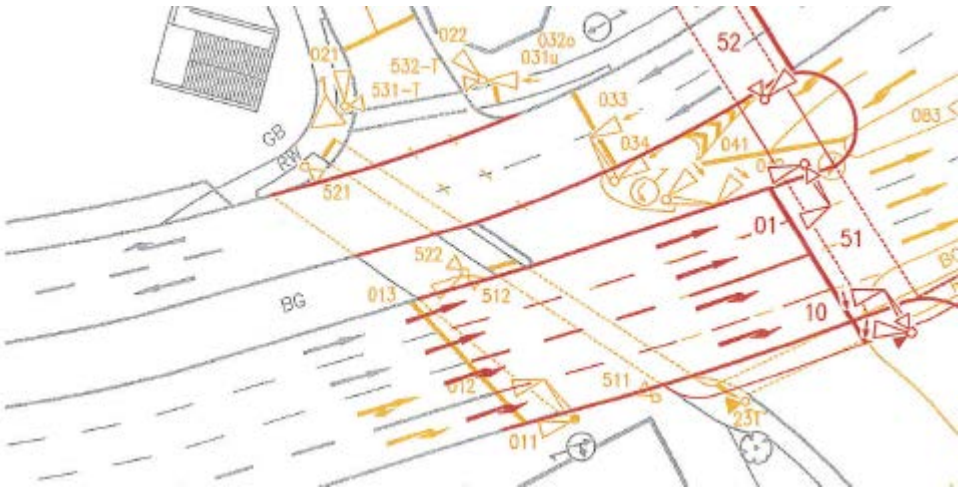


Figure 26 – Section of CAD drawing of new junction design

The formal capacity calculation had allowed identifying the design with the highest capacity for motorized traffic. But, the design also allowed the actors to explore and identify (calculate) what design was most feasible for other modes, such as walking and cycling. From the perspective of motorized traffic capacity, it was better to let all cyclists and pedestrians cross from North to South on one side of the junction, as this would allow more green time for cars on the other side of the junction. Several of Munich's intersections designed during the second half of the 20th century indeed still function in this way. Such designs force those road users to make lengthy detours, and as one of the planners noted people cycling were unlikely to follow this prescription.

> "So the [situation] is in fact that [cyclists] will shoot straight across, as they do so far. They will not make a 90 degrees left turn and [then] a 90 degrees right turn to go left again past [that building]."

Third, a qualculation produces an outcome or result. This may be a number, a KPI, or a specific design.

> "And, third, a result is extracted. A new entity is produced. A ranking, a sum, a decision. A judgment. A calculation. And this new entity corresponds precisely to—is nothing other than—the relations and manipulations that have been performed along the way." (Callon & Law, 2005, p. 719)

In the end, one design was picked: design alternative number 4. This was the design that was most feasible from the perspective of motorized vehicles. But was this the only consideration taken into account? Certainly not. It was also a design that reduced the number of traffic lanes and created more space for pedestrians and cyclists. And it was a design that would engender no issue for the busses that needed to cross.

The choice for this design was based on the qualculative process just described. Drawing on established modes of planning, the participants articulated a particular calculative space, thereby limiting the entities to be taken into account. A part of the situation was calculated using formalized capacity calculation methods, but other interrelations were discursively explored in ways that deviated from those methods. And at the end of the meeting, one of four design alternatives was picked. From a romantic point of view, this way of rendering calculation processes may feel insufficient and even problematic as it no longer fully explicit how calculations

are performed. However, as I will explain next, a baroque sensibility suggests that calculation can never be made fully explicit and that this is what we need to appreciate.

4.5. CALCULATIVE VERSUS QUALCULATIVE, ROMANTIC VERSUS BAROQUE

The distinction between the calculative and the calculative maps onto that between the romantic and the baroque, which runs through this thesis. A romantic view defines calculation and planning more broadly in terms of formal procedures that guarantee singular outcomes or perspective on complex realities. However, as we have seen, in practice, planners often need to consider other modes, aspects, and values than the ones prescribed by formal methods. In practice, planners (have to) consider a multiplicity of entities and concerns. As such, they deal with the gap between the formal methods and goals of planning by deviating from the former and by considering entities not accounted for.

From a romantic perspective, this is a loss. It sees such deviations as an infiltration of the rational by the irrational, the objective by the subjective, the technical by the political, etc. Calculation is commonly seen as a strictly quantitative activity. From this perspective, it is hard to appreciate that the fact that planners use qualitative judgments is a form of qualculation, and not merely a matter of discursive persuasion or political power play.

When planners deviate from formal procedures, their calculations and decision become implicit. Romantic approaches, such as the FLOW project, can precisely be understood as an attempt at rendering ways of knowing and calculating complex urban situations explicit. This romantic concern with the explicit (Law, 2004) is closely linked to the liberal-instrumentalist political theory underpinning the work of Jürgen Habermas and communicative planning theory (Innes, 1995). The key idea here is that technical standards offer a way for 'the public' scrutinize and reconfigure how planners (state actors) calculate. Making actions fully explicit is assumed to make them transparent to those not directly involved, i.e., the public (Ezrahi, 1990).

However, in practice, planners often need to deviate from formal methods and the insights they produce. A romantic approach suggests that such deviations require the invention of new rules and methods. The FLOW project can be understood in these terms. However, it is essential to realize that also when multimodality becomes calculable, unreflexively applying this method to specific problems is unlikely to produce desirable results. In practice, planners always have to consider issues and concerns that do not fit the formal framings that such methods contain. Even if the FLOW project is successful, this would not resolve the issue as it still deals with a highly specific version of reality, and cannot incorporate the wide variety of entities with which transport planners are concerned.

A baroque approach is more pragmatic in this respect: "…unlike the romantic, the baroque is tolerant of the implicit. To know something, indeed to know it well, is not necessarily to make it explicit. It may be enough to reflect or refract or enact or embody it." (Law, 2004, p. 9). For the citizens of Munich, the result, the road that is built, might be enough to know if decisions are made 'well' or not.

The realization that calculation is qualculative rather than calculative, baroque rather than romantic however raises an important theoretical issue. As discussed in chapter two, the romantic view underpins most of planning theory and suggest that planning depends on the capacity of overview. It sees overview as a crucial antidote against the fragmentation or splintering of urban societies. However, in this chapter, I have demonstrated that such singular perspectives are never fully realized. By contrast, I have argued that to make good design decisions planners need to consider a variety of modes of planning that do not fully add up to a singular perspective. A common reaction to this claim is that of course, perspectives never fully add up, but it is nonetheless an ideal that needs to be pursued. The baroque approach that I develop in this dissertation, however, suggest that we leave this romantic ideal behind and ask how planners achieve coherence between different urban entities without obtaining a singular perspective or overview.

5. MEETINGS, MAPS, AND THE MULTIPLE MODES OF TRANSPORT PLANNING

On a Tuesday morning at 09.00, I joined 'team center' for its almost daily team meeting. Team center consists of five members plus a team leader, who I will refer to as Sofia, and is responsible for traffic planning in Munich's city center. At the start of the meeting, Sofia informed her team about the news of the day. There was a request to build a cycling lane in Elisenstraße—a main artery in the center of Munich. As the road was located in the direct vicinity of Munich central station, this seemingly simple request was actually a highly complex matter. The area formed a major junction in all of the city's transport networks. It was a major crossing for cars, trams, buses, pedestrians, and cyclists. As if that was not enough, there was also a concrete plan for extensive reconstruction of the station building and the possible pedestrianization of the road in front of its main entrance. Those plans included space for cyclists on the new square and foresaw leading them along a still to be built bike lane in the Prielmayerstraße, a road that runs parallel to the Elisenstraße for which the request was made. Amidst all those developments, Sofia and her team now had to figure out if constructing the bike lane was feasible and desirable.

Figure 27—Meeting around a map

This chapter continues where the previous one ended. It further explores how planners achieve coherence between different urban entities without obtaining a singular perspective or overview. In the last two chapters, I argued that transport planning in Munich contains two different *modes of planning*. First, it is still motivated by the *network-city ideal* (mode 1), the idea that the city can be integrated through citywide infrastructural networks, and today articulates a variety of transport modes with this ideal. Second, in the previous chapter, I argued that capacity calculation constitutes a second planning mode, but that formal methods (mode 2) are incommensurable with the new concern for cycling and multimodality (mode 1). I also showed how planners address this issue in practice and argued that their approach is best captured by a *baroque* conception of complexity—a concept elaborated on in chapter 2. Acknowledging this has important implications for planning as baroque complexity rejects the possibility of *overview* (Hillier, 2012; Law, 2004), it rejects the idea that there is or can single coherent perspective from which one sees the city as a whole. Planning theory has, however, long assumed that overview is necessary achieve the coherence of urban communities. In other words, it has deemed overview to be crucial for the city to exist.

To demonstrate how planners plan without overview, I will focus on two planning methods that are commonly seen as key in the achievement of overview, namely maps and meetings. First, it is common to see meetings as moments for decision-making and reaching consensus. As such, they often appear to be key sites for coordinating multiple perspectives into singular ones. However, scholars who have studied meetings ethnographically also stress the opposite. They foreground that meetings often do not lead to singular results, but rather (re)produce a multiplicity of phenomena. In other words, while conventional wisdom might associate meetings with romantic sensibilities and overview, the literature suggests the opposite. Another vital aspect of meetings foregrounded by anthropological and STS research is the role of materiality, particularly documents. Maps have however received far less attention, but like documents, they are important planning instruments.

The second section of this chapter focusses on maps. Not just because they have received little attention in the literature on meetings, but most importantly, because they are strongly associated with the idea of overview. Maps indeed literally offer an overview of the city as a whole. They can perhaps be thought to embody this very ideal. However, as I will argue, the fact that maps allow planners to see the city in its totality does not imply that they offer them a coherent overview of its complex urban reality. This argument is partly in line with arguments made by other social theorists who have foregrounded that maps, and other planning instruments, do not merely represent urban reality but are better understood as *simplifying* or *transforming* it. James C. Scott, for example, speaks of maps as 'state simplifications'. Similarly, STS scholar Ola Söderström shows how maps offer a view of the city that could not exist without them (not even if one would be hovering in mid-air) thus transforming what can be seen and known. In this way maps, Söderström argues, contribute to the so-called 'planning gaze', a specific modern way of seeing and organizing urban reality. Implicit in the work of these scholars is, however, the (romantic) assumption that the different instruments of planning, such as methods and calculative methods, do indeed add up to a coherent whole. A baroque approach questions this.

Drawing on the insights from the first two sections, the chapters' third section explores what happens when the romantic focus on singularity is replaced by a baroque sensibility for the multiple modes that meetings articulate. I will show that it becomes possible to capture that planners articulate complex situations through *even more* planning modes than the two already discussed in the previous two chapters. In addition to the networked-city (chapter 3) and capacity calculation (chapter 4) I also show how Sofia and her team used the modes of *safety*, *Politics*, and *bureaucracy* to articulate the complexity of the situation.

The chapter's fourth and final section explores what is gained by articulating complex planning problems through a multiplicity of modes. More specifically, I will explore how this enables actors to plan without overview. This, I will argue, has everything to do with *interferences*.

5.1. MEETINGS

Meetings, such as the meeting of Sofia and her team, are promising sites for understanding how coherence is achieved and maintained in practice, for several reasons. First, meetings are ubiquitous in (transport) planning. The two teams that I ethnographically followed for this study had respectively three and four team meetings per week. The team members additionally spend much of their days participating in, preparing for, or traveling to meetings of working groups, organizational teams and different political bodies such as the city and city-district councils. As such, a better understanding of how meetings function is likely to offer insights into the dynamics that drive planning more broadly.

Second, it is common to see meetings as gatherings in which people negotiate their interest, make decisions, and reach an agreement. As Klara, a senior member of the transport planning department put it: meetings are crucial for "circulating information" and "making sure that everyone work[ed] towards the same goals". In this light, meetings might very well appear to be essential activities through which coherence, singularity, and overview are achieved.

However, and this brings me to my third point, scholars from a variety of fields challenge this idea, They argue that meetings are often not the sites of univocal clarity they are thought to be, but rather express complex realities. In her seminal book *The Meeting,* anthropologists Helen Schwartzman (1989), for example, argues that meetings often:

> "generate the appearance that reason and logical processes are guiding discussions and decisions, whereas they facilitate […] relationship negotiations, struggles, and commentary. It is this process that can make meetings such frustrating occasions because they appear to be doing one thing whereas, in many ways, they are accomplishing something entirely different." (Schwartzman, 1989, p. 42).

Schwartzman here thus points to a dual nature of meetings; the fact that they are often thought as producing singularity (decisions, reason, clear outcomes) but in reality (re)create a multiplicity of complex phenomena. Drawing on his experiences as the dean of his faculty, STS scholar, Bruno Latour also stresses the multiplicity of meetings. In a meeting, he argues, "each of us is designated as characters in multiple contradictory stories, all of which come to an end at different deadlines and with different sanctions" (Latour, 2012, p. 8). In line with this, communication scholars Tracy and Dimock, argue that meetings are best understood as "discursive sites for building and fragmenting community" (Tracy & Dimock, 2004, p. 127). They furthermore emphasize how hard it is to observe clear decisions being made in a meeting room: "[o]ne realization that becomes apparent when looking at the talk of groups having real meetings is that key analytic concepts, such as decision, are difficult to observe" (Tracy & Dimock, 2004, p. 140). Observing 'decisions' in practice might be easier by paying attention to the role of materials, an aspect overlooked by Tracy and Dimock due to their focus on spoken discourse.

Anthropologists especially have persistently emphasized the importance of materiality in organizational gatherings. Challenging the commonsense idea that meetings are merely places in which people talk, Brown et al. indeed suggest conceiving "meetings [as] sites in which people and materials are assembled as networks with more or less durability and differential capacity to act." (Brown et al., 2017, p. 15).

Existing, material-constructivist accounts of meetings particularly foreground the role of documents. Lamp (2017), for example, speaks of the 'intimate relationship between meetings and documents' highlighting how documents constitute formal meetings, while informal meetings are precisely those left undocumented. This concern for the role of materials, specifically documents, in meetings is nothing new. In 1989, Helen Schwartzman already emphasized how meetings often (re)appear as texts that actors can draw on to reaffirm themselves about the situations they are dealing with. Schwartzman: "[i]n the process […] of producing and

reading meetings as texts, before, during, and after their occurrence, participants generate and affirm cultural values and beliefs or systems of meaning." (Schwartzman, 1989, p. 36). Schwartzman's observation that meetings are often read 'as texts' connects with the STS notion of inscription devices (Akrich, 1992; Latour & Woolgar, 1979)[27]. In this view, meetings and the objects and actors composing them are inscribed into, and circulate through documents. It is perhaps in this way that 'decisions' can be said to materialize. Drawing on an ethnographic study of an organizational board, Fear (2012) gives an idea of how this works. In Fear's words: "the minutes of the board meeting at time *t* are re-presented, and reread, in the meeting at time t+1" (Fear, 2012, p. 491). Clarity and stability of decisions made in a meeting are thus achieved through the translation of the meeting into paper form, which also affords their transportation from one gathering to the next. More broadly, these authors thus foreground the crucial role that documents play before, during, and after a meeting.

Figure 28 – Discussing in front of the map in the coffee kitchen

[27] It may be relevant noting here that the STS concept of *inscription* carries at least two related but slightly different sensibilities. First, in the work of Akrich (1992) *inscription* refers to a process through which the worldviews of engineers are *inscribed* into material artefacts, which subsequently both afford and constrain certain ways of acting by users. Second, when initially coined as an STS concept Latour and Woolgar defined *inscription* as a process performed by a (collection of) device(s) which "can transform a material substance into a figure or diagram which is directly usable" (Latour & Woolgar, 1979, p. 51). Hence, the emphasis is here on how inscriptions can be directly used again within the same practice, rather than how it defines the actions of others.

In the next section of this chapter, I shift the focus onto maps rather than documents. While maps are ubiquitous in planning, their role in meetings have received relatively little attention in comparison to documents. Like meetings, maps are everywhere in Munich's transport planning department. As the photo at the beginning of the chapter shows, they often form the center of meetings. They also appear in documents, PowerPoints and in a variety of forms on the walls of almost every room in the building. There is even a map of Munich in the coffee kitchen, which becomes the center of discussion from time to time (see fig. 28). My focus on how will be on how the role of maps has been theorized in and beyond STS. Afterwards, I turn to how they are actually used in everyday planning activities.

5.2. MAPS

Social theorists have long been interested in maps, and specifically in understanding how they make planning possible. That city plans play a pivotal role in planning should hardly be surprising as they literally allow one to see the city as a totality. However, for theorists, it is not just how maps *represent* urban reality that makes them so important for planning, but also how they *transform* that reality. Famous in this respect is the work of James C. Scott who links modern planning to the invention of what he refers to as "state simplifications". As the notion of simplification suggests, for Scott, the power of maps lies in the fact that they *simplify* (and thus transform) otherwise highly complex urban realities. For him, it is this reduction of complexity that makes planning possible. To be sure, maps were not the only instruments on which modern state craft relied. By contrast, Scott describes how the modern state emerged with the invention of a variety of techniques as well as a spatio-material reconfiguration of urban life (straight roads, street names, house numbers, etc.) that rendered the city legible and governable. Together, Scott argues, such inventions engendered a capacity to "see like a state", that is, an *overview*. The pre-modern state was, according to Scott, "partly blind" as it lacked the instruments to coordinate its activities and produce an overview of its territories (such as the city) as a whole. For Scott, maps and other devices thus enabled state actors to see the city as a whole because they *simplified* complex (urban) realities, in such a way that they became 'visible' from a centralized point of view:

> "Certain forms of knowledge and control [such as planning] require a narrowing of vision. The great advantage of such tunnel vision is that it brings into sharp focus certain limited aspects of an otherwise far more complex and unwieldy reality. This very simplification, in turn, makes the phenomenon at the center of the field of vision more legible and hence more susceptible to careful measurement and calculation. Combined with similar observations, an overall, aggregate, synoptic view of a selective reality is achieved, making possible a high degree of schematic knowledge, control, and manipulation." (Scott, 1998, p. 11)

Like Scott, ANT scholars also have a long-standing interest with the state as a centralized macro-actor and the enquiring into how this perspective is achieved (Latour & Callon, 1981; Passoth & Rowland, 2010). These authors emphasize the role of material instruments such as maps, and likewise stress that those instruments do not merely represent but rather transform[28] reality. Such transformations are crucial in making planning possible, as we will soon see. Where Scott understands such transformation as a *simplification,* ANT conceives it as a *complication* of reality. Following Latour, complication here refers to situations in which "relationships can be treated one by one, and folded into one another in the form of a black box." (Latour, 1996, p. 233). In this view, a map does not just offer a simplified view on a complex reality 'out there', as Scott suggests. Rather, a city plan embodies a long chain of social and technical inventions that are 'folded' into it and which continue to shape the views and actions of those using them.

In a truly fascinating paper, Ola Söderström (1996) mobilizes this (early)ANT strategy to explore the inventions 'folded' into the maps that planners use and how they mediate urban realities. I will now discuss the insight that Söderström offers, but most importantly, I will show how his work subscribes to a romantic conception of complexity. His account implicitly assumes that different representational techniques add up to a singular perspective and that there is something like a "planning gaze".

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[28] ANT scholars also use the notion of *mediation* to refer to this capacity of material objects to "transform, translate, distort, and modify [reality]" (Latour, 2005, p. 39).

