5. Praxis of Practical Ensembles: Bodies in Motion

5.1 Introduction

The principal goal of this chapter is to explore some of the ways that Sartre's investigation into the dialectics of action, technology, and society, which culminate in his view on practical ensembles, can be applied to contemporary challenges of the human condition. The chapter, therefore, applies Sartre's thoughts on practical ensembles to urban mobility to illustrate some of the underlying dynamics and effects of people's spatial, technologically mediated, and organized movement through their built environment.

In this chapter, *urban mobility* systems are those that enable the movement of people, goods, and information within, as well as in and out, of urban spaces (Sheller & Urry 2006; Urry 2007). Urban mobility systems consist of people, artifacts, rules, regulations, expectations, habits, institutions, structures, infrastructures, and networks that interplay in various ways to contribute to an overall urban flow. Such systems can be found in one form or another in all cities and settlements. This ubiquity is apparent in the way the very fabrics of cities and larger settlements throughout history reflect the dominant modes used by their inhabitants to move between places (Newman & Kenworthy 2015).

5.2 Urban Mobility as Practical Ensemble

This section outlines an understanding of urban mobility as a practical ensemble. In accordance with the findings from the previous chapter, needfulness represents the entry point for this outline. Human needs and desires, as well as material demands and requirements, permeate every level of societal constellations. According to Sartre, it is always through a goal-oriented human agency that structured interrelations form and prefabricated options for action eventually become realized. Understanding the foundational role of needs, desires, and action allows one to accentuate interrelations between human and non-human elements on the micro-level. It also makes it possible to scrutinize them for the way the interrelations are struc-

tured as well as for how their specific mode of structuring affects how and why not only people but also goods and information, move through urban spaces the way they do.

Eventually, this multilevel analysis discloses other structures that equally affect, inform, and mediate such structured interrelations. In this way, structured interrelations on the micro-level reveal more modes of structuring at the meso-level. The interrelations between these modes of structuring can again be scrutinized regarding the way they mediate interrelations on the macro-level. Another possibility is to conceive of these meso-level modes of structuring as partial totalities themselves. The interrelations of these partial totalities represent structural moments in a larger totalization on the macro-level. The overall totalization represents the form of organization of urban mobility as a complex process. This process is represented by the overall flow of elements and thus affects the interrelations of structures and elements on the meso- and micro-levels.

Structural Moments of Urban Mobility

Following Sartre's thoughts about practical ensembles, the complex machinations of urban mobility systems can be understood in a more abstract way, namely as an overall totalization, reconstructed as an interplay of certain structures enabling the flow of goods and people to move through urban spaces. Through this perspective, the dynamic micro-level interrelations of road users at individual road segments must be understood as being serially structured and not communally so. These structured interrelations form through isolated practical relations between road users and other people, things, structures, and rules, or a combination of all of them. Furthermore, the interrelations mediate the various movements of all road users based on their motion-relevant requirements. In an optimal case, the controlled and safe movement of all road users is the outcome of this structuring. For instance, crosswalks and pedestrian lights make it likely for pedestrians to safely cross streets. Traffic-calming measures, such as road diets and speed bumps, slow down car traffic to mitigate accident risk (Lee et al. 2013; Kim et al. 2019). Each of these traffic-governing systems represents a mode of structuring between elements, and each of these modes of structuring contributes to the whole form of organization at the road segment.

When two or more road segments meet, like at intersections or highways, other modes of structuring mediate the interrelations between those coupled segments. In this regard, the structured interrelations between road segments can be understood as a practical ensemble that represents a partial totality on the meso-level. The structuring of these interrelations causes some road users to stop their movements and yield to others, all to enable an overall flow of traffic between the segments. Eventually, this interplay affects individual road users at road segments and

enables their movement. The interplay of structured interrelations between human and non-human elements is thus both an outcome of balancing strategies to tackle needs and desires, and also a complex yet abstract need itself, which must be taken care of and concretized so as not to affect this delicate balancing.

The overall macro-level form of organization for urban mobility can thus be understood as permeated by needs and desires at every level. From the perspective of human elements, the organizational form reflects people's requirements, wants, and wishes to move from one place to another. These may be the abstract need for movement in general, or concrete desires to move to do something else, such as reach a destination.

From the perspective of non-human elements, the enabling function and the services provided by these elements are related to the needs and desires of the human elements. Traffic lights, speed bumps, and speed controls are in place simply because the ends of individuals must be attained, and because the various strategies of how this can be done must be balanced and reconciled so as not to inhibit each other. Material demands and requirements then arise, because the proper function and service provision of non-human elements is critical for managing the interrelations of human elements. Consequently, there emerges a further desire to maintain and protect these elements from damage.

From the perspective of the ensemble's macro-level, the overall provision of flow through interconnected structurings of human and non-human elements eventually affects individual road segments at the meso-level, and also enables the individual micro-level movements of road users at those segments.

Mediated Interrelations

Sartre's practical ensemble framework can be applied by foregrounding specific forms of human action and examining how these actions are mediated by technology in the form of practico-inert instrumental means. Again, the goal-directed actions of human beings, as well as their needs and desires, represent the entry point of this analysis. Here, Sartre's philosophy of technology comes into play (see section 3.2).

The movement of pedestrians, for instance, can be understood as the result of a serial structuring based on human needs and desires, which concretize abstract structures of need and thus transforms them into desires by manifesting their potential satisfaction through instrumental means. These means are the pedestrians' shoes, the pavement, traffic lights, and other items. The connected employment of these instrumental means represents an equipmental field that corresponds to the practical field of possibilities for these pedestrians (see sections 2.3 and 3.2). This equipmental field thus enables pedestrians to realize their movements by mediating between their