The ichnographic map

Söderström shows how plans, like the ones used by planners in Munich, incorporate a specific representational technique, called *ichnographic projection* (Söderström, 1996). This representational technique, invented during the Renaissance, allows one to see and comprehend the city in a way that is unobservable to the naked human of a human observer, even if that observer would be hovering in mid-air (Pinto, 1976). To understand this, it is helpful to compare *ichnographic projection* to another representational technique invented at the time: *perspective* projection. Perspective representation, allows three-dimensional objects to be represented on a flat surface just as a human observer would see them. Given its significant contributions to disciplines as diverse as engineering and the arts; it might be a surprise to learn that perspective representation does not underpin modern planning. As Pinto (1976) notes:

> "The perspective system was admirably suited to representations which could be viewed by a single observer situated at a particular point. However, in order to represent a complex object such as a city, which could not be seen in its totality by a single observer standing earthbound at a fixed point, a different representational method was necessary." (Pinto, 1976)

In a *perspective* representation, objects closer to the observer appear larger than objects further away. This corresponds to how a single human observer would see such objects but distorts the spatial relations between them. Ichnographic projection addresses this issue by representing buildings, roads, and other elements as outlines in a ground plan, keeping spatial dimensions constant. In other words, ichnographic projection enables seeing the city as a whole, without the distortions that perspective representation produces.

However, it is vital to realize that while ichnographic projection corrects the distortions of perspectivism, it transforms and distorts (*mediates*) reality in other ways. It can only depict that what can be represented visually and tends to value the collective over the individual, the whole over the part, and the homogenous over the heterogeneous (Söderström, 1996).

Söderström suggests that this also holds for several other planning devices, including social statistics, master plans, zoning plans, and bureaucratic techniques. Without going into detail, the point he makes is that all these different techniques transform urban reality in an analogous way, which here refers to as "the planning gaze" (Söderström, 1996, p. 272). To emphasize those different instruments thus add up to a specific a singular perspective, a particular way in which planners or the state see the city as a whole:

> "The principal family resemblance between the ichnographic plan, the master plan, the zoning plan, and social cartography is that they synthesize the city in terms of material objects, or individuals who are treated as objects, that is, reduced to social types, operators of functions (living, working, travelling, recreating) or of standard needs (norms of comfort, of noise, of household goods)." (Söderström, 1996, p. 275)

At the heart of Söderström's (1996) and Scott's (1998) work thus lies the romantic idea that different representational techniques, and the realities they articulate, can be synthesized, that they *do* indeed add up to a singular perspective. For Scott, this is a *simplified* perspective, while for early ANT—the theory on which Söderström draws—it is a *complicated* one. Despite those differences, both suggest that planning establishes a singular perspective, or in other words, a singular mode of planning.

However, partly due to their historical approach, these two authors do not explore how coherence between different instruments is achieved in practice, if at all. In the previous chapter, I already demonstrated that such an assumption does not always hold. I showed that there is a gap between the methods and goals of planning in Munich. Existing methods only consider a single mode while most actors agree on the need for multi-modality. And that in practice, planners do not necessarily achieve a singular (romantic) perspective on the complex situations which they seek to understand and transform. Instead, as I will argue next, a baroque disposition suggests that planning in the light of complexity is possible precisely because it does not achieve a singular perspective. By contrast, it suggests that maps and other instruments do not add up to a singular perspective, but rather support planners in articulating complex situations through a multiplicity of modes and explore the interferences between them.

5.3. THE MODES OF TRANSPORT PLANNING

I now return to the meeting of the 'team center', with which I opened this chapter and explore the *modes of planning* articulated in it. As mentioned, the meeting was led by Sofia the team leader and it concerned the possibility to construct a cycling lane in the *Elisenstraße,* a main artery near Munich's central railway station. However, answering this question was not as straightforward as one might think. Not only due to the central location of the road, but most importantly, because there were advanced plans for an extensive renovation of the station building. As part of those plans, the street in front of it would possibly be pedestrianized.

The networked-city

During the meeting, there was a map lying in the middle of the table (see fig. 27) at the very beginning of the chapter. This map allowed Sofia and her team to have an undistorted view of every building and road in the area. However, during the meeting, this hardly played a role. By contrast, the map supported Sofia in articulating the elements of the road network and traffic flows that interested her.

> "So where are we? [Sofia opens the map] Here, well, the station square… In the previous plan it was an idea to keep this open and then to [have cars] drive North here. So, if you have some displacements [of motorized traffic], because you are here, you will have crossed [the] Goethestraße, from there, there will be displacements [of traffic] here on the Altstadtring and that will affect the Paul-Heyse-straße."

That the *network-city* was indeed a key mode through which Sofia articulated the complex situation, became apparent at several other moments during the meeting. Sofia, for example, stressed the need to see the cycling lane's construction in connection to the *transport networks in the wider area.* At the start of the meeting, Sofia, for example, explained to her team that:

> "it [is] important to me that the further planning process considers the dependency between [the Elisenstraße project] and the surrounding central station area."

She further clarified that this was necessary because the road performed a "network function" in the wider area and that it was necessary to consider this area as a whole:

> "If I leave this all out, because I'm saying I'm just taking [the cycling lane] project because I want to have it now, as fast as possible, and I ignore everything that ultimately I would have to take as a network function in the overall concept, then I certainly get problems with other things. I do not know for sure, but possibly. And that's why I want to see that as a whole"

Sofia thus insisted on the need to see the cycling lane and the *Elisenstraße* not as independent objects but as elements within a wider (multimodal) transport network that needs to be planned as a whole.

This concern for the city as a larger networked whole also came up at other moments, such as here:

> "one can solve the problem only if one does not allow so much traffic in the entire inner city area."

And here:

> "So, the relocation [of traffic] both on to the Altstadtring and the Elisenstraße was actually not that big. Because it was assumed that this is distributed in the large superordinate network."

While these comments might be patchy, the idea should be clear. Prompted by the request to build a cycling lane in the *Elisenstraße*, Sofia and her team were concerned about the impact this could have on the broader road network and the area as a whole, and they explored possible challenges and opportunities.

Being a transport planner, Sofia's is primary interest is the circulation of traffic through the road network in the area and the city as a whole. However, to understand the situation, knowledge about existing and planned connections (network-city mode) was not enough. Attempts at understanding the effect of the yet-to-be-built cycling lane on the traffic circulation in the area also required *qualculating* the road's capacity—a mode of planning in itself.

Qualculating capacity

Sofia and her team specifically focused on the impact the cycling lane could potentially have on the road networks "*Leistungsfahigkeit"* (capacity). To emphasize, they thus also articulated the situation through the second mode of planning, discussed in the previous chapter. Consider, for example, the following quote:

> "The Elisenstraße will be a capacity defining route. It needs to handle the traffic, which then no longer flows over the station square. That means I have to consider prognosis and capacity [to calculate] what it can handle."

Although no one had brought any material to visually represent the capacity nor a computer for number crunching, there was still *qualculative* work going on. As I argued in the previous chapter, *qualculating* road infrastructures requires creating several design options. During the meeting, the team explored two possibilities. In the first, the station square remained open to motorized traffic and in the second it would be closed. As described by Felix, another team member:

> "In the end, it's simply about considering the development in the main station area, as it is being planned, as well as the option of closing [the station square], that that is simply taken into account in the study."

These two options, as well as several other ones, had already been *qualculated* about a year earlier. The city had commissioned a Munich based traffic-engineering firm to conduct a *Verkehrstechnische Untersuchung* (Gevas Humberg & Partner, 2015) and the consultants concluded that pedestrianizing the square would increase the traffic volume on some of the roads in the area, but within reasonable limits. As mentioned earlier, this study did consider the possible construction of a cycling lane on the new square and into the Prielmayerstraße. However, it had not explored the implications of building a cycling lane in the Elisenstraße. As a result, it did not offer any insight into its effects, which meant that another capacity calculation was necessary.

Safety[29]

Simon, a transport planner and member of Sofia's team, however, suggested that road capacity was irrelevant here. In his opinion, the construction of a cycling lane in the *Elisenstraße* is a safety issue, rather than a matter of traffic capacity. Simon:

> "the Elisenstraße is not a traffic engineering question, that's a safety issue. It is not a wish to create cycling infrastructure there. Actually, according to the guidelines we are obligated to offer something [infrastructure for cyclists] at such levels [of motorized traffic]"

Simon thus defined 'traffic engineering' (technical calculations) and 'safety' as two distinct modes, and argued that the latter rather than the former should form the basis for decision-making. Following this line of reasoning would imply that the decision to construct the cycling lane, or not, would no longer be up to them. As Simon reminded his colleagues, safety is a mode of planning that falls under the responsibility of the *Kreisverwaltungsreferat*, a different department of the city administration.

> "but the KVR can already do that. If the KVR already right now ... they have to do something ... they really do not need us."

Following this line of reasoning would also imply that, in principle, the decision to build the cycling lane or not could be based on this single mode. However, Sofia reminded the others that this is not how things work.

> "Well, let's say so, the political climate and the decision-making situation is already so that we have to write the basic decisions."

I argue that what Sofia refers to here as "the political climate" and "the decision-making situation" constitute two further modes that planners take into account.

Politics

In addition to the three modes discussed so far, Sofia and her team also needed to deal with the mode of Politics—with a capital P. Sofia saw the request as politically motivated, as it was requested solely by the SPD, the socialist party.

> "The application for the Elisenstraße is a pure SPD application. And I think that the SPD wants to show now on the basis of these reports. It wants what happens and that it is attributed to the SPD. I think that's the reason for this proposal."

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[29] Safety receives too little attention in this dissertation, both as a cycling issue and as a planning mode. This is partly because safety is not the primary responsibility of Munich's transport planning department, where I conduced my ethnography. In Munich safety issues fall under the responsibility of the KVR, to which I did not obtain ethnographic access despite multiple attempts. Still I think safety should have received a more prominent place in this dissertation and I consider it a shortcoming that it does not. Part of a baroque engagement with the world is that such loose ends 'loose ends' (Law, 1994) are not deleted or left implicit but made visible – on such an attentiveness also see Star (1990).

However, *Politics* did not just refer to the fact that planners need to take the demands of Political parties into account. While it is sometimes thought that planners make decisions based on 'objective' or 'technical' grounds, Sofia made quite clear that in her work the technical and the political are mixed. She insisted that she was reluctant to build the cycling lane even if technical capacity calculations would demonstrate that it was possible. Mainly because she felt she still had to persuade 'politics'[30] to go along with the pedestrianization of the station square:

> "To [close the] station square as the first step, I [do] not want to do anything in the Elisenstraße. Because I have to … still convince 'politics' that this station square is closed. That is not yet cut and dried[31]. All imagine that..."

To achieve this, Sofia thus not just needed to understand the technical details of the transport networks in the area, such as their capacity, but also be able to mobilize them in a political mode. In her view, the Elisenstraße needed to be left untouched for now to assure it would not jeapordize the pedestratinization of the station square.

> "I think I need that as a trump, to maintain [Elisenstraße] in an adequate performance. To close the station square [to motorized traffic] first, I [do] not want to do anything in Elisenstraße."

Almost like a seasoned politician, Sofia thus understood that road and their designs are not just technical but often also political materials.

Administration

As mentioned, Sofia did not just speak about the "Political situation" (the mode of Politics), but also about the "decision-making situation". Simon also made this distinction, albeit in slightly different words:

> "For me, it is currently not about the political discussion. For me, it is about the administration's discussion."

Following Sofia and Simon, I will define *administration* as a distinct mode of planning. This mode does not so much describe 'an organization' but rather a specific way of *organizing*[32] planning activity. In this view, administration (or its synonym *bureaucracy*) expresses a concern for a particular (collective) identity—the administration—and care for formal procedures and documents. That planners distinguish between 'Politics' and 'administration', suggest that the city government does not fully control such procedures, but that they

30 In German it is possible to refer to "die Politik" rather than 'Politicians'. I have sought to retain that meaning here.

31 Cut and dried is a British expression, which refer to things that have been decided and are unlikely to be changed. I here use it as a translation for the German expression that Sofia used, *"(nicht) in trockene Tücher*".

32 In organizational studies, especially Karl Weick (2005) has popularized the idea that organization should be studied as verb (organizing) rather than a noun (an organization). Others have emphasized the need to keep in focus that organization is both noun (an organization) and verb (organizing) (Bakken & Hernes, 2006).

indeed constitute a mode in themselves. Part of what the notion of *mode* seeks to convey here is that although politicians might not be fully in control of administrative procedures, neither are people like Simon and Sofia who work for the city's bureaucracy. The (baroque) point is that there is no single actor in full control of those rules. Rather bureaucracy constitutes a mode of planning (or organizing) in which a variety of actors participate.

Acknowledging that administration is a separate mode, challenges the popular idea that bureaucracy provides an overarching or underlying structure for planning activity with the head of government at the top. This is another example of a romantic ideal that a baroque sensibility calls into question. In the next chapter, entirely devoted to the mode of administration, I further explore this assumption and the implications of rejecting it. Now I first turn to the question of what is gained by articulating five different modes and how planners maintain coherence between them.

5.4. INTERFERENCES AND PLANNING WITHOUT OVERVIEW

Having identified five[33] modes of planning it becomes time to return to the question posed at the beginning of this chapter and by this dissertation as a whole: how planners achieve coherence between the entities they generate, without reducing the issue to one mode only. In short, *how planners plan without overview*. As I have just shown, in meetings, planners plan by articulating the complex urban realities through a variety of modes of planning. These include the networked-city, capacity calculation, safety, Politics, and bureaucracy. But how does this enable them to organize and structure those realities without ever grasping those situations entirely and without ever reducing them to one mode only, to a singular perspective?

Drawing on STS insights, I argue that coherence is achieved because the articulation of the complex planning problem through a multiplicity of modes renders *interferences*[34] visible and knowable. Here I'm taking inspiration from the suggestion of John Law, who argues that articulating 'stories' alongside one another implies a loss of overview, but renders *inferences* visible:

> "I explore a less direct alternative by growing different stories alongside one another. Smaller narratives—a lot of smaller keys. Working in this way has a cost: we do indeed lose the possibility of an overall vision. But at the same time we also create something that was not there before: we create and make visible interferences between the stories. We bring new and unpredictable effects into being, effects which cannot be predicted or foretold from a single location."(Law, 2002, p. 5)

More importantly, Law suggests that such interferences may form a source of strength for coexisting (nonsingular) distributions:

> "The possibility of different, somewhat incompatible, and coexisting distributions should not necessarily be seen as a problem. Rather their interferences may represent a source of strength rather than of weakness: where one distribution seems uncertain, there is displacement into another"

Inspired by these insights, I suggest that planners plan not just through articulating complex urban realities through a variety of modes, discussed above. But, most importantly, by exploring and acting based on the *interferences* this renders visible.

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[33] There might be more, but for now, identifying five is enough to make the point that planners engage in a multiplicity of modes.

[34] John Law is certainly not the only STS scholar to propose the notion of *interference* as a concept for thinking about coherence without falling back to the one/many dyad. Moreira (2004) for example argued that medical objects are generated out of the *interferences* between different types of (topological) spaces. And interference is synonymous to the notion of diffraction in the work of Haraway (1997) and Barad (2007). Barad indeed emphasizes that she uses " the terms "diffraction" and "interference" interchangeably" (Barad, 2007, pp. 28–29). Finally, also Annemarie Mol puts interference front and center. In her book, *The Body Multiple,* she argues that "[i]nterferences deserve a lot of further study." (Mol, 2002, p. 144) and stresses how this book aims to contribute "to a philosophical shift in which knowledge is no longer treated primarily as referential, as a set of statements about reality, but as a practice that interferes with other practices" (Mol, 2002, pp. 152–153).

During their Tuesday morning meeting, Sofia and her team articulated a variety of *interferences*.

First, there were interferences between the *network-city* and *capacity calculation* mode. This was not just because the bike lane possibly affected traffic flow, but also because some of the team members questioned how to *qualculate* road capacity. During the meeting, Simon proposed a quite radical change in the type of entities to consider in the qualculation of road capacity. As discussed in the previous chapter, current guidelines prescribe that capacity calculations maintain a certain 'Level of Service' for motorized traffic. With a predicted increase in Munich's population, and the traffic demand taken as externally given, this suggested that more rather than less space was to be allocated to motorized vehicles. However, Simon reminded the others that this was not necessarily so:

> "…the argument that we become more, [was] also turned around for the tram-west-[route]. They said because [the population] become[s] more we need this public transport route. And [for the Elisenstraße, we can argue that] because we are more we need continuous cycle infrastructure."

Simon recalled how in a different planning project—the realization of a new tram route in the west of Munich—the tram was framed as necessary to accommodate growing traffic demand. And a similar argument could be made for cycling. This is not merely a different line of reasoning, but indeed a different way of qualculation road capacity. In the approach proposed by Simon, capacity is a multi-modal issue rather than a single-modal one—this connects with the discussion on multi-modality in chapter 4.

Second, the mode of *capacity qualculation* also interfered with the mode of *politics*. Not long before, the administration had argued in favor of constructing a cycling lane on a similar main road. Based on formal capacity calculations, the administration had argued it was possible without significantly hampering traffic flow, even though building cycling lanes on that road required removing two of four general traffic lanes. However, in that project, the local government had dismissed theadministration's reasoning and send the project back to the drawing board with the instruction to maintain the four general traffic lanes (CSU & SPD, 2014).

This political intervention in a different project was enough reason for Sofia to oppose Simon's proposal—for a different way of *qualculating capacity*—in the current one. Sofia:

> "And all right Simon but you have seen for yourself how the discussion in the [other project] went. We have proven that [it works] with one lane [per direction], they [the politicians] did not follow us."

The controversy in the other project thus created a political situation in which changing the way of conducting capacity *qualculations* was not considered. Politics interfered with the *qualculation* of capacity.

Finally, the mode of *safety* interfered with, or perhaps better, was interfered by almost every other mode. As mentioned, *safety* was the responsibility of the KVR. In principle, this meant that if cycling safety was at stake, the KVR could build cycling infrastructure on its own authority. However, the controversy in the other project had led to a reconfiguration of formal *administrative* procedures defining this right. After the dispute in the *other* project, the administration and government had renegotiated their responsibilities (Kreisverwaltungsreferat, 2016). From then on, if the construction of cycling infrastructure required removing a general traffic lane in a main road, it had to pass by the city government (*the mode of Politics)*. And such procedures now impeded on with the situation Sofia's team was dealing with. Because in this change of rules, neither the KVR nor the transport planning department could single handily commission a capacity calculation let alone the construction of a cycling lane in main roads such as the *Elisenstraße*. As Sofia explained:

> "But we ourselves have agreed that such a redistribution measure, so to speak, should be a decision of the city council. We have proposed this ourselves as administration, and as such, we can now also not get around that."

The governance of *safety* on Munich's road *networks* thus interfered with the specific configuration of the *administration* and its relationship to *Politics*.

5.5. CONCLUSION

This chapter started with the question: how planners achieve coherence between different urban entities, without attaining a singular perspective or overview. I explained how this question, which is also the research question of this dissertation, is crucial for a baroque understanding of planning. In the previous chapter, we already saw that a baroque disposition best defines how planners calculate (or *qualculate*) road capacity in practice.

In the first section of the chapter, I argued meetings are particularly promising sites for understanding how coherence is achieved and maintained in practice. On the one hand, they are commonly understood as sites for making decisions, reaching an agreement, and thus establishing singularity. However, scholars who have studied meetings ethnographically persistently emphasize their multiplicity. They foreground how meetings often express a multiplicity of phenomena. The existing literature on meetings also foregrounds the role of materials, and particularly of documents, but has so far paid little attention to maps.

In the second section, I explained that social theorists have long acknowledged the central role of maps in modern planning and governance. A major insight of this work is that maps do not merely represent reality, but rather transform it in ways that make planning and governance possible. Authors such as James C. Scott and Ola Söderström respectively argue that maps make complex urban realities plannable because they *simplify* or *complicate* the objects of planning, in such a way that different planning instruments add up to a singular view of the city as a complex whole. However, as I explained, those authors implicitly draw on the romantic assumption that such a view is indeed achieved, but do not study this in practice.

Drawing on the insights from the first two sections, the chapters' third section explored what happens when the romantic focus on singularity is replaced by a baroque sensibility for the multiple modes that meetings articulate. Drawing on a meeting during which 'team center' discussed the possible construction of a cycling lane, I showed how maps are materials that contribute to the articulation of one specific mode of planning, the network-city ideal. The meeting, however, also included other modes, namely: capacity qualculation, safety, Politics, and bureaucracy. A romantic view would suggest that planners either represent one of those perspectives or that they add up to a singular coherent view. A baroque disposition, however, comes to a different conclusion.

As explained in the fourth and final section of the chapter, a baroque approach, suggest that coherence without overview is achieved through *interferences*. By articulating complex planning problems through a multiplicity of modes, planners render the *interferences* between them visible and knowable. In turn, knowledge about such interference affords the (re)ordering of ongoing processes without over achieving an overview of those processes as a whole. It is in this way that planning without overview becomes possible.

The idea that planners plan without overview may feel so counter-intuitive that it is hard to appreciate at first. Romantic ways of thinking about planning are so common that appropriating a baroque sensibility may be challenging. Therefore, the next chapter will further explore the implications of a baroque approach to planning, by focusing on *bureaucracy*. The reasons to zoom in on bureaucracy, and not on the modes of safety or Politics, are twofold. First, bureaucracy is widely associated with romantic sensibilities and the idea of overview. However, I will delve into what happens when one leaves such romantic sensibilities behind. Secondly, bureaucracy is frequently understood as an organizational form incapable of dealing with complex (planning) problems. However, my claim is that rather than criticizing bureaucratic institutions, theorists need to appreciate their complexity. Finally, I will show that by articulating the baroque complexity of a state bureaucracy, like Munich's transport planning department, also offers further insight into how actors achieve coherence without overview.

6. COMPLEX BUREAUCRACY: FORMALITY, ISSUES, AND AMBIGUITY

The preceding chapters explored how Munich's planners plan for cycling, based on a baroque conception of complexity. I showed how practitioners participate in a variety of *modes of planning* that enable them to articulate different types of entities. However, I also explained that those entities do not always add up to a coherent whole and asked how such coherence is achieved in practice. Where a romantic view, which informs most of planning theory, suggests that this requires the establishment of a singular perspective or overview of the city as a whole, I argue that such a view is never achieved. Instead, as seen in the previous chapter, I show how planners establish coherence between cycling and other urban elements through exploring and dealing with *interferences*.

This chapter further explores one of the three modes identified in the previous one, *bureaucracy*. So far, I have suggested that *bureaucracy* forms one mode amongst five others. In this chapter, I move beyond this and argue that bureaucracy is itself composed out of a variety of modes[35]. Drawing on fieldwork and readings of academic literature, I propose and explore three *modes of bureaucracy,* namely: *formality*, *issues*, and *ambiguity*.

Articulating bureaucracy as a multiplicity of modes goes against the popular conception of this organizational form. Both proponents and critics of bureaucracy commonly conceptualize it as a single and coherent structure. For those who praise bureaucracy, this singularity forms a prerequisite for democratic and liberal forms of governance. In this view, formal procedures allow people to act legitimately in the face of conflict and uncertainty. Other scholars, however, see bureaucracy as an organizational form that is inefficient, unjust, and ineffective in the light of complexity.

In their book *Planning with Complexity*, prominent planning scholars Judith Innes and David Booher, for example, argue that bureaucracies are ill-equipped to deal with complex planning problems:

> "Bureaucratic agencies are hierarchical in structure, routinized in their practices and each designed to fulfill a limited mission. They are unable to address the multiple goals of their constituencies, much less deal with rapid change. They cannot address the interdependencies among their missions to achieve sustainable management of natural resources. They are not set up to look at cities or regions as wholes, nor to address complex, rapidly changing problems." (Innes & Booher, 2010, p. 3)

While I wholeheartedly support Innes and Booher's call for a greater appreciation of complexity and fluidity in planning, I disagree with their way of portraying bureaucracy. Interestingly, even though Innes and Booher (2010) set out to explore the implications of complexity thinking for planning, their conception of bureaucracy is surprisingly non-complex. In this way, they risk overlooking what John Law has referred to as "bureaucratic

[35] Here I preform a *fractal* move. I implicity demonstrate that the level complexity remains the same at every scale of the analysis – on this point also see Jensen (2007). Fractals are another concept from complexity theory developed by scholars from various disciplines including STS (Bruun Jensen, 2007; Law, 2002) and Anthropology (Strathern, 1992; Wagner, 1991). Although I do not explicitly develop this concept, readers familiar with the concept may recognize a fractal sensibility. Such a sensibility is indeed central to post-ANT (Gad & Bruun Jensen, 2010; Law, 1999).

non-coherence" (Law, 2004, p. 9). It fails to appreciate the fact that bureaucracy is a complex phenomenon in itself.

To be sure, Innes and Booher are not alone here. Both critics and proponents of bureaucracy commonly conceptualize it in non-complex ways, something I will discuss in detail in the next section. I will specifically focus on how a complex conception of bureaucracy differs from idealistic and post-bureaucratic ones. Afterward, section 2 will discuss the theoretical underpinnings of the three modes that I propose: *formality*, *issues*, and *ambiguity*. In part three, four, and five, I test those modes empirically and show how they make it possible to appreciate and articulate the complexity of bureaucracy itself. The chapter's final section will reflect on the insights this approach brings with regards to the broader question running through this dissertation, how planners achieve coherence without overview in the planning for cycling.

6.1. FROM POST AND HYBRID TO COMPLEX BUREAUCRACIES

Today bureaucracy is a heavily debated topic. I do not claim to offer a comprehensive overview of such debates, but observe that both critics and proponents of bureaucracy both subscribe to similar idealized conceptions of bureaucracy. As a result, they obscure bureaucratic and organizational complexity.

In praise of bureaucracy

Paul du Gay's *In Praise of Bureaucracy* (du Gay, 2000), is probably the most famous contemporary defense of bureaucratic modes of organization and governance. His work takes a strong position against emerging 'post-bureaucratic' sentiments in and beyond the academy. Du Gay reminds his readers not to dismiss rule-governed and hierarchical organizational forms too quickly, as they form essential insurance against patrimonial forms of governance. He argues that the bureaucratic ideal of adherence to procedures and the acceptance of hierarchy is often unjustly criticized for being overly rational and unwarrantedly objective. Bureaucratic imperatives of rationality and objectivity should, du Gay argues, not to be equated with scientific (epistemological) neutrality and the establishment of a 'god's-eye' view, but rather be thought of as an attachment to the bureaucratic 'ethos of office'. This ethos entails a rejection of personal and other extra-official ties, and as such of patrimonial forms of governance.

> "The objectivity and rationality required of the bureaucrat in this case entails the capacity to set aside pre-bureaucratic forms of patronage. What is to be excluded as irrational by this form of conduct is not value-laden action per se but … forms of 'private' group prerogatives and interests" (du Gay, 2000, p. 30)

For du Gay strict adherence to procedures and the acceptance of hierarchical sub- and superordination is a mean towards this end. In line with classic liberal political theory (Ezrahi, 1990) du Gay sees such rules as crucial for rendering governance transparent and accountable. In this view, clear rules and procedures allow citizens to 'observe' how decisions are or ought to be made, and hold public representatives accountable when state agencies deviate from them.

The functioning of this arrangement, however, crucially depends on the coherence and singularity of bureaucratic and organizational forms. Du Gay, for example, stresses this point when criticizing the emergence of new 'customer oriented' forms of governance:

> "So long as mutually incompatible accountabilities - between the requirements of traditional forms of political accountability and the newer forms of 'customer' responsiveness - continue to be fostered, confusion concerning the location of authority and responsibility in government is likely to persist." (du Gay, 2000, p. 111)

Which raises the issue of:

> "How … accountability [can] be guaranteed if substantive decisions in government are to be taken by managers at their level, for which ministers can disclaim responsibility?" (du Gay, 2000, p. 111)

For du Gay, the answer is simple. Accountability requires "hierarchical systems of unified authority" (p. 111). In other words, and to sum up what I have said so far, du Gay suggests that bureaucracy offers a mode of conduct that can assure legitimacy and accountability in the handling of conflicting objects of governance.

However, for him, such accountability crucially depends on the singularity and coherence of organizational forms at play.

Bureaucratic critiques and beyond

Post-bureaucratic theorists, however, criticize this very idea that bureaucracies can adequately and legitimately govern liberal societies. Such evaluations have come from a large variety of scholars and disciplines, including but certainly not limited to, studies of new public management (Osborne & Gaebler, 1992) and feminism (Karant & Ferguson, 1986). Management scholars primarily criticize bureaucracy for its inefficiency, while feminist scholars see it as an inherently gendered organizational form. More broadly, critical scholarship sees formal administration as an obstruction or even a threat to the development of equal and or prosperous liberal societies (Boltanski & Chiapello, 2005; Karant & Ferguson, 1986; Osborne & Gaebler, 1992). In this view, the bureaucratic ideals of adherence to procedures and the acceptance of hierarchy are seen as either inefficient, oppressive, or ill adjusted to the demands of an increasingly complex world.

Despite different understandings of what the issues are, a common thread of post-bureaucratic scholarship is that addressing these issues requires novel organizational forms that are "decentralized, loosely coupled, flexible, non-hierarchical, and fluid" (Alvesson & Thompson, 2006, p. 3). Such arrangements are deemed as more adequate for managing, governing, and planning contemporary societies. Implicit here is the assumption that post-bureaucratic organization is a zero-sum game. Those who critique bureaucracy retain the idea that it is indeed accurately defined as a consistent organizational form and should, therefore, be abandoned in full. Organizational scholars, Alvesson and Thompson, for example, argue that bureaucracy "simply no longer works" (Alvesson & Thompson, 2006, p.2) in today's complex societies, thus "causing or requiring the break of bureaucracy" (Alvesson & Thompson, 2006, p. 4). Hence, they equate improving organizations by abandoning 'old' bureaucratic structures.

Such a conception, however, risks overlooking the *complex* co-articulation of different organizational forms. It rejects that bureaucracy can be part of an inherently complex reality, rather than seeking to understand what it means to think and perform bureaucracy in the light of complexity.

I argue that doing so requires appreciating the complex and multiple nature of bureaucracy. As such, I align myself with a growing number of authors from a variety of fields. Organizational scholar, Karen Lee Ashcraft for example, investigates what she refers to as 'hybrid bureaucracies' (Ashcraft, 2001, 2006). That is, organizations which are composed of both bureaucratic and post-bureaucratic forms. More specifically, she studies 'feminist organizations' who are strongly committed to consensual decision making and the abandonment of all types of hierarchy and fixed procedures. Yet, Ashcraft observes that even actors with such strong 'anti-bureaucratic' commitments can never really escape it in full.

> "In feminist organizations, for example, pressure to espouse the "right" feminism can squelch dissent and/or generate hotly charged, and even moralized conflict … Bureaucratic control systems often emerge in response to such conditions…" (Ashcraft, 2001, p. 63)

The critical move that Ashcraft makes is not to see this as a failure of feminist ideals, but rather as the emergence of a hybrid organization, or 'hybrid bureaucracy'.

Anthropologists too have increasingly explored the complexity of bureaucratic organizations in recent years. Mathew Hull, for example, speaks of the "bureaucratic complexity" (Hull, 2012, p. 249) of the statutory planning department of Islamabad, Pakistan. Drawing on an ethnographic study that spanned many years, he shows how the world inside the bureaucracy is just as, if not more, complex than the world outside of it.

Hull's work stands in stark contrast to earlier Anthropological accounts of bureaucratic conduct, such as that of Michael Herzfeld (1992). Herzfeld offers a sharp critique of bureaucracy. He asked, "'how and why can political entities that celebrate the rights of individuals and small groups [i.e., bureaucracies] so often seem cruelly selective in applying those rights?" (Herzfeld, 1992, p. 1). For him, this has everything to do with the fact that bureaucracies treat society as a homogenous entity. He argues that they stimulate acceptance in those who are similar but simultaneously engender a "rejection of those who are different" (Herzfeld, 1992, p. 33). For Herzfeld, this 'production of indifference', as he calls it, is intrinsic to bureaucracy. Be it as it may, his critique of bureaucracy suffers from a symmetry issue.

While Herzfeld criticizes bureaucracy for its indifference to the complexity of social life, his accounts fail to appreciate the complexity of this type of organization itself. More recent anthropological work, however, calls for a move in this direction. Besides Hull, anthropologist Colin Hoag, for example, suggests thinking about bureaucracy as the "assembling of partial perspectives", which can be taken as synonymous to the different modes this chapter explores. Furthermore, where Herzfeld merely offers a general critique of bureaucracy, Hoag explicitly calls upon ethnographers to explore how their work might contribute to "producing knowledge that can build better bureaucracies" (Hoag, 2011, p. 88). And he proposes that researchers can contribute by exploring how to "talk about bureaucracies without reifying their own idealized self-representations" (Hoag, 2011, p. 84). Idealized representations that, as I have just shown, also inform large swaths of social theory. In the next section, I propose a strategy for achieving this.

6.2. COMPLEX BUREAUCRACIES

Moving beyond idealized conceptions of bureaucracy requires appreciating its complexity. This, in turn, requires moving beyond the idea that bureaucracy forms a *singular* coherent structure or mode and towards an appreciation of its *multiplicity*. Put simply, in a complex view, bureaucracy is not only one mode of planning, among others, but rather itself composed out of several different modes[36]. And drawing on ethnographic inquiry and reading of academic literature, I propose the following three: *formality*, *issues*, and *ambiguity*.

Formality

Formality refers to formal structures, procedures, and regulations that define institutionalized planning processes. These are things commonly associated with administration and bureaucracy. They are also the things criticized by post-bureaucratic scholarship. As mentioned, for authors who defend a post-bureaucratic position, formal rules and procedures are part of an 'old' and outdated organizational form. They argue that such procedures are best abandoned and replaced with more fluid organizational forms, as the latter is better suited for handling complex planning problems. Inspired by the work of Karen Lee Ashcraft (2006), I instead contend that insights on complexity ask for an appreciation of how formal procedures participate in complex organizational processes, rather than simply rejecting them. In the next section, I will illustrate this empirically, but I first want to foreground one crucial point.

A complex conception of organizational and bureaucratic structures requires that researchers refrain from making *a priori* assumptions about their forms. STS scholars have long criticized the tendency amongst social scientists to unreflexively place their research subjects in a predefined (micro, meso, macro) structure, and instead asked how people instantiate structures, scales, and hierarchies themselves through forming relationships with other people, institutions, and objects (Bruun Jensen, 2007; Latour & Callon, 1981). This also implies letting go of the assumption that bureaucracies are simply hierarchical. While bureaucratic self-representations often take the form of hierarchical organigrams with a single decision making authority at the top, I will show that in practice, things are more complicated than that.

I will specifically focus on what I suggest referring to as 'positioning devices', that is, tools which planners use to (re)produce formal structures and situate themselves and others within them. As Callon and Law (2004) have argued, a complex conception of space and structure demands from researchers and planning practitioners that they acknowledge that there is "no context in which beings, things, or events naturally arrange themselves. All of which is not to deny that size and position are important, but to treat them as permanent existential questions rather than as fixed coordinates." (Callon & Law, 2004, p. 3)—on this point also see Hillier (2012). The point here is thus that while bureaucratic hierarchies may appear almost like 'fixed coordinates', in practice, they need to be constantly (re)produced and, as I will show in the next section, coordinated with other organizational structures defining the bureaucracy.

Issues

Issues are the complex and problematic objects around which those involved in a planning process gather. The notion of issues has received a large amount of attention from STS scholars in recent years (Asdal, 2015; Barry, 2001; Gomart & Hajer, 2003; Marres, 2007). In this body of work, it captures a concern for the role that objects, such as roads, play in democratic politics. Or, as Marres puts it, for the "articulation of issues, as matters of

[36] fractality

public concern" (Marres, 2007, p. 776). I have no ambition to engage in this debate and leave questions concerning public participation and democratic legitimacy aside.

Why then talk of issues, and not merely of 'objects' or as Asdal suggests of 'non-issues' (Asdal, 2015), to define the things dealt with by those working within Munich's planning bureaucracy? The reason is simple. Speaking of objects would implicitly suggest that things inside the administration have become stabilized and coherent. However, I seek to convey the opposite. I argue that planning problems remain complex even if they are handled primarily within the walls of the bureaucracy. The word *issue* simply better conveys this unruliness of planning problem, then *object* does.

Building on this, section 4 will describe how from 2005 onwards, planners involved in cycling development set up several, what I suggest referring to as, 'issue-oriented meetings'. Those meetings specifically addressed the problematic aspects of promoting cycling, that is, the issues that were unlikely to stabilize.

Ambiguity

Ambiguity refers to situations in which things have more than one meaning or in their uncertainty about a state of affairs. However, while administrative procedures are commonly conceived as an antidote to ambiguity, I argue that such uncertainty needs to be seen as a constitutive part of bureaucracy, and indeed as a mode in itself. Idealist conceptions of bureaucracy suggest that when facing uncertainty, planners should simply adhere to technical standards and procedures, as they may reduce ambiguity in ways that are legitimate and rational (du Gay, 2000).

While it is undeniable that bureaucracies are 'ambiguity-reducing machines' (Best, 2012, p. 79), a complex conception of bureaucracy demands acknowledging that ambiguity can also be generative of bureaucracy. This is not just because uncertain situations may call for the introduction of order and structure, which they certainly do, but also because ambiguity can act as glue to make such structures cohere. In the fifth section of the chapter, I will not only explain how actors strategically produced ambiguity to deal with potential conflict between different modes of transport. I will also show how such ambiguity became inscribed into formal procedures.

I am not the first to note the constitutive role of ambiguity in bureaucracy. Anthropologist Colin Hoag, for example, speaks of "indeterminate bureaucratic knowledges" (Hoag, 2011, p. 85) and he sees attentiveness to such indeterminacy or ambiguity as highly promising for moving beyond idealist (self) representations of bureaucracy:

> "[one] way to answer my question, regarding how to talk about bureaucracies without allowing bureaucratic ideals to predetermine the analysis, is to consider the ways that indeterminate textures bureaucratic knowledge and practice" (Hoag, 2011, p. 85)

Hoag's example of such ambiguity is the experience of waiting that many clients encounter when dealing with bureaucracies. Drawing on an ethnography of the IMF and the World Bank, Jaqueline Best further shows that bureaucratic professionals may also perform 'bureaucratic ambiguity', intentionally and reflexively, to achieve their goals:

> "What we can more easily presume is that ambiguity is likely to be *persistent* within organizations' documents and policy practices—either because of the unintentional effects of applying narrowly defined rules to messier cases, or because of the intentional introduction of ambiguities into policies to allow for flexible interpretations" (Best, 2012, p. 93 italics original)

Best's is a crucial argument, as it suggests that ambiguity may play a positive role within bureaucratic organizations. That ambiguity should be appreciated, especially in the light of complexity, has also been argued by planning theorists in recent years. Innes and Booher, for example, advocate that planners adopt a "mindset that embraces *ambiguity* and change and that allows experts, professionals, and citizens to live with multiple, shifting knowledges and realities and to adapt as needed" (Innes & Booher, 2010, p. 176 italics added). However, as mentioned earlier, for these planning scholars, this entails a break with bureaucracy. In contrast, Best (2012) shows that bureaucracies may indeed sustain and proliferate ambiguities, not just serendipitously but also intentionally as it allows for interpretative flexibility and collaboration across differences. As such, Best invites us to articulate how the planners working in Munich's bureaucracy are already embracing ambiguity. But before coming to this I now first turn to the mode of *formality*.

6.3. FORMALITY, COMPLEXITY, AND THE ROLE OF POSITIONING DEVICES

Look at the organigram below (fig. 29). It represents Munich's transport planning department and can be found lying on desks and hanging on its walls. Because it is an internal document, names and phone numbers have been removed. Still, the overall hierarchical structure should be clear. It is essential to realize that this structure does not simply exist by itself, but needs to be brought into being through everyday activities. Meetings play an important role in this respect. Each of the organizational units depicted on the organigram does not simply exist on paper but also gathers around a table at regular intervals. As mentioned in the previous chapter, some of the teams meet as often as three or four times a week, and the department's senior staff meets once a week.

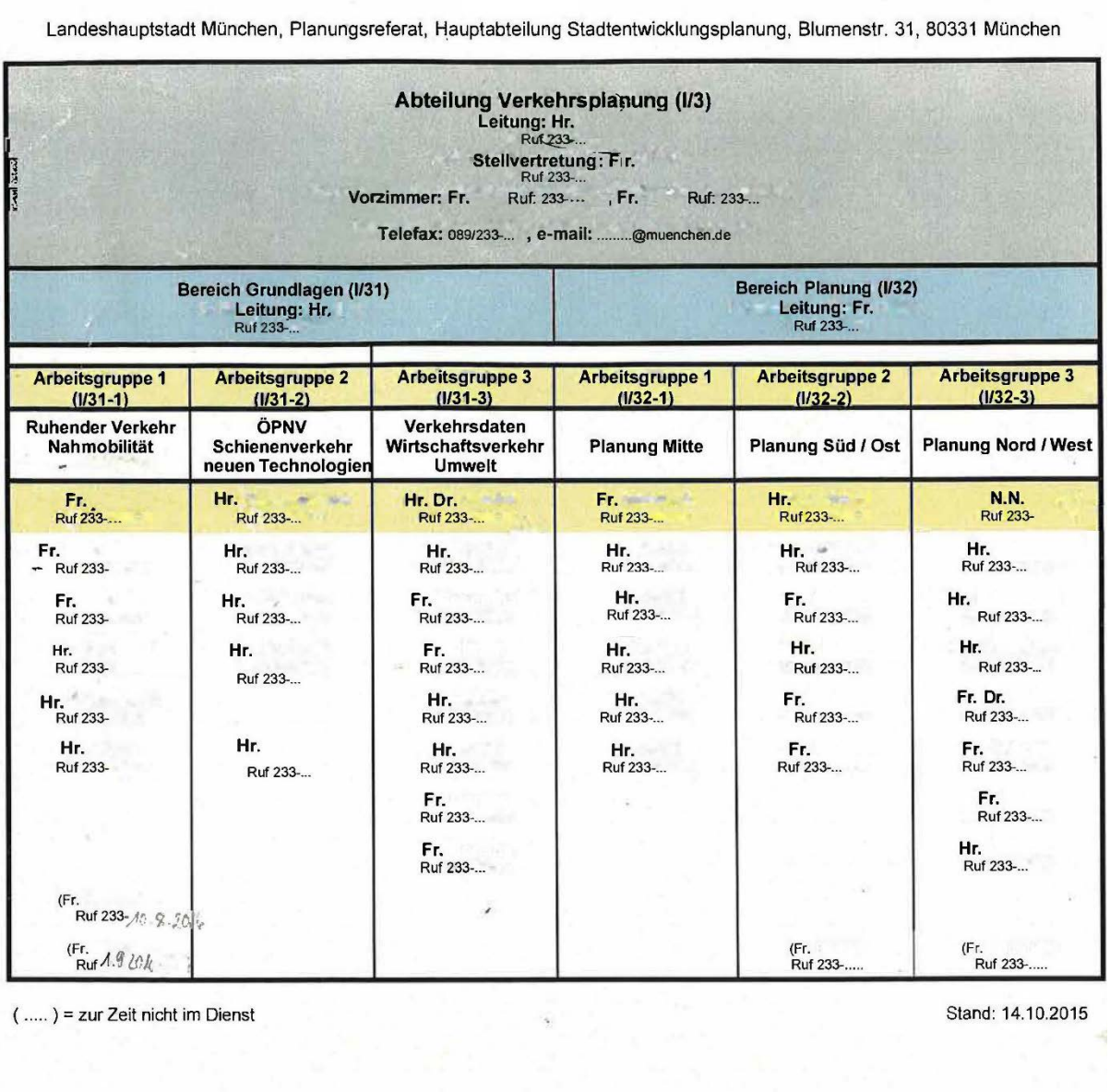
A closer look at the organigram furthermore reveals that all of these units have particular topics assigned to them. As can be seen (fig. 29), the transport planning is grouped into four different hierarchical levels, with the head of the department at the top and the so-called *Sachberbeiters,* or 'clerks', at the bottom. The department is also divided into two sub-departments, both of which are further divided into three different teams. The first of the two sub-departments, 'section foundations (1/31)' is thematically organized, and its three teams are responsible for 1) *Ruhende verkehr and Nahmobilitat* (stationary and local traffic), 2) *ÖPNV, Schienenverkehr, Neuetechnologien* (public transport, rail traffic, new technology), 3) *Verkehrsdaten, wirtschaftsverkehr, Umwelt* (traffic data, economic traffic, environment). The second of the two sub-departments, 'section planning', is geographically organized and its teams (1 to 3) are respectively responsible for 'Center', 'South and East', and 'North and West'. As such, the organigram does not just formalize who deals with whom (teams, sub- and super-ordination) but also who deals with what.

Performing the hierarchy

> "Today is the deadline for the position statement on the Rosenheimer Straße; it's a bit hectic."

This is a quote from Anthon, a transport planner and member of 'team center'. The *Rosenheimer Straße* is a main artery in Munich and was one of 'the lighthouse projects' of the 2009 cycling development plan. It was one of the roads in which a general traffic lane could possibly be given up to make space for cycling, but as such also proved controversial. Anthon was involved in the project for many years and deeply committed to its success. Over the previous weeks, he and his colleagues had formulated a so-called 'position statement' that laid out why they supported the construction of the cycling lane. However, because the *Rosenheimer Straße* is a main artery, the final decision was not up to the administration—for smaller roads it is—but to the city government. The position statement thus needed to pass by the city government, but as Anthon explained, the deadline for submitting the project to the next city council meeting was today. Missing the deadline would delay the project by at least two weeks—the interval at which Munich's city council discusses planning matters.

Be that as it may, to get the position statement into the city council, Anthon needed to follow specific procedures. As a *Sachbearbeiter* (clerk) Anthon was the lowest in the department's hierarchy, and for the document to make it to the top, the document had to go, in his words, "through the whole hierarchy". Anthon needed to collect the signatures of all his superiors, five in total. Doing this the standard way, through the internal mail system, would take 3 to 4 days. Therefore, Anthon deviated from the formal way of doing things by carrying the position statement around by himself.



Landeshauptstadt München, Planungsreferat, Hauptabteilung Stadtentwicklungsplanung, Blumenstr. 31, 80331 München

Abteilung Verkehrsplanung (I/3)
Leitung: Hr.
Ruf 233-...
Stellvertretung: Fr.
Ruf 233-...
Vorzimmer: Fr. Ruf: 233-... , **Fr.** Ruf: 233-...
Telefax: 089/233-... , **e-mail:** .....@muenchen.de

Bereich Grundlagen (I/31) **Leitung: Hr.** Ruf 233-...			**Bereich Planung (I/32)** **Leitung: Fr.** Ruf 233-...		
Arbeitsgruppe 1 (I/31-1)	**Arbeitsgruppe 2 (I/31-2)**	**Arbeitsgruppe 3 (I/31-3)**	**Arbeitsgruppe 1 (I/32-1)**	**Arbeitsgruppe 2 (I/32-2)**	**Arbeitsgruppe 3 (I/32-3)**
Ruhender Verkehr Nahmobilität	**ÖPNV Schienenverkehr neuen Technologien**	**Verkehrsdaten Wirtschaftsverkehr Umwelt**	**Planung Mitte**	**Planung Süd / Ost**	**Planung Nord / West**
Fr. Ruf 233-...	**Hr.** Ruf 233-...	**Hr. Dr.** Ruf 233-...	**Fr.** Ruf 233-...	**Hr.** Ruf 233-...	**N.N.** Ruf 233-
Fr. Ruf 233-	**Hr.** Ruf 233-...	**Hr.** Ruf 233-...	**Hr.** Ruf 233-...	**Hr.** Ruf 233-...	**Hr.** Ruf 233-...
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Hr. Ruf 233-		**Hr.** Ruf 233-...	**Hr.** Ruf 233-...	**Fr.** Ruf 233-...	**Fr. Dr.** Ruf 233-...
	Hr. Ruf 233-...	**Hr.** Ruf 233-...		**Fr.** Ruf 233-...	**Fr.** Ruf 233-...
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(Fr. Ruf 233-... 18.8.-30.9.					
(Fr. Ruf 1.9.-30.9.				(Fr. Ruf 233-.....	(Fr. Ruf 233-.....

(.....) = zur Zeit nicht im Dienst

Stand: 14.10.2015

Figure 29 – Organigram of Munich's transport planning department (names and phone numbers removed)

Over the day, Anthon carried a so-called 'Rote Mappe' or red folder from one office to the next. Bureaucratic files, or '*Rote Mappe',* are important mundane devices in the performance of bureaucracy. They contain many of the documents relevant to a project, which not only keeps things organized but also allows those who have to put their signatures on legally binding documents to effortlessly recollect the plan they have in front of them—an issue I come back to in a moment. In any case, it allowed Anthon to keep things organized as he moved the stack of papers representing the project 'up the hierarchy'. Over a few hours, Anthon collected the signatures of all his superiors, until, he made it to the office of the department's head, Ms. Müller[37].

Formal, hierarchical, and centralized authority has important benefits in complex planning processes, as procedures and responsibilities are clear to everyone involved. Indeed it was precisely because there was such a clear structure that Anthon could speed up the planning process. He knew exactly where to go, whom to go to first, whom to go to second, and where the document needed to end up at the end of the day. Namely, on the desk of Ms. Müller. Moreover, his superiors also knew what was expected from them, and all signed within less than an hour. Such coordination would be unthinkable if the organizational structure needed to be negotiated at every step of the process.

That said, centralized authority also has notable downsides, as became clear when Anthon and I reached the office of his boss by the end of the day. After crossing the street to Ms. Müller's building, and taking the elevator to the 6th floor of the so-called *Hochhaus*—famous for being Munich's first 'high rise' building—Anthon learned that she was not there. Her secretary explained that Ms. Müller was attending a meeting and would have no time for signing documents today. As we left the room, Anthon pointed at a large stack of more than 20 red folders just like the one he just handed over. He explained, how all these folders, and thus the projects they embodied, were waiting for a signature before they could move on. In centralized organizations, much comes to depend on specific individuals and the amount of work they can handle. Being required to attend meetings and manage dozens of red folders can often be too much.

However, such issues are mitigated in several ways. First, the different members of the city government, such as the head of the bureaucracy, do not always meet all at once. Rather, there are several commissions who each deal with different thematically areas, and planning & construction is one of them. Those commissions seek to assure that agreement between parties is reached before things enter the city council.

Second, and most importantly, many individual decisions on planning projects never need to pass the city government. Once a (master) plan, such as the 2009 cycling development plan[38], has passed the city council, the administration becomes responsible for its implementation. With that, a meeting of departmental representatives then becomes the highest body of authority responsible. This body does *not*, however, take the lead in coordinating individual planning projects. Rather, often one (sub)department and a specific group within it are ascribed this role. Such a group is then *Federführend* (literally: 'the one holding the feather'), it has to lead a project's progression and holds the *Rote Mappe* that embodies it. Besides centralization, there is thus also decentralization of authority.

Complex bureaucracies, and how to position oneself within them

There is thus not one centralized authority coordinating planning process in Munich, but instead several. Besides the city government, these may be the heads of, or groups within, a department that is *Federführend.* Or, it may be a previous government whose 'will' is still being articulated through procedures and master plans. Master plans often have a life span of 10 years or more. City governments, by contrast, never last that long, and this

[37] This is a fictitious name.

[38] Landeshauptstadt München (2009)

may create issues when it comes to the coordination of planning activities. During my fieldwork in 2015, the most current cycling development plan was still the one from 2009. That plan had however been issued by a 'red' / 'green'[39] government, but since then the government had changed to a coalition of 'red' and 'black' (Tz, 2014). As a result, a plan being implemented 'in the name of the city government' may come into conflict with the desires of the current government.

Planners thus find themselves in a complex organizational context with multiple and shifting centers of authority. While the organigrams (fig. 29) represent many of the elements composing this, it omits that, throughout a planning process, organizational units and even individuals might change in composition and importance (Bruun Jensen, 2007; Latour & Callon, 1981). I argue that in such a complex organizational context, planners are constantly confronted with the need to *position themselves* and the projects they are working on. They need to know where projects have been, where they are, and where they can and should go next.

To this end, planners in Munich use several mundane tools or, what I suggest referring to as, 'positioning devices'. Such positioning devices do two things. They enact a *project specific version* of the organizational structure and allow actors to situate themselves and others within it. In this way, they allow planners to know where projects have been, where they are, and where they can and should go next. I will now discuss two of such positioning devices, namely: so-called *Laufzettels* & stamps.

First, *Laufzettels* are sheets of paper on the front of every *Rote Mappe*, such as the one depicted below (fig. 30). This red folder is similar to the one Anton was carrying, the only difference being that this one contains an internship agreement[40] between 'the regional capital of Munich' and myself. Nevertheless, let us focus on the *Laufzettel*. It does not just offer the reader information on what is inside the folder, an internship agreement, but also who has drafted the document (Mr. X[41]) and to whom it went next (Mr. Reiß-Schmid). Note how before his name it reads "I an HA1" which means: 'first: to main department one', and below that: 'II WV.I/01' which refers to the legal and administrative department that drafted the document. These abbreviations map onto the organizational organigram, and as such enact a specific version of the organizational structure. They also instruct the reader where the paper has been and where it needs to go next. In this case, the signature next to 'Mr. Reiß-Schmid's name signifies that he has meanwhile seen the folder, and thus that the document has been to the organizational level he represents. Initially, the document's author had prescribed to return the document back to his department 'II WV.I/01', but apparently, someone had changed the document's course after it was printed. Mr. Reiß-Schmid perhaps? The document had been diverted to Ms. Y[42] in order to first obtain a signature from me, and I took this photograph when I brought the folder to Mr. X's office again. A *Laufzettel* like this one thus enacts a version of the organizational structure and also allows the reader to determine where the folder, has been, is, or needs to go next.

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[39] I use colours instead of party names here, for the sake of readability, and because what matters here are not the party names, but the fact that governments change regularly.

[40] For the bureaucracy I became an 'intern' as it had no other way to categorize ethnographers.

[41] I have removed his name to protect his privacy.

[42] Name removed to protect privacy.

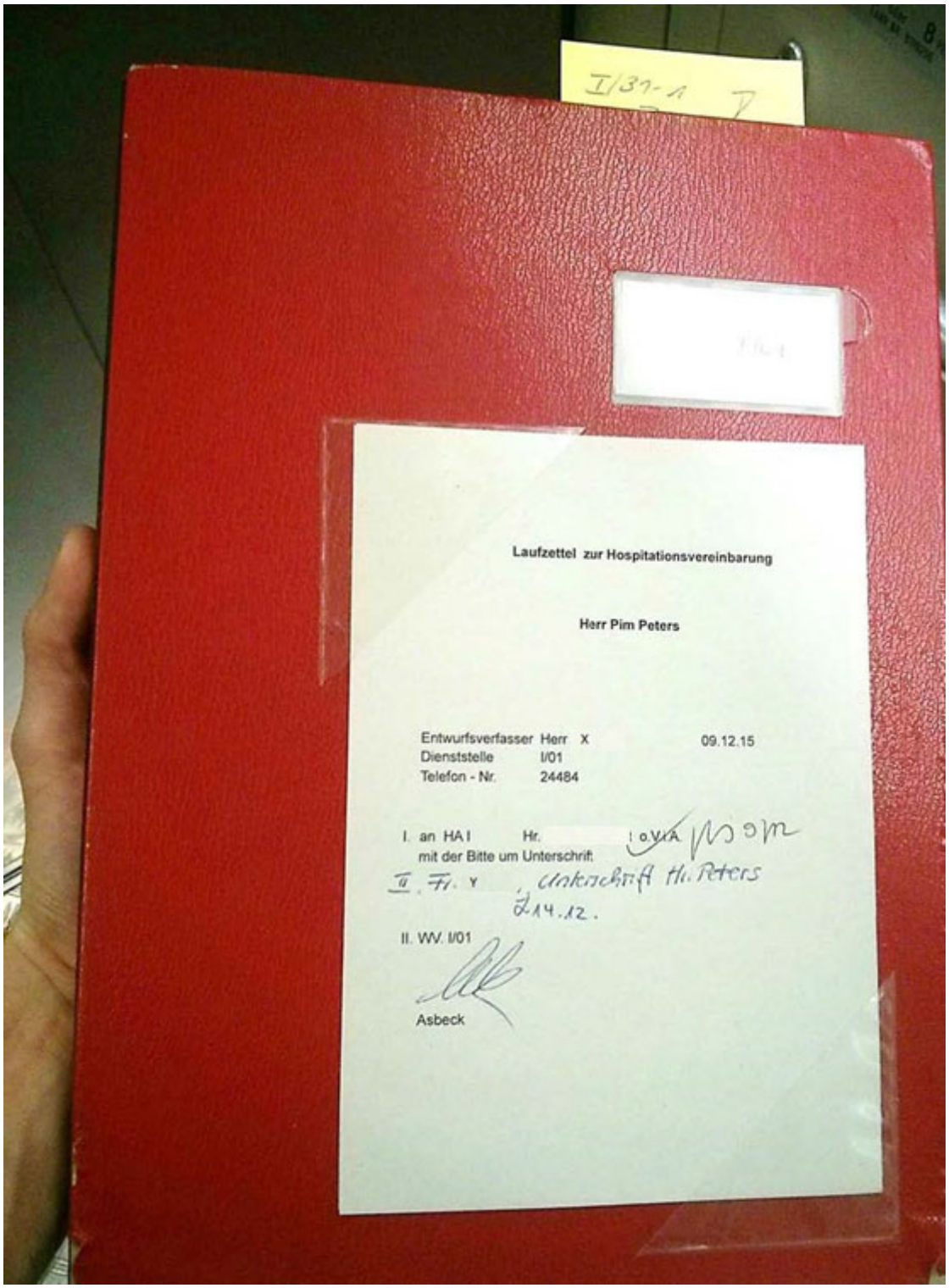

Figure 30 – Red folder with 'Laufzettel' *(names replaced with letters 'X' and 'Y')*

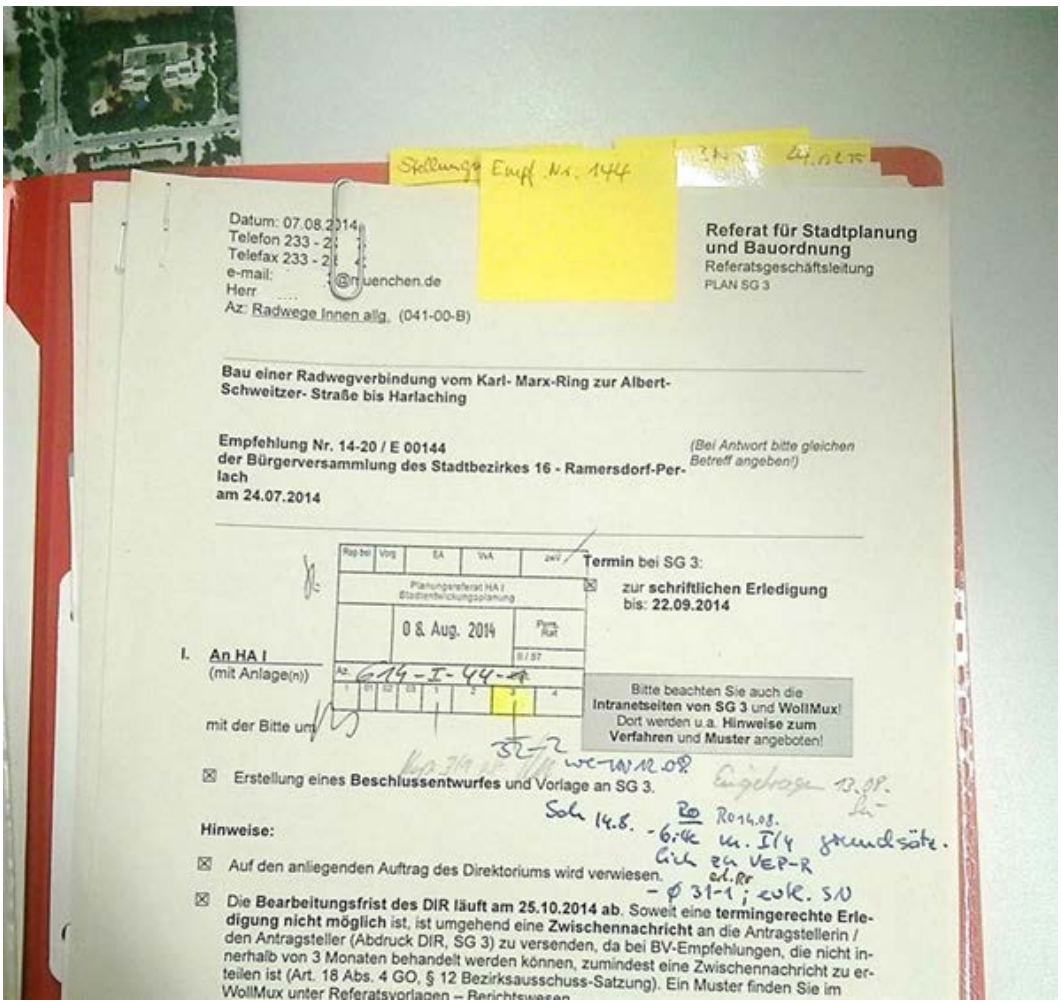

Figure 31 – Document inside red folder (name and email address removed)

Opening the folder reveals more mundane material tools, such as paperclips, staples, and yellow post-its, supporting planners in organizing their everyday activities. Furthermore, names, telephone numbers, email addresses, and dates offer the reader concrete handholds for situating themselves and the document within a wider complex reality. Exciting stories can be told about each of those elements, but here I will focus on the stamp in the middle of the page, as it is specific to Munich's bureaucracy.

These stamps are put onto every document handled or produced by the bureaucracy, enacting a project specific version of the organizational structure and enabling actors to (re)construct a project's trajectory within it. Several elements of this stamp can be mapped onto the organigrams discussed earlier. Above the date 'August 8, 2014' it, for example, reads: "*Plangungsreferat HA1 Stadentwickelungsplanung*" or in English: 'Planning department, HA (main department) 1 urban development planning'. This is the main department of which the transport planning department is a subordinate. The four boxes at the bottom right numbered '1' to '4' refer to the different sub-departments of HA1. These components thus correspond to elements of the organigram.

Depending on whether such boxes are ticked or left open, planners can determine where folders, and the projects they embody, have been, where they are, and where they may need to go next. Note for example how both number one and three are ticked here. This marks that both these sub-departments have received a copy

of the document. Number 1 refers to the department for 'Law, Administration, and Regional Matters[43]' and number 3 refers to the department for transport planning. It was pointed out to me that number 3 is not just ticked but 'crossed', like so: ✝ . This tiny horizontal line of ink marks an important difference. It implies that department number three is *Federführend*, meaning that it has the responsibility and that its copy of the document is the official version whereas the copy sent to department 1 (Law, Administration, etc.) is precisely that, a copy.

The scribbles below the stamp offer even more information. Consider those on the right, written in ink. The first scribble reads '32-2'. The first '3' here stands for the transport planning department, and the first '2' for its second sub-department '*Bereich Planung'*. The final '2' signifies the second team of this sub-department. In this case, the folder was thus assigned to the team 'South / East'. If this is confusing, I suggest looking at the organigram above once more. The number 32-2 also appears there.

Below '32-2', one can read several scribbles with dates behind them; they read as follows:

- Wew 12.08
- Sch 14.08
- Ro 14.08

These are the abbreviated names of those who have seen the document, with their respective dates. The last person is a so-called '*Sachbearbeiter*', situated at the bottom of the hierarchy. The scribbles below his or her name signify a request for other departments to get involved.

The use of folders, stamps, and scribbles makes clear that planners do not work in a simple and straightforward environment. By contrast, a great deal of work is put into re-producing formal ways of ordering things time and time again. There is, however, not one clear, stable, and centralized organizational structure in which employees, objects, and projects all have their place. By contrast, there are at least as many formal structures as there are projects, making the bureaucracy into a complex space in which planners are constantly confronted with the need to position themselves in relation to other people, objects, and institutions.

[43] In German: "Recht, Verwaltung, Regionales"

6.4. MODE 2: ISSUE-ORIENTED BUREAUCRACY

Acknowledging that formal bureaucratic procedures are not, as often thought, the final coherent structure against which planners (may) orient their actions, may feel unsettling at first. It dissolves the certainty of a stable ground. However, it also opens up a possibility to appreciate the complexity and multiplicity of bureaucracy. If *formal* procedures are not the fundamental structures they are sometimes thought to be, then it is possible to appreciate that planning is buttressed by other modes of organizing as well. I propose that Munich's transport planning department is *also* organized around specific *issues*. In other words, I suggest that besides formal and hierarchical, the planning department is also an issue-oriented bureaucracy. Even stronger, I will show that such issues play a vital role in reconfiguring formal procedures, and vice versa.

While cycling promotion has been an important issue in Munich since the 1980s, as described in chapter 3, it received specific public attention in 2007 when the city of Munich co-organized the Velo-city conference. Velo-city is a major cycling conference hosted annually in cities around the world and in 2007 it brought about 1000 cycling enthusiasts to Munich for four days and attracted significant attention from the local press—for an overview of media coverage see Kaulen (2007). That the conference came to Munich is mainly due to the lobbying efforts of deputy mayor Hep Monatzeder, also known as 'the cycling mayor'[44]. In January 2005, Monatzeder and Munich's mayor, Christian Ude (SPD), for instance accompanied conference director Oliver Hatch on a cycling tour through the city (Hutter, 2005).

What interests me about the conference is the impact it had on the administration, specifically, its organizational structures. During my fieldwork, I interviewed Anna, a planner and group leader, who had been directly involved in organizing the conference. In her view, the Velo-city conference had been one of the most important events in Munich's recent cycling history, as after the conference "everyone thought [increasing cycling levels] was possible". The symposium thus played an important motivational role. However, I want to focus on how the event challenged existing formal structures and inspired the installment of several interdepartmental 'issue-oriented meetings'.

During our interview, Anna explained how the conference had posed a new type of problem, which was hard to address through existing organizational forms. Regular planning projects, she explained, have somewhat flexible deadlines. Due to their political nature and lengthy formal procedures, it is always possible that things are postponed. However, delaying the conference beyond its starting date was not possible. The Velo-city conference *had* to start on the 12th of June 2007.

Meeting this deadline was particularly challenging as, at the time, there was little interdepartmental collaboration on cycling. Cycling planning had been handled through lengthy formal procedures, ill-suited for dealing with the new challenge that the conference posed. To deal with this, Anna explained how she and her colleagues had set up a new cross-departmental meeting that specifically dealt with the organization of the Velo-city cycling conference.

After the conference, Anna got involved in the writing of the 2009 cycling development plan, and specifically in drafting its "project structure" (fig. 32). Inspired by the meeting set up for the Velo-city conference, she proposed several interdepartmental *Arbeitsgruppe* or 'working groups' that would deal with different issues connected to the implementation of cycling. To emphasize, those working groups had not existed before, Anna and her colleagues introduced them through the 2009 cycling development plan.

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[44] Hep Montatzeder is widely credited for his contributions to the development of cycling in Munich. In 2013, he won the 'Leadership Award for Cycling Promotion' (Tz, 2013).

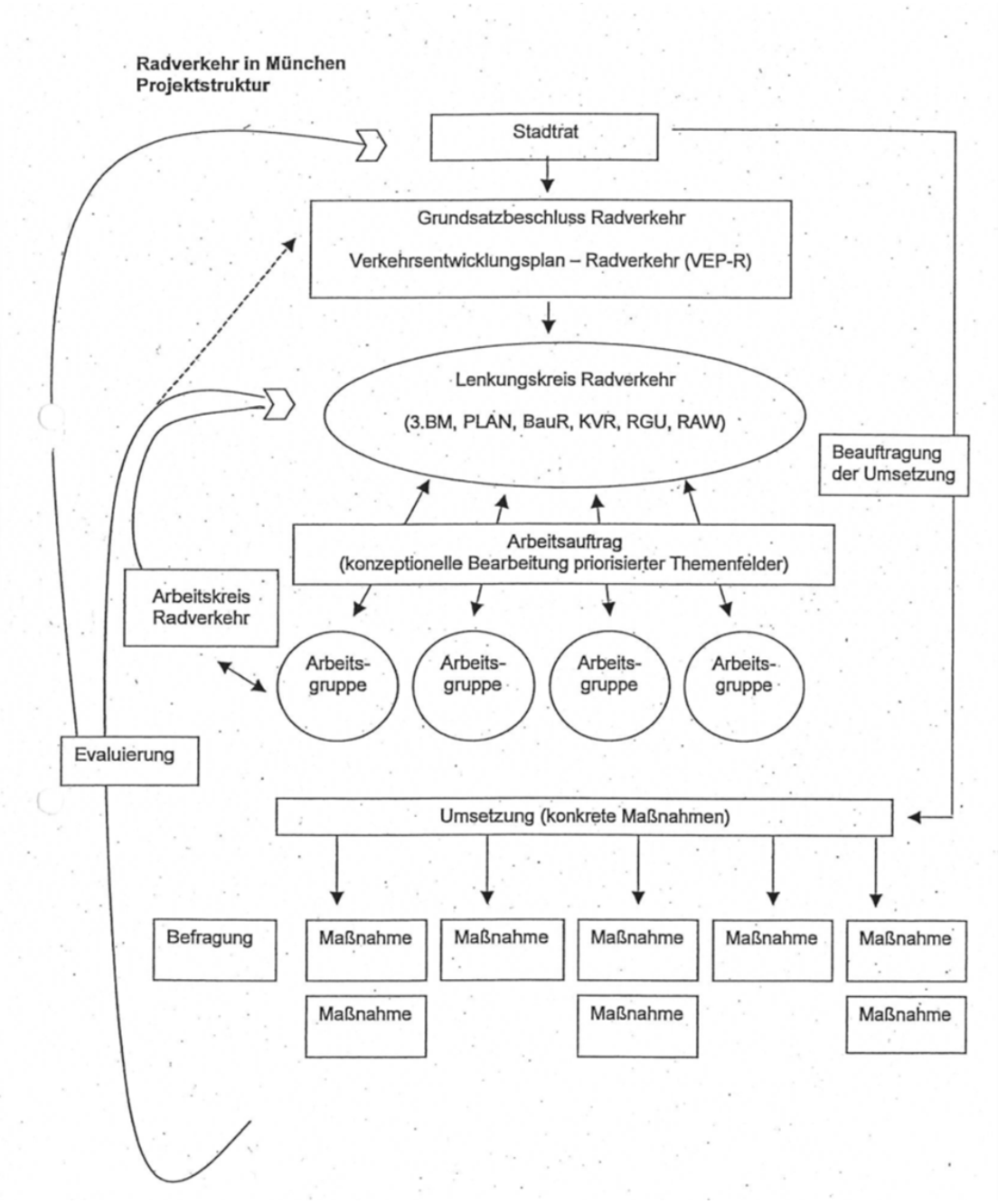

Figure 32 – Organigram representing the 'project structure' of the 2009 cycling development plan. Source: Landeshauptstadt München (2017)

The four circles at the center of the organigram represent these *Arbeitsgruppe,* or working groups, but in reality, the plan introduced six of them, namely:

- Road-based parking facilities;
- Opening of one-way streets and realization of cycling streets;
- Optimization of bike+ride facilities;
- Complicated junctions;
- Bottlenecks and network gaps;
- Marketing;

The establishment of these issue-oriented working groups expresses aspects of post-bureaucratic forms of governance. Those meetings differed from the silo mentality that had defined cycling planning in Munich until then. As mentioned, they were indeed precisely set up with this goal in mind. Most important in this respect is that the meetings are attended by representatives from 3 to 5 different departments, working at the lowest hierarchical levels. As can be seen below, the working group 'bottlenecks and network gaps' for example, gathers representatives of three; and the working group 'marketing' of five different departments. Both decentralization and flat decision-making structures are key characteristics of post-bureaucratic organization forms. Moreover, the reconfiguration process is fluid to a certain degree. Anna and her colleagues did not rigidly draw on existing procedures to approach the planning of cycling but rather invented new structures tailored to the specific issues linked to cycling, such as the construction of parking facilities, opening one-way-streets, and dealing with bottlenecks and network gaps.

However, the very formalization of those procedures makes clear that this new organizational form does not fully break with formal bureaucracy. Furthermore, as can be seen in figure five above, for each issue-oriented meeting, there is still one department: *Federführend*—a term I explained earlier. Ultimately, one department is responsible. In this way, the issues are linked to existing formal structures and vice versa.

In practice, this has concrete effects, as issues and formalities define what is being discussed in a meeting and by whom. During the course of the ethnography conducted for this study, I attended three meetings hosted under the banner of the 'working group bottlenecks and network gaps[45]'—one of the six issue-oriented meetings set up in 2009. As figure 6 (above) makes clear, meetings of the working group bottlenecks are *formally* attended by internal actors only. More specifically, they are attended by representatives of three different departments: the department for urban development (of which transport planning is a sub-department), the KVR, and the construction department. The first two meetings in which I participated were indeed attended by people working for one of those organizational units.

[45] Network gaps here refers to gaps in the 'cycling networks', and bottleneck to sites were closing such gaps conflicts with other transport networks, such as the road or public transport network.

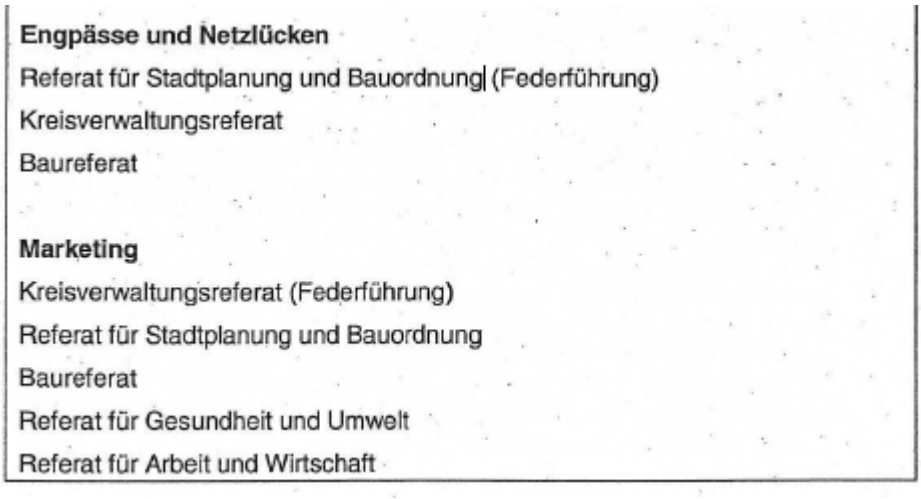

Figure 33 – Excerpt from 2009 cycling development plan *(Landeshauptstadt München, 2009)*

However, in late 2015, I attended a meeting hosted under the banner of this working group that was also attended by representatives from industry and cycling lobby groups. From inside the administration, there were representatives of the traffic planning department, the regulatory department (KVR), the public transport organization (MVG), and the department for environment and health. From outside there were two representatives of cycling lobby group ADFC, the *Planungsverband Äußererwirtschaftsraum München*[46] (PV), someone from the chamber of commerce, two people from Siemens and one from BMW—companies that both have their headquarters in Munich.

The presence of these external parties implied a deviation of formal procedures, which as mentioned prescribe that those meetings are attended by people working for the administration only. This again shows that planners do not simply follow formal procedures, not even those they set up themselves. Instead of seeing such deviations as a failure of legitimacy, as idealistic conceptions of bureaucracy would suggest, I think it is important to ask why those deviations were made and why those specific actors were present that day.

Articulating the issue

The meeting's invitation email explicitly defined the gathering in two different ways. On the one hand, it presented the meeting as a "special session of the working group bottlenecks and network gaps". However, it also named it as "kick-off meeting project cycling highway Munich North". In short, according to the planners' own definition, cycling highways are four-meter wide cycling lanes that prioritize cyclists over other modes to offer them fast and direct connections over longer distances. I will come back to the definition of cycling highways in a moment, as I first want to note that although the meeting was hosted under the banner of the working group bottlenecks, the formal definition of this working group had little overlap with the actual meeting that day.

The meeting thus deviated from formal procedures. It did not deal with a specific gap or bottleneck in the existing cycling network, but instead implicitly proposed a completely new type of network. Furthermore, it did

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not just gather people from 'inside', but also from 'outside' the city administration, which again demonstrates that bureaucratic practices are more dynamic than formal representations might suggest.

That the meeting dealt with a different issue and was attended by not only internal but also external actors, had, I argue, everything to do with the work done by those external parties. In the preceding years, the PV, ADFC, and BMW had all put substantial effort into getting the cycling highway onto Munich's planning agenda. Already in June 2013, the PV—a network organization acting on behalf of communities in the Munich region—had organized a series of events in which it presented the cycling highway as a way to improve the connection between the city of Munich and the surrounding municipalities. Afterward, the PV had been commissioned to produce a feasibility study for the cycling highway, which it finished in early 2015 (Planungs verband Äußerer Wirtschaftsraum München, 2015).

What's more, it might be somewhat of a surprise that one of the world's biggest car manufacturers, BMW, also supported the construction of a cycling highway in the city. Having its headquarters and an actual car production facility located only a few kilometers outside of the city center, the company, however, had a keen interest in mobility issues in the area. It hoped the infrastructure would improve the mobility of employees while simultaneously reducing the pressure in the road network, heavily used by trucks supplying the factory. Following from ambitions to expand those facilities, the car producer commissioned Zurich based planning consultant Ernst Basler + Partner AG to explore the effects on the mobility situation in the area. In their report, published in May 2014, the consultants explicitly argued in favor of the construction of a cycling highway. Consider the following quote:

> "There will only be appreciable increases [in cycling levels] when also in the cycle network highways are offered [that] complement but not replace the offer of cycle paths along the road. " (Ernst Basler + Partner AG, 2014, p. 17).

To be sure, the report mentioned many other possible infrastructural interventions to maintain and improve the mobility situation in the factory's area. However, even if BMW's interest in the development of the cycling highway was primarily driven by its interest to get its employees to and from its plants, other actors seeking to realize the next generation of cycling infrastructure did welcome their support.

In February 2014, cycling lobby group ADFC (2014) also published a cycling highway report, and explicitly articulated its own interest as being aligned with those of BMW. This is, for example, evident in the visualization below (fig. 34). As can be seen, the map does not just propose a specific route for the cycling highway but also highlights the actors that the infrastructure might benefit. These are local inhabitants, the technical university (and its students), a hospital and indeed BMW.

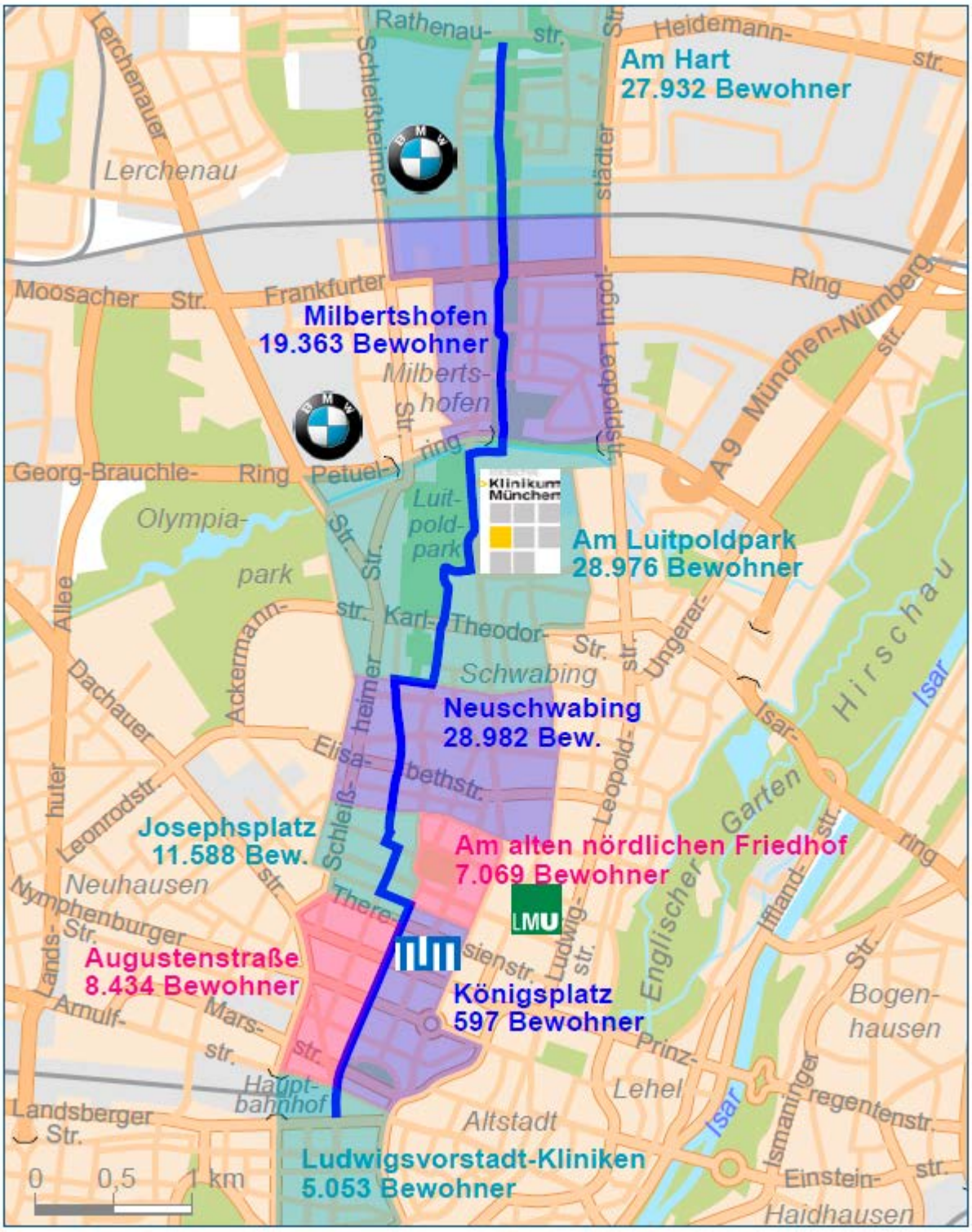

Figure 34 – Map of cycling highway route proposed by ADFC Munich. Source: ADFC (2014)

These three different actors thus all gathered around the issue of mobility, and collectively articulated the cycling highway as a feasible and desirable infrastructure for addressing it. They did this by stressing how such infrastructures were not just in their own interest but also in the interest of the other parties involved, and in the public interest more broadly.

Such a gathering of non-state actors around a specific common concern, mobility in this case, may appear to be a clear example of a post-bureaucratic approach to planning. In the story I have told so far, the actors did not gather based on formal procedures or an overarching plan, but collectively explored the issues by which they were all affected, and propose infrastructural interventions for addressing them. In line with the definition of post-bureaucratic forms of governance (Alvesson & Thompson, 2006), their mutual engagements may seem to have been decentralized, loosely coupled, and non-hierarchical. In other words, formal bureaucratic procedures did not seem to play a role.

However, as one might expect, the local state did get involved in the process. On the 22nd of October 2014, the city council passed a new '*traffic concept Munich North*'. The report stated that the development of the city's population and the number of jobs needed to be "accompanied by adequate development of transport services across all modes of transport." (Landeshauptstadt München, 2014, p. 8). One of the measures proposed was indeed, the construction of a cycling highway.

Now, one could see the city authority's involvement as a failure of what had so far been a complex and post-bureaucratic planning process. However, I think this is a tendency to be resisted, and instead argue that it was a successful attempt at shaping planning in Munich by those interested in the cycling highway's development. The cycling highway indeed only entered official policy *after* BMW and the ADFC had published their reports. Only the plan's final version suggested a cycling highway as a means for addressing mobility issues in Munich North (Landeshauptstadt München, 2014, p. 43). Two earlier draft versions did not include this idea. By contrast, the plan's first draft only prescribed further expansion of the city's cycling infrastructure network (Landeshauptstadt München, 2011b) and the second draft did not mention cycling infrastructure at all (Landeshauptstadt München, 2012). To emphasize, the cycling highway thus only entered official policy after the PV, BMW and the ADFC had become involved.

Now, to briefly reflect on what I have said so far. I think it is essential to consider what exactly was achieved. It is sometimes thought that once planning objects are handled by formal procedures and supported by local government, complexity is reduced. One could think that with the publication of the *Traffic Concept Munich North*, the city government now unambiguously supported the development of the infrastructure. However, in the next section, I will show that, even for those directly involved, this was far from clear. What was achieved, in the case of the cycling highway, was the articulation of this infrastructure through two different modes of planning or bureaucracy.

First, the actors collectively established it as an *issue* that they all were interested in, and most importantly also shaped the issues being dealt with by Munich's planning bureaucracy. They succeeded in enrolling the local authorities into the collective gathered around the issue of developing a cycling highway. Second, achieving this also necessitated performing the necessary formal procedures to shape the transport plan for the area. Now, while it is tempting to see this as a clear expression of intent by an actor who has an *overview* of the city as a whole, in the next section, I will show that this was not the case. How even though the plan acts as a spokesperson for the city government, and as such the city as a whole, in practice it does not offer planners such a view. By contrast, even after its publication, the status of the cycling highway remained complex and ambiguous.

6.5. BUREAUCRATIC AMBIGUITY – OR WHAT DOES 'THE CITY' ACTUALLY WANT?

I now return to the cycling highway kick-off meeting, which as I mentioned earlier, was attended by representatives from the city administration and various other organizations, including the PV, ADFC, and BMW. At the start of the meeting Max, a young planner who led the meeting, reminded the others why they met. That is, what justified the fact that they all gathered to work on the development of Munich's first cycling highway. The key in this respect was that the city government had recently passed the '*traffic concept Munich North'*. This, Max argued, was a "concrete political order" and "an expression of intent". It was, according to Max, as if the city council said, "Yes we [the city council] want a quick cycling highway".

However, the plan offered a somewhat limited definition of this infrastructure:

> "Cycling highways are a new network element in traffic planning for distances up to 20 km. The target group is the everyday traffic with a focus on routes to work and school and, due to the higher speed, the rapidly growing group of e-bike users. Following ERA 2010[47], the target speed on the cycle highways is 15-25 km/h in the city, or 20-30 km/h in the case of regional or interregional cycling links." (Landeshauptstadt München, 2014, p. 43)

Much of the meeting was indeed devoted to articulating and further exploring what a cycling highway could look like. To do so Max had prepared a PowerPoint, which he started by rhetorically asking:

> "What actually *is* a cycling highway?"

Max had apparently anticipated that, at least to some of the meeting's participants, the concept of a cycling highway was still *ambiguous*.

To reduce this ambiguity, Max drew on technical standards. Reading from his slides, he explained what a cycling highway is:

> "according to the FGSV [cycling highways] are connections in the cycling network of a municipality or a city-countryside-region, which connects important areas with high potentials over long distances and allow continuous, secure, and attractive travelling at high speeds [and allow cyclists to travel at minimum speed of] "20km/h inside and 30km/h outside built-up areas [which required] prioritization at junctions"

As Max explained, he took this definition from the FGSV, which stands for *Forschungsgesellschaft für Straßen- und Verkehrswesen* or 'research organization for roads and transportation'. The FGSV publishes technical standards and working papers on transport planning and infrastructure design.

FGSV standards form an instantiation of the *formal* mode of bureaucracy. Max and his colleagues indeed explained to me that although FGSV standards are not legally binding, deviating from them needs to be justified.

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[47] This definition directly drew on the 'ERA 2010'. ERA stands for *Empfehlungen für Radverkehrsanlagen* or 'recommendations for cycling facilities', and is published by the FGSV, the *Forschungsgesellschaft für Straßen- und Verkehrswesen* or 'research organization for roads and transportation'.

As such, they are thus the de-facto national standards that prescribe how to design a road or in the current case, a cycling highway.

Such standards are sometimes associated with the neutrality ascribed to science. On its website, the FGSV indeed defines itself, as a "techno-scientific association" whose main task it is to facilitate 'knowledge transfer' on transport planning and infrastructure design within. It thus implicitly grounds itself and its standards in scientific objectivism. As I have extensively discussed the problems surrounding this epistemological framework in chapter 2 and 4, I will not discuss those issues in detail here. However, it is important to realize that such standards do not offer a 'neutral' point of view. By contrast, cycling highway standards support planners in realizing particular, politically motivated, and value-laden goals. The construction of a cycling highway in this case.

As we just saw, Max, for example, used the standards to give a clearly articulated definition of a cycling highway. Besides carefully crafted sentences, the FGSV working paper also provided Max with visualizations that he used in his PowerPoint (see fig. 35).

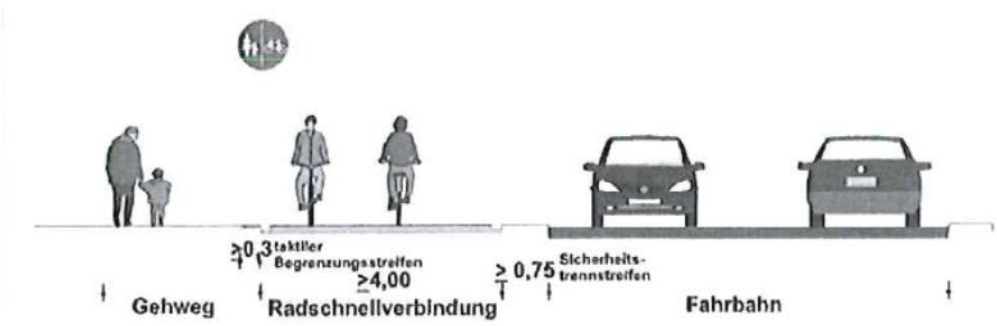

Figure 35 – Cross-section of a cycling highway. Source: FGSV (2014)

As can be seen, cycling highways are at least 4 meters wide. Such images are aligned with the definition that Max provided earlier, and the broader idea that cycling highways should offer "continuous, secure, and attractive traveling at high speeds" over "long-distance" (FGSV, 2014).

Standardized text and images thus helped Max to articulate a coherent story of 'what a cycling highway actually is'. This, I argue, can be understood as the articulation of this infrastructure through different modes. Max used *formalized* standards (mode 1) to articulate the *issue* (mode 2) he and the others were dealing with. More specifically, it allowed him to reduce the ambiguity of what a cycling highway actually *is*.

This neatly aligns with the idea that bureaucracies are 'ambiguity-reducing machines' (Best, 2012, p. 79). However, inspired by Best (2012), I now show that the meeting also achieved the opposite. It also engendered ambiguity. As Max finished his presentation and opened the floor to questions, the status of cycling highways and specifically the degree of support from the city government, which Max had taken as given at the start of the meeting, were immediately called into question.

A multi-headed government

As mentioned, the FGSV standards on which Max drew, define cycling highways as infrastructures that at junctions prioritize cyclists over other modes of traffic. Something that is necessary to increase the average speed of cyclists. However, one of the meeting participants questioned is was really, what the city council

wanted. He asked, "is the city [of Munich] actually willing to impede [the flow of] public transport and motorized vehicles, to the benefit of the bike?"

Another participant reminded the others, "public transport is the backbone of the transport system [in Munich]". In other words, he implicitly stated that public transport was to be prioritized over cycling. Important to note here is that this is not an individual opinion, but rather the articulation of a common trope shaping transport planning in Munich. It not only heard in meetings but also nd in official policy documents. Munich's 1983 urban development plan for example already defines "public transport as the backbone of Munich's traffic system" (Landeshauptstadt München, 1983, p. 29) an ideal that shapes transport planning in Munich up until today.

The representative of the public transport organization added that the public transport system was already operating at the limits of its capacity. Max laughed and said that "right now the political mood on cycling highways is very positive, but when things would get more concrete the discussion moves into a different phase…" hinting on the fact that *then* 'the city's will' could turn out differently.

Eloquently capturing the situation in which they found themselves, another participant pointed out that in the last months the city council had passed a variety of plans that all seemed to contradict each other in one way or another. Leaving him wondering: "what the city council actually wants?"

The city council no longer seemed to speak with a single voice here was no longer *one* head on top of the bureaucratic hierarchy, but at least two. One was supporting the construction of a cycling highway, now defined as an infrastructure that prioritized cyclists over other modes, and the other one was supporting public transport as 'the backbone of the transport network'. Whether or not these two demands could be united was however questionable, or at least ambiguous, and there was formal procedure for resolving this.

Inscribing ambiguity

Still, being a bureaucratic organization, the outcome of the meeting needed to be inscribed into documents. In other words, the formal mode of bureaucracy needed to be performed. As I will show now, this process did not annul but rather sustained the ambiguous relationship between the cycling highway and the public transport network. Moreover, all actors present in the meeting had the opportunity to participate. In that sense, each of the three modes (formality, issues, and ambiguity) thus played a role.

For the inscription process, Max circulated a draft document over email that participants then commented on. To be sure, many aspects of the cycling highway were uncontroversial and readily accepted. Yet the prioritization of the cycling highway vis-à-vis the public transport network spurred some discussion even after the meeting had come to an end. One of the participants had reemphasized the issue by sending an email in which he proposed including the following statement:

> "Emphasis on public transport as a 'backbone' of sustainable mobility, no measures at the expense of local public transport" (from internal communication)

Max, who most probably discussed the issue with his colleagues, however, replied:

> "dominant role of public transport is out of the question; complete exclusion of impact on public transport is too rigid; Suggestion: stronger emphasis [on public transport]" (from internal communication)

Ultimately, the official text read as follows:

> "Public transport is the undisputed backbone of sustainable mobility in Munich and should remain as unaffected as possible by the measures envisaged in the [cycling highway] pilot project." (Referat für Stadtplanung und Bauordnung, 2016, p. 5)

The key point I seek to make here is that, in contrast to what is often thought, ambiguity was not resolved but rather maintained or even used as the planning process moved forward. The statement 'as unaffected as possible' signals that the relationship between public transport and cycling highways remains open to interpretation, that is, ambiguous. Furthermore, this ambiguity did not entail a break with formal bureaucracy but became an integral part of it. It was inscribed in documents that formalized the objects actors were dealing with.

6.6. CONCLUSION

This chapter has challenged idealized conceptions of *bureaucracy* prevalent amongst both proponents and critics of this organizational form. As discussed in section 1, most scholars define bureaucracy as a singular, formal, hierarchical, and rule-governed organizational structure. But I have shown that things are more complicated than that. Most importantly, I have argued that bureaucracy is as complex as the world 'outside' of it. Even stronger, this chapter demonstrates that bureaucratic modes of conduct are fully interwoven with other social phenomena. Besides detailed ethnographic inquiry, capturing such bureaucratic complexity requires moving beyond the conventional idea that bureaucracy is accurately defined as one organizational form, and towards an appreciation of the multiple modes that play a role, namely: *formality, issues,* and *ambiguity*—discussed in section 2.

Section 3 showed that formal hierarchical structures, represented in conventional organigrams, play an important role in practice as they allow planners to structure their collective activities. However, I also explained that planners might deviate from formal procedures to increase the effectiveness of their efforts. Most importantly, I showed that in practice, there is not one single organizational structure, as organigrams might suggest. There are more decision-making bodies than they depict and planners often have to deal with the fact that those authorities, or even different versions of the same authority, contradict one another. Furthermore, actors, objects, and values may shift over time, and change from one location to the other. Planners thus work in a complex organizational context in which they are constantly confronted with the need to position themselves. Something they achieve not just by following formal procedures but also by using mundane objects and 'positioning devices' such as red folders, *Laufzettels*, and stamps.

In section 4, I described how efforts to promote cycling in Munich have led to a lasting reconfiguration of formal bureaucratic structures, specifically, the installment of 'issue-oriented meetings' for the promotion of cycling. As a result, cycling planning in Munich today no longer only follows the formal trajectories laid out by conventional organigrams—in which coordination amongst different units and departments only happens at 'higher' organizational levels—but also through interdepartmental working groups consisting of those 'lower' in rank. I argued that such working groups are not just defined by formal procedures, but *also* by the issues that specific planning agendas bring into being. Aims to promote cycling, for example, led to the creation of issue-oriented meetings for dealing with parking, marketing, and bottlenecks—among other things. Section 4 also explored how those new meetings are actually performed in practice, and I argued that it would be wrong to see these meetings as either formal or issue-oriented. By contrast, I showed how actors used shaped formal procedures and made 'the city government' articulate the issues with which they were concerned.

Finally, section 5 showed that the successful inscription of issues into formal producers does not imply that things stabilize or become less complex. Not even for those directly involved in such processes. By contrast, once articulated as relevant bureaucratic matters of concern, issues are likely to encounter other issues or other versions of the same issue. I showed how the plan to develop a cycling highway—in order to address mobility issues—came into conflict with the desire to maintain public transport as the backbone of Munich's mobility system—for the same reason. Most importantly, the city government formally supported both those conflating plans. As a result, there was no final overarching procedure specifying how to proceed. To move forward nonetheless, planners left important aspects of their goals *ambiguous* and inscribed the ambiguity of the issues they were dealing with into formal documents. This constructive deployment of ambiguity may shine a new light on what it means to plan and specifically on how planners maintain coherence between different entities. That said, I leave those reflections for the next and final chapter of this thesis.

7. CONCLUSION

This dissertation opened with a straightforward question, namely: *how do planners plan?* A question that as we saw in the introduction, quickly evolved into the slightly more complicated, *how do planners plan without overview*? Before addressing the reason for this, let us first start by briefly reviewing the groundwork we have laid and the context of our study. This has focused on the planning of cycling and cycling infrastructure, ethnographically studied from within Munich's transport planning department. Cycling offers an excellent case for studying planning as building cycling infrastructure in a dense city like Munich is often controversial and often explicitly political. Indeed, during the course of this research, building cycling infrastructure was such a political contentious issue that the city government stopped all cycling projects. In their view, too much cycling infrastructure was being built at the cost of space allocated to motorized vehicles.

Now to come back to the issue of overview. Many social theorists, including planning and STS scholars, have long assumed that conflicts, such as those surrounding cycling in Munich, are and even should be dealt with by establishing a singular perspective, a consensus, or what I refer to as *overview*. But already in the introduction, I explained that recent STS insights suggest that such a comprehensive perspective is not possible in practice. An important goal of this dissertation has been to test such claims and to ask how planners plan then, that is, how they plan without overview.

In the preceding chapters, I have demonstrated that the assumption of overview, so central to planning theory, does indeed not hold when planning is studied in practice. From this I have offered an alternative explanation of how it is that planners plan, contending that planners plan by articulating the complexity of the situations they are dealing with through a variety of *modes of planning*. This, I claim, allows them to register and act on the basis of *interferences* this makes visible. I will now summarize how I arrived at this conclusion and afterward reflect on the insights and implication that follow from this.

7.1. PLANNING WITHOUT OVERVIEW: A SUMMARY

In chapter 2, I explained that the idea of overview is central to both objectivist (Altshuler, 1965) and communicative planning (Innes, 1995), two of the most influential traditions in planning theory. Objectivist and communicative planning assumed that urban reality is fundamentally 'simple'. Scientific objectivism believed that planning could stem from knowledge of the single and simple structure underlying urban society. Similarly, communicative planning assumes that planning can be based on a single coherent framework of laws, regulations, and procedures. Those theoretical traditions assume that if such structures are uncovered or followed, it is possible to arrive at a rational and/or democratically legitimate perspective of the city as a whole.

I also discussed the 'complexity turn' that planning theory has recently made (de Roo et al., 2010; Portugali et al., 2012). In short, this body of work challenges the idea that urban reality is fundamentally simple, and has been particularly successful in developing ways of modeling, representing and knowing the city as a 'complex adaptive system'. However, as acknowledged by authors involved in those developments themselves, it has been less successful in conceiving actual planning processes as complex.

> "It has proven much easier to see cities as tangible physical artefacts in terms of the elements of complex adaptive systems than it has been to articulate the processes of their planning in this way." (Batty & Marshall, 2012, p. 42)

A central claim of this dissertation is that understanding the complexity of everyday planning processes requires moving from a *romantic* to a *baroque* conception of complexity[48]. A romantic view is closest to conventional conceptions of what knowing, representing, and planning the city entails. It suggests that planning depends on different types of planning methods and practices, such as plans, calculation tools, meetings, and bureaucratic procedures. In a romantic view, it is assumed that the insights produced through such activities do, or at least can, add up to a coherent perspective. It is in this way, by synthesizing insights, that planning based on overview becomes possible. It is worth noting here that not just planning theorist but also early ANT scholarship implicitly (Latour & Callon, 1981) and explicitly (Söderström, 1996) subscribed to such romantic ideas[49]. Söderström indeed argued that different planning instruments synthesize complex urban realities into a singular perspective and offer planners a synoptic view of the city as a whole, that is, an overview.

However, a baroque view calls this into question. As I theorized in chapter 2, baroque complexity makes clear that romantic modes of knowing need to limit what they take into account—also see Law and Ruppert (2016). As a result, each planning instrument, method, or practice enacts a different version of reality that may not add up to a singular coherent view (Mol, 2002). Instead of assuming that planners zealously work to achieve such a view, more recent STS scholarship—known as post-ANT (Gad & Bruun Jensen, 2010; Law, 1999)—has developed ways to articulate and appreciate such complexity. As such, it offers a promising conceptual repertoire for achieving that what planning theorists have been calling for, namely a deep understanding of how planners plan in the light of complexity.

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[48] For a more extensive discussion of romantic and baroque complexity I refer to chapter 2 (especially sections three, four, and five) as well as the work of STS scholars see Kwa (2002) and Law (2004).

[49] This is not just my opinion but indeed acknowledged by prominent ANT scholars themselves. As John Law explains: "in some of its earlier versions actor-network theory also reflects and carries the torch of scientific romanticism. It looks up and centres in order to discover the emergent. And in doing so, notwithstanding the talk of heterogeneity, it homogenises" (Law, 2004, p. 4)

Drawing on such post-ANT insights, we saw in the preceding chapters how planners achieve coherence between the *multiple modes of planning* in which they participate, without reducing the problems they are dealing with to a singular perspective. In other words, how they plan without overview. The word *multiple* or *multiplicity* here signals the fact that the reality in which planners find themselves is neither singular nor entirely fragmented. The notion of *modes* here refers to the material-discursive assemblages in which planners participate, allowing them to articulate a specific version of the city. In this view, 'the planner' is neither an individual nor a single macro actor, but rather a composition of different modes. The key question is how this makes planning possible. Where a romantic view would suggest that planning requires coordinating such different modes into a single one, a baroque sensibility demands asking how planning is possible without establishing such a singular view.

Chapter 3 – Re-cycling the networked city

To start answering this question, the first empirical chapter, number 3, tackled the idea of overview head on. I described how the idea of planning the city as a whole emerged in Munich around the end of the 19th century. However, rather than seeing such an overview as the outcome of planning, I argued that it constitutes a mode in itself. I furthermore proposed that this mode could be conceived through what urban theorists refer to as the *modern network-city ideal*, the idea that the city can be integrated into a coherent whole through networked infrastructures (roads, electricity, water) and planned and managed 'from above'. I showed how in Munich the emergence of this mode was inextricably linked with the invention of the *Hauptverkehrsstraße,* at the turn of the 19th century. Those were the first roads that were planned and designed to integrate the city into a coherent whole. As I explained earlier, at the time, planning was dominated by objectivist planning. It was thought that constructing infrastructures required comprehensive plans and rational principles, that would offer an *overview* of the city and its future. At the time, only one mode was deemed part of this modern future, namely the car. As a result, and despite very high cycling levels, roads were, just as in many other European cities, planned and designed for cars.

In Munich, cycling however never fully disappeared from planning agendas. As demonstrated, even during the 1960s, the heydays of car-oriented planning, the city authorities maintained a limited commitment to the construction of cycling infrastructures. This is not to suggest that planning in Munich was not car-oriented. It was. However, it may explain why cycling quickly re-emerged on planning agenda's when the unsustainability of solely planning for motorized vehicles became clear.

That the city of Munich promoted cycling so quickly again, also has implications for theory. Often drawing on the American experience, urban and planning theorists have suggested that the network-city ideal came to an end in the 1970s, a time in which the negative social and environmental consequences of infrastructure development became increasingly clear. Some scholars suggest this had led to increasingly fragmented or splintered urban societies and car-oriented planning is one of the important culprits of such accounts (Graham & Marvin, 2001).

Quite the contrary, in Munich the network-city ideal still lives on, even in the planning for cycling. Since the 1970s, Munich has certainly experienced a major shift in the way transport infrastructures are planned. But this shift mainly concerns the modes that are taken into account. Planning in Munich has shifted from single modal, car-oriented planning in the 1960s and 1970s, to a multimodal approach today. What has not changed, however, is the goal to realize citywide transport networks that are universally accessible. In Munich, the network-city mode has not come to an end. By contrast, planning for cycling in Munich is partly driven by the same desires that drove planning a century earlier. Different actors involved in planning still articulate their goals in terms of infrastructural networks that need to be rolled out through the city as a whole. In this way, they also reproduce the dream of overview, the idea that the city can be planned, organized, and managed from an overall position.

Chapter 4 – Making roads in/qualculable

However, the persistence of the modern-network city ideal does not imply that planners actually hold a coherent perspective of the reality they are dealing with. One of the central insights of chapter 4 was indeed that there is a gap between the goals and the methods of transport planning in Munich. While chapter 3, discussed above, showed that actors in Munich pursue a multi-modal planning agenda, chapter 4, showed that formalized methods for calculating the network's capacity only account for motorized traffic. Other modes, including cycling, can officially not be taken into account.

This demonstrates a crucial point I make in this dissertation. It shows that, in contrast to what is commonly assumed, different planning instruments do not offer planners a single coherent view of the city. They do not always add up to a single perspective or overview. From a romantic point of view, such a gap is problematic. I indeed described how the city of Munich and many other cities are currently involved in a multi-million EU project, Horizon2020, that seeks to resolve this issue. It aims to develop a multi-modal capacity calculation tool that will allow its users to express a road's capacity through a *singular* number. To be sure, it is not my goal to criticize this project. Instead, my interest lies in showing that while scientific romanticism is highly productive in explaining how such calculations work in practice, it offers little insight into how calculations are actually made in practice. How planners calculate road capacity in actual practice, is much easier to appreciate through a baroque sensibility. Acknowledging the baroque nature of situated planning practice has important implications. As I explained earlier, it rejects the possibility of overview, which has been widely understood as key for achieving coherence between different urban entities. With that possibility lost, it became time to ask how planners achieve coherence in practice, instead.

Chapter 5 – Maps, Meetings and five modes of transport planning

Chapter 5 thus set out to explore how planners achieve coherence between different urban entities without obtaining a singular perspective or overview—the central question of this dissertation. To explore how this works, I focused on two planning methods that are commonly seen as key in the achievement of overview, namely maps and meetings. First, meetings are widely seen as moments for decision-making and consensus-building. Conventional wisdom thus takes meetings as key sites for coordinating multiple perspectives into singular ones. However, I explained that scholars who have studied meetings ethnographically have also stressed the opposite. They foreground that meetings often do not lead to singular results, but rather (re)produce a multiplicity of phenomena. In other words, while common thought might associate meetings with romantic sensibilities, the literature stresses the opposite. Such aspects are better defined through a baroque sensibility.

Second, maps form another planning instrument directly associated with overview. This is not so surprising given that they literally offer an overview of the city as a whole. However, as I argued, the fact that maps afford planners to see the city in its totality does not imply that they offer them a coherent overview of its complex urban reality. As I explained, maps provide a synoptic, yet limited, view of the city that does not exist without them. In that sense, they enact a specific version of urban reality that needs to be coordinated with other ones. Only if different types of representational devices, maps, and other ones, can be synthesized into a singular perspective would an overview of the city as a complex object be achieved. Social theorists have often criticized planning for failing to appreciate complexity—the work of James C. Scott (1998) is a perfect example of this—but this is based on the romantic assumption that planners do indeed strive for and actually achieve a singular perspective of the city.

The chapter's third section explored what happens when the romantic focus on singularity is replaced by a baroque sensibility for multiplicity. I showed how this makes it possible to appreciate that planners do not coordinate several modes into a singular one, but rather articulate complex situations through *even more* planning modes than the two already identified (*network-city* and *qualculation*). In addition to the networked-city and capacity calculation, I argued that planners also performed the modes of *safety*, *Politics*, and *bureaucracy* to articulate the complexity of planning objects.

In the fourth section, I finally showed how planners plan. I demonstrated that they do this by exploring and acting based on the *interferences* between the entities such modes generate. For example, I showed how the ideal of a *multi-modal network city* (mode 1) interfered with *calculation* (mode 2). During the meeting from which I reported, one of the planners proposed a fully different way of reasoning and calculating the design of the road. This proposition was, however, quickly stopped in its tracks by the *Political* situation (mode 3) in which the planners found themselves at the time. These and other interferences ultimately meant that, by the end of the meetings, the planners concluded they needed to request permission to conduct a formal capacity calculation (mode 2). That this was the right thing to do, could however be concluded only *after* the situation had been explored through those various modes. Finally, it is essential to realize that the calculation request did not reduce the situation to this specific mode. The very fact that a *request* needed to be made was because the mode of bureaucracy interfered with the situation.

Chapter 6 – Complex Bureaucracy: formality, issues, and ambiguity

Chapter 6 further explored the mode of bureaucracy, both in theory and in practice. While chapter five proposed that bureaucracy was one of five modes that enable planners to plan, in chapter 6, I again questioned this. I argued that bureaucracy is itself composed out of at least three different modes, namely *formality, issues,* and *ambiguity*. This breaks with common idealistic conceptions of bureaucracy. Both proponents and critics of bureaucracy commonly conceptualize it as a single and coherent structure. For those who praise bureaucracy (du Gay, 2000), this singularity forms a prerequisite for democratic and liberal forms of governance. In this view, formal procedures allow people to act legitimately in the face of conflict and uncertainty. Implicit here is thus the assumption that bureaucracy is a way of resolving complexity. Other scholars are more critical of bureaucracy (Alvesson & Thompson, 2006). They see it as an organizational form that is inefficient, unjust, and ineffective in the light of complexity. Planning theorists Innes and Booher (2010) for example, argue that bureaucracies cannot deal with complex problems. However, as I explained in the previous chapter, especially given the fact that Innes and Booher set out to explore what 'planning with complexity' entails, they conceive bureaucracy in a surprisingly non-complex way. They ignore what John Law has referred to as "bureaucratic non-coherence" (Law, 2004, p. 9), the fact that bureaucracy is a complex phenomenon in itself.

Drawing on my fieldwork, I argued that bureaucracy is indeed a 'non-coherent' organizational form composed out of three different modes: *formality, issues,* and *ambiguity*. Formality here refers to that what is commonly associated with bureaucracy, namely rules, procedures, and hierarchies. In contrast, to what some scholars claim, in section 2, I showed that formal procedures support planners in dealing with complex problems, as they offer clarity on what to do and how to act. However, I also explained that this does not mean that the organizational environments they work in are simple and straightforward. Quite on the contrary, I demonstrated that planners use all kinds of mundane 'positioning devices', such as stamps and notes, that enable them to situate themselves within the complex and dynamic policy processes in which they participate. Close attention to those stamps also made clear that there are more organizational forms than depicted in formal hierarchical organigrams.

One such mode is what I referred to as *issue-oriented bureaucracy*. In section 3, I showed that how planners and the city administration deals with complex planning problems is not only guided by formal procedures but also by specific issues. I showed how the international cycling conference, *Velo-city,* not only drew renewed attention to cycling but also inspired the establishment of interdepartmental working groups that dealt with specific issues. This issue-oriented form of organization, however, did not break with formal bureaucracy, but instead partly reconfigured its structure around the issue of cycling.

Drawing on insights into the development of Munich's first cycling highway, I furthermore showed that external actors might play a key role in articulating the issues with which the local state is concerned. The idea to build a cycling highway in Munich was first articulated by official plans in 2014. Although one might assume that this was a clear decision by the city council, the head of the bureaucracy, I showed that many non-state actors, including cycling lobbyist and surprisingly from car manufacturer BMW, were involved. Those actors were

successful in inscribing their issues into official policy, but as I asserted, this did not mean that the process of building a cycling highway became any less complex, or ambiguous.

In section 4, I reported from the cycling highway 'kick-off' meeting. Most importantly, I showed how during the meeting the actors realized there was a conflict between cycling highways and public transport. Cycling highways were defined as infrastructures that prioritized cyclists over other modes. However, in Munich, there is also a strong commitment to the idea that public transport should form the backbone of the transport system. There was thus a clash, between two types of infrastructures that were both formally supported by the city government. This made the participants realize that what the city council wanted, was *ambiguous*. There were, however, no formal procedures for resolving such ambiguity. Quite the contrary, I showed how the ambiguity became formally inscribed into bureaucratic documents. Ambiguity was thus used positively to maintain the coherence between the different infrastructural entities.

In sum

Having summarized the dissertation, I now return to the research question that guided it. Let me repeat the question once again; I asked *how planners plan (i.e., how they maintain the coherence between different entities) without overview*. It should be clear by now that they do this by articulating the complexity of urban situations through several different modes. Those modes make planning possible because they allow practitioners to explore and act based on the *interferences* between the entities those modes generate. The network-city mode (discussed in chapter 3) for example enacts the city as a whole and allows planners and other actors involved in planning, to explore what entities are (un)desirable when the city is conceived as an integrated totality. Some scholars have criticized this perspective for its inability to capture the complexity of urban reality (Scott, 1998). However, it is key to realize that it is not the only mode through which planners plan. Even though the network-city mode is frequently equated with modern planning, it is important to acknowledge that planners also participate in many other modes when they plan for cycling. Most crucially, these modes often do not add up to a singular perspective. It is indeed precisely because planners pursue different partly overlapping approaches that they can comprehend and plan complex realities, without overview.

Now regarding the issue of coherence. As I explained earlier, overview has long been deemed as crucial for maintaining the coherence of the city, in the light of the many conflicting goals of its citizens. Acknowledging that planners plan without overview thus demands other explanations for how such coherence is achieved. I want to make two broad propositions in relation to this issue. First, I suggest actors involved in planning achieve coherence by making continuous adjustments to their own action and the actions of others. Such adjustments can happen on a large scale, such as the shift from car-oriented to multi-modal planning over the course of several decades, or efforts to reconfigure calculation tools through European projects. They can also happen on a small scale, such as day to day decisions to proceed or deviate from formal procedures. Whatever the scale, the point here is that there is no underlying or overarching logic in place coordinating all those adjustments being made. Precisely for this reason, it is not so surprising that, also within planning, there are many gaps, conflicts, and frictions between different modes and entities. For example, the desire to build a cycling highway may or may come into conflict with the prioritization of public transport. Continuous adjustments alone can thus not explain how coherence is maintained. This brings me to my second point, the positive role of ambiguity. In chapter 6, I showed how planners not just resolve but also articulate and maintain the ambiguity between different entities and ways of reasoning. This is, I contend, crucial for coherence. Rather than only seeing ambiguity as something that needs to be overcome, it also needs to be acknowledged positively, as that which allows conflicting elements to co-exist. This links back to point one again, as one thing that ambiguity makes possible, is the belief that adjustments can still be made at a later stage. In this way, ambiguity acts as the glue between different incommensurable modes and entities. Perhaps then, planners plannot by establishing an overview but by making continuous adjustments to some things, whilst leaving other things ambiguous. But what else can we learn from this?

7.2. WHAT HAVE WE LEARNED: CONTRIBUTIONS TO PLANNING AND STS

This dissertation has identified and explored eight modes of planning. Chapter 5 already identified five modes, namely: network-city, qualculation, safety, Politics, and bureaucracy. Then, in chapter 6, I added three further modes by zooming in on the mode of bureaucracy, namely: formality, issues, and ambiguity. Speaking of planning as a series of interfering modes, or even modes within modes, may sound confusing. However, it is something we need to learn to appreciate when coming to terms with a baroque sensibility. The baroque indeed always finds more complexity (more modes) within a given part. In John Law's words, it is "a world of ponds within ponds and gardens within gardens. Such is the baroque sensibility." (Law, 2004, p. 6).

But why make things so complicated? Is it not better to keep things simpler, by just focusing on the most important one, two, or three modes? And if not, then what is gained by identifying all those modes. What can be learned from this exercise? These are important questions to pose and reflect upon now that we approach the end of this thesis. But let me start with another question that follows from this type of approach, namely the question of where to stop adding more modes. Why identify eight modes and not five, six, or twenty? Is there anything intelligent that can be said about this?

STS and specifically ANT have long concerned themselves with this question, the question of where to stop the analysis. As I discussed in chapter two, after her 1987-1988 visit to CSI in Paris—the home of ANT scholars Bruno Latour and Michel Callon—Susan Leigh Star insisted on the need for attentiveness to complexity, difference, and inconsistency (Star, 1990). This however, also brought along a theoretical problem, namely how many differences to identify, that is, where to stop. A few years later, John Law, who dealt with the same issue I am dealing with here, put it this way:

> "I'd moved from two modes of ordering to three, and then to four. But why should I stop at four? Why not five or six or, for that matter, fifteen? It was [Susan] Leigh Star who put this point to me. In response, I said ' Well, its an empirical matter, really.' And she [Susan] said something like this: 'No, it isn't empirical. It's theoretical. You [John] tend to see big blocks of things, whereas I [Susan] tend to see differences and contingencies. '" (Law, 1994, pp. 87–88)

Susan Leigh Star thus argued that stopping or continuing with identifying modes was not an empirical matter, but a theoretical one. The researcher makes a choice between, on the one hand, taking things (such as planning as a whole) as a single phenomenon, or on the other, articulating their complexity. A baroque sensibility insists on the latter, it highlights that there is always more complexity to be found in every part. Still, the researcher needs to stop somewhere; but where and when? John Law offers a concrete and useful suggestion. He argues that "the answer is that there is no ultimate answer. It depends on what we are trying to do." (Law, 1994, pp. 88–89).

In this dissertation, I have demonstrated that planners do not hold nor achieve a singular view of the city. There is no overview. Identifying five modes and exploring the clashes between them is a very productive strategy for achieving this. However, stopping after several modes, let us say two or three, risks suggesting that 'this is it'. Particularly when presenting modes side by side, as I did up until chapter 5, risks suggesting that the number of modes is limited and that once those five modes are identified and described, we understand how planning works. Moreover, this would implicitly suggest that we now have an overview of planning practices, precisely the tendency to be resisted. Therefore, zooming in and demonstrating that more modes can be found in the mode of bureaucracy was an important move to make. It helped to challenge further the idea that there is an overarching structure, by demonstrating that even the organizational form most commonly associated with this, can again be articulated as complex and multiple. Even bureaucracy does not offer a final coherent perspective. Its head has no overview of the complex reality, the city is.

But what is gained by identifying all those modes, apart from challenging that planners plan through overview? On the following pages, I will discuss how the insights from this dissertation contribute to STS, as well as to planning theory.

Contribution to planning theory

This dissertation contributes to planning theory by demonstrating how the complexity of institutionalized planning practices can be articulated through a baroque (post-ANT) sensibility. In the introduction, chapter 1, I already discussed how planning theory has recently made a complexity turn and increasingly adopts post-structuralist insights. However, some planning theorists see post-structuralism as incommensurable with institutionalized state-led planning. This, as I explained, has led some planning theorists to experiment with 'planning beyond the plan' (Boelens & de Roo, 2016) or even outright denounce institutionalized planning for its incapacity to deal with complexity (Innes & Booher, 2010). This position, however, risks alienating practitioners from theorists and vice versa, thereby potentially increasing rather than addressing the theory-practice gap (Alexander, 1997). To be sure, my position is not that we should simply praise planning authorities, or reproduce their agendas unreflexively. However, if advancing post-structuralism is the goal—which is what binds these planning and ANT scholars—then, there is also a need to re-articulate institutions in those terms.

In this dissertation, I have indeed shown that post-ANT, a theory grounded in post-structuralism, is highly productive for opening up state institutions and specifically for articulating their complexity. Articulating the complexity of planning processes, something planning scholars have been calling for, can however not be done based on the same theoretical assumptions that have been used to articulate the complexity of cities. Cities are, at least among planners[50], commonly understood as complex adaptive systems. It draws on romantic complexity. However, as I have shown in this dissertation—especially in chapter 4 on *qualculation*—this approach fails to define actual practices accurately. Situated planning is indeed better understood through a baroque (post-ANT) sensibility.

This approach differs from some existing work on planning and complexity that sees state planning as antithetical to complexity. In their book, *Planning with Complexity*, prominent planning scholars Judith Innes and David Booher (2010) indeed argue that bureaucratic planning institutions cannot address complex planning problems.

> "Bureaucratic agencies are hierarchical in structure, routinized in their practices and each designed to fulfill a limited mission. They are unable to address the multiple goals of their constituencies, much less deal with rapid change. They cannot address the interdependencies among their missions to achieve sustainable management of natural resources. They are not set up to look at cities or regions as wholes, nor to address complex, rapidly changing problems." (Innes & Booher, 2010, p. 3)

Planning theorists Luuk Boelens and Gert de Roo (2016) make a similar argument. They argue that while planning theory has increasingly incorporated insights on the complex interrelationships between meaning and matter from post-structuralist social theory, "mainstream [state] planning is still structuralist" (Boelens & de Roo, 2016, p. 59).

In my opinion, criticizing institutionalized planning for its failure to acknowledge insights of complexity is of little help to practitioners who seek to incorporate such insights into their work. If planners working in state

[50] Work on urban assemblages (Farías, 2009; McFarlane, 2011; Ureta, 2013), at the intersection of ANT and urban studies, offers a baroque conception of the city, that is, closely related to the conception of planning that I propose.

institutions are to use insights from complexity sciences into their work, social theorist should first appreciate and articulate the complexity of such institutionalized activities. Planning scholars Boelens and de Roo (2016) are also pointing in this direction. They explain how over the past 15 years or so, they experimented with complex planning 'outside' state institutions. However, reflecting on their endeavors, they have come to realize that institutionalized planning is often not moving in the same direction, let alone with the same speed as the processes in which they collaborate. Addressing this issue, they suggest, requires "further elaboration … of adaptive and co-evolutionary institutional arrangements of becoming, precisely because they enhance restrictive 'lock-ins' for continued innovation." (Boelens & de Roo, 2016, italics original). Put simply, Boelens and de Roo (2016) thus call for a better understanding of institutionalized planning practice through a complex (post-structuralist) lens. This thesis offers such an account.

Contribution to STS

Besides demonstrating how post-ANT insights can contribute to standing concerns in planning theory, this dissertation also contributes to a broader and much more ambitious STS agenda. In recent years, some STS scholars have started to question one of the foundational pillars of western society: the idea that societies, including cities, should or even are governed by centralized authorities. In other words, the idea that they can and should be governed through overview. If there is one thing in which all STS scholars will agree, then it is the fact that Science, Technology and the State are inextricable interwoven (Jasanoff, 2012b; Latour & Woolgar, 1979; Shapin & Schaffer, 1989; Winner, 1980). Large parts of STS, however, remain committed to the romantic idea that there is ultimately one singular reality, or at least that such a reality can be achieved (Law, 2015). This is also true for early ANT. That being said, influenced by Anthropological and feminist insights, post-ANT scholarship has not only sought to question such assumptions, but also further explores how it can be resisted. One key argument here is that we need to replace that idea that we live in a singular reality—simply seen differently by different people—to a reality that is multiple. That is, that there are different versions of reality that are incommensurable. The innovation of STS scholars such as John Law and Annemarie Mol (2002) is to demonstrate that such multiplicity not only exists in encounters between 'the North' and 'the South', but also within 'Northern' practices themselves. John Law: "[t]he argument is that in the 'North' we do not live in a single container universe, but partially participate in multiple realities or a fractiverse." (Law, 2015, p. 126). This insight, as Law explains, has come out of the post-colonial encounter in Anthropology. The realization that other 'cultures' have fundamentally different conceptions of what reality *is*, realities that are at least partly incommensurable with those of 'the North'. It has long been thought that such differences can be accounted for by modern science. In this perspective, science offered access to the 'true' version of reality or 'nature', while the realities of 'others' were merely founded on beliefs. This very same idea also underpinned objectivist planning up until at least the 1960s—I discussed the influence of scientific objectivism on planning in chapter 2. Post-modernism, however, pushed the debate to the other extreme, it posed that there was no fundamental way of distinguishing the objective from the subjective, and that modern science was just as much a believe system as any other world view. New post-colonial insights go even further than this. It insists on the fact that we are not simply dealing with different world*views*, but indeed with different and potentially incommensurable worlds—see for example, Verran (2001). As Law explains:

> Are we dealing with matters of belief? Are we simply saying that white people believe one thing, for instance about what we code up as 'nature', whereas Aboriginal people believe something different? Or is something different going on? The new post-colonial response is that the differences are not simply matters of belief. They are also a matter of reals. What the world is, is also at stake." (Law, 2015, p. 127)

John Law takes this anthropological insight on the incommensurability of 'Northern' and 'Southern' worlds, and suggest that it might also elucidate complex realities within the North itself. Law indeed stresses the need to demonstrate that even practices that insist on the singularity of reality—a 'universe' in Law's terms—such as

planning, do indeed perform *multiple* realities—or a 'fractiverse'—such as the multiple modes this dissertation maps out.

> "It becomes urgent, too, to pick through the practices within the North that multiply realities, even as they insist on a universe rather than a fractiverse. And it becomes important to ask how fractiversal realities might be freed up." (Law, 2015, p. 128)

This is precisely what this dissertation has done. As discussed in chapter two, planning theory has long insisted on the singularity of urban reality and on the need to come to singular coherent perspectives on that reality. It thus insists on the singularity of the real. However, throughout this dissertation, I have shown that planners participate in *multiple modes of planning*, which enable them to enact and explore different versions of a complex planning problem but do not add up to a coherent whole. More strongly, I have argued that planning is possible precisely because it does not rely on a singular approach. In chapter 4, for example, I showed how planners drew on different types of logic to *qualculate* a road.

Law is not the only one to challenge the centralized state. Donna Haraway already spoke of the "god trick of seeing everything from nowhere" (D. Haraway, 1988, p. 581) and insisted that every perspective is a partial one. Similarly, in their work on Paris, Latour and Hermant challenge the Foucauldian image of the panopticon, the idea that state that can see everything from a centralized positioned. Drawing on an ethnographic inquiry into a large number of state institutions, they argue that what can be found there are 'oligopticons', sites from which very little can be seen at any one time, but everything that appears with great precision. Put simply; they are the methods, devices, and techniques that planners and other urban professionals use to know and represent urban environments. Capacity calculations, discussed in chapter 4, are a perfect example of this.

> "Water, electricity, telephony, traffic, meteorology, geography, town planning: all have their oligopticon, a huge control panel in a closed control room. From there very little can be seen at any one time, but everything appears with great precision owing to a dual network of signs, coming and going, rising and descending, watching over Parisian life night and day. No single control panel or synoptic board brings all these flows together in a single place at any one time. […] No bird's eye view could, at a single glance, capture the multiplicity of these places which all add up to make the whole Paris." (Latour & Hermant, 2006, p. 32)

An important question here is where to go in order to identify and articulate alternatives. That is, where to go to study what it means to, in my terms, plan without overview. Latour and Hermant (2006) suggest that we look *between* the 'networks' or 'oligopticons' they study:

> "Everything changes, however, if the networks highlighted in this work occupy only a tiny narrow place. As big as the oligopticons visited in our inquiry may be, they occupy only a few square metres, and if they spread everywhere, it's only through very fine cables that the slightest trench dug in the ground for the flimsiest motive. But what is there between these cables? Nothing. So *there's* the space we need to be able to breath more freely!" (Latour & Hermant, 2006, p. 102, italics original)

Although Latour and Hermant are not very explicit about this, I think it is important not to equate oligopticons with whole institutions. As can be read in the quote above they indeed argue that such devices only occupy 'a few square meters', a metaphor for the fact that oligopticons do not define such institutions as a whole.

And indeed as I have demonstrated in this dissertation, the methods planners use to plan offer highly specific and limited insights into complex realities, what Haraway (1988) refers to as partial perspectives or Latour and Hermant as oligopticons. The 'in-between space' that Latour and Hermant are talking about is thus to be found not only outside of institutions but literally in between the formal methods and procedures (the oligopticons) located there.

But, what to do with this information? How may STS proceed if this insight is taken to heart? Here I am following the suggestion of John Law, who has argued that there is a great need to create sensibilities and toolkits to interfere with all types of 'social distributions', thus including the distributions that define planning.

> "For it is the case, or so I am asserting, that the distributions of the social world—project distributions, political distributions, but also the more classic distributions of ethnicity, gender, or class—are sustained as much in narrative incoherence as they are in narrative coherence. Are sustained as much in interference between multiplicities as they are in successful and singular enactment. Thus the need—the great need—is to create sensibilities and toolkits that will allow us to sense, to work upon, and to interfere with those distributions once they escape the possibilities of single stories and enter the logic of oscillation [that is, complexity and multiplicity]." (Law, 2002, p. 202)

This dissertation primarily contributes to the first step of the strategy laid out by Law. It contributes to the development of a baroque (post-ANT) sensibility in planning. One could also argue that its different chapters interfere with the different modes of planning that they describe, by reconfiguring existing stories defining those modes. However, Ph.D. dissertations are notorious for their small readership and even more senior scholars working on the intersections of ANT and planning (Boelens, 2010) have admitted the challenge of having a real impact on actual planning processes. Perhaps this is one of the big questions that planning poses for STS, that is, how researchers might productively interfere in planning practice itself. This is a question I turn to in the next section where I discuss some of the shortcomings of this thesis and explore directions for future research.

7.3. ROADS LEFT UNTRAVELED AND ROADS AHEAD: LIMITATIONS AND FUTURE RESEARCH.

Every perspective and every account is partial, and so is this dissertation. Like the methods that planners use to plan, this dissertation has several limitations. To some, it might appear to offer a very 'local' account. This is a common critique against ANT work, though one that misses the point, as I will explain in a moment. A more credible criticism against this thesis is that it overlooks important aspects of planning for cycling. This is true. I have largely ignored the issue of cycling safety, and I have paid limited attention to the role of the public and the issue of participation. Finally and perhaps most importantly, before submitting, the claims in this dissertation have not been extensively tested with practitioners. Only several weeks after writing this, will Munich's planners themselves have had the opportunity to offer their feedback on my accounts. I will now study those limitations in more depth, and afterward, turn to the implications this, and the research as a whole, has for further study.

Limitations

Some might question the insights of this work on the grounds that it is 'too local'[51]. This study has indeed focused on planning processes in one German city (Munich) in one department (the transport planning department) and ethnographically followed only two different teams of planners. However, such a critique fails to appreciate the implications of a complex baroque conception of space and scale, which sees spaces as relational and multiple, and allows thinking how 'the global' exists within 'the local' and vice versa (Law, 2004). This is not the place to discuss these theoretical insights in detail, but it is important to realize that each of the chapters has indeed offered insights into phenomena that are both larger and smaller than the city of Munich. Chapter 2, for example, offered insights into theoretical discussions that involve scholars from all around the globe, yet that has certainly not shaped all of Munich. Similarly, chapter 4, on *qualculation*, described events that took place in the US between the 1920s and 1960s, and how they continue to shape planning in Munich up until today. The chapter is thus far from 'local'. It spans half the world and a century of developments. In 'local' practice, such 'global' phenomena, however, have to compete with other versions of what counts as global and as local (other modes of planning). In a baroque view then, Munich's planning department is not simply a single

[51] This is a common critique against ANT research, such as this study. STS scholar, Sheila Jasanoff (2012a) for example mobilizes this critique against the laboratory studies of Bruno Latour (1987). Jasanoff argues that, as Latour was busy studying how (American) scientists constructed facts in their laboratories and scientific papers, "controversies were playing out on much larger fields of action than individual laboratories or the pages of professional journals. Those were years when climate modeling came into its own with all of its potential for scientific controversy." (Jasanoff, 2012a, p. 438). She thus suggest that Latour overlooks the larger context, in which the phenomena he studies takes place. However, such a critique draws on a romantic conception of space and scale. It implicitly assumes that phenomena, such as climate modelling and writing papers, can indeed be univocally ascribed to a specific (micro, meso, or macro) scale. Jasanoff implicitly suggest that laboratories and writing take place in 'local sites' that exist in a large context defined by phenomena such as climate modelling. (post-)ANT however draws on a fundamentally different (baroque) conception of space and scale in which the global exists within the local and vice versa (Bruun Jensen, 2007; Law, 2004). Such a perspective makes clear that Jasanoff's account is itself a specific 'local' definition of what counts as global (in her case, historical accounts of scientific controversies) and what as local (the practices of scientists). Unlike Jasanoff (2012), Latour's (1987) primary interest did not lie in describing 'what truly happened' historically, but rather in *how* things happen. His account of how scientific facts are constructed, describes phenomena that are likely to be found in almost any laboratory and scientific paper around the world. As such, his work is thus just as global or local as that off Jasanoff.

local site within a larger or nested global context. Instead, it is better understood as a *site multiple* (Lepawsky, Akese, Billah, Conolly, & McNabb, 2015), a site in which different versions of the global and the local interfere with one another.

A more legitimate critique against this study, and indeed an important shortcoming, is that it has overlooked important aspects of cycling and cycling planning. Most important in this respect is that I have ignored the issue of cycling safety. It should need little explanation that safety is a key issue given the vulnerability of cyclists. To give an idea, in the first five months of 2019, three people, including an 11-year-old boy, were killed whilst cycling on Munich's roads (Sueddeutsche Zeitung, 2019). While I recognized safety as one of the modes of planning, in chapter 5, I have not explored this mode in detail. This is partly because safety is not the primary responsibility of Munich's transport planning department, where I conducted my ethnography. In Munich, safety issues fall under the responsibility of the KVR, to which I was unable to obtain ethnographic access to despite multiple attempts. Still, I believe safety should have received a more prominent place in this dissertation, and I consider it a shortcoming that it does not.

Besides safety, this study has also paid no attention to the role of city marketing in cycling promotion. Since the Velo-City conference in 2007, Munich has explicitly marketed itself as a 'Radlhauptstadt', or 'Cycling Capital' (Landeshauptstadt München, 2011a). However just like safety, marketing also falls under the prime responsibility of the KVR, the department I lacked access to. While this can be taken as a shortcoming, the fact that specific modes are missed or receive less attention due to the situatedness of the researcher is in line with the broader argument this dissertation makes. I have indeed claimed that no site offers an *overview* of the city as a complex whole. There is not one site containing all modes. One should indeed expect to find different modes of planning as we move from one site to the next. In Munich's transport planning department, marketing hardly played a role.

This dissertation has also paid limited attention to the role of 'the public'. Chapter 6 paid some attention to how external actors shaped the development of Munich's first cycling highway. But apart from this, public involvement has received little consideration. This is certainly not to say that Munich's planners were not concerned with this. They were. However, this dissertation has sought to challenge the common idea that 'planners' form a coherent group. Therefore, I have focused on the different forms of planning rather than how 'internal' actors (planners) differ from 'external' ones (the public).

Finally and perhaps most importantly, the claims made in this dissertation have not (yet) been tested with practitioners. As I mentioned earlier, I will present my insights to those who I collaborated with several weeks after writing this. Admittedly, it is questionable that this one-off engagement will have a lasting impact on the city administration. It perhaps could have, had the research been organized in a more collaborative fashion, based on a reciprocal relationship. Distancing oneself from the field is, however, still an important virtue amongst academics. On the one hand, this has certain benefits. Especially during the formative years of a Ph.D., it allows the researcher to acquire an independent voice and to identify the academic audience of his or her work. On the other hand, if the claim that knowledge and realities emerge out of interferences between different modes is to be taken seriously, then I think more engaged forms of STS (Sismondo, 2008) are the way to go.

Future research

This also brings me to the final part of this thesis. I see several roads ahead. Considering the limitations just discussed, there are several ways of moving forward. The most obvious direction for further study is to test and expand the typology of *modes of planning* proposed in this study. It is interesting to ask if such modes hold across sites and what other modes can be identified. Particularly interesting to ask in this respect is how such modes shift and change between sites. As I explained, safety perhaps plays a bigger role in the KVR than in the transport-planning department. Similarly, it is likely that other modes come into view when moving from the planning to the construction or the environmental department, etc. This may help to complicate the picture

presented in this dissertation, specifically its implicit suggestion that all modes exist in the same intensity across different instantiations of planning activity.

Two obvious candidates for future research are the two modes that have received limited attention in this dissertation: Safety and Politics. While STS has paid ample attention to uncertainty and its relation to risk (Callon, Lascoumes, & Barthe, 2009), safety has received less attention. An exception here is, Haavik (2014) who has argued that STS' material constructivism can make a contribution to the emergent field of 'safety science'. The line of inquiry from this dissertation could be continued by exploring how safety is interfered by other modes that planners and other professionals need to take into account.

Unlike safety, politics is central to STS research. Insistence on the political nature of Science and Technology is perhaps indeed what binds STS scholars into a coherent community. However, academic understandings of 'politics' go far beyond the understanding ascribed to it by practitioners. While conventional wisdom sees politics as 'that what politicians do', that is, as big party politics with a capital P, social scientist define it in numerous different ways—for an overview of different meanings of 'the political' see Latour (2007). STS specifically insists on the politics of materials and technoscientific objects. STS scholarship particularly foregrounds two things. First, that objects may implicitly carry certain values (sub-political) (Akrich, 1992) and second, that they may become the center of political gatherings (object-oriented politics) (Gomart & Hajer, 2003). Due to the focus on 'alternative' conceptions of politics, big party Politics has however received less attention. Despite explicit suggestions of prominent STS scholars such as Latour (2003) and Law (2002) that Politics is to be recognized as an interesting *mode* for STS inquiry, there still appears to be space for more research on this mode and how it interferes with other ones.

Finally, I want to offer some suggestions on concrete sites that researchers might travel too. As such, I take up John Law's suggestion quoted earlier, that STS needs to develop toolkits for engaging with and interfering in knowledge practices, such as planning. Even though developing such tools has not been the main aim of this dissertation, my work does offer useful insights regarding the 'sites' in which planning takes place. Such insights might serve as useful instruments for researchers interested in prying open the agencies that govern contemporary societies. A central conviction guiding this dissertation is that state institutions, such as planning departments, are indeed great places to locate oneself as a researcher. However, the vast number of rooms, objects, and sub-sub-departments that can be found there often make it hard to decide what to focus on. To resolve this issue, I suggest that researchers may significantly benefit from situating themselves in meeting rooms. For STS researchers meetings may appear odd candidates at first, as they often lack the materiality that they, researchers, are searching. Indeed as I wrote in my own early field notes, meetings may appear to be all "talk, talk, talk". However, once one realizes that meetings are material-discursive activities and focus on what and how materials are articulated—through which modes of planning, for example—then meetings become some sort of pressure cooker in which issues, frictions, and gaps come to the fore. When one realizes this, they become great sites for exploring the in-between spaces that Latour and Hermant (2006) were talking about. But perhaps more importantly, as we saw in chapter 6 when discussing the cycling highway meeting, meetings are the sites were outsiders may interfere with formal planning activities. I showed that attending meetings was one of the ways in which cycling lobbyist and representatives from industry managed to participate in the development of this infrastructure. It is my hope that STS students use this knowledge to find their way in.

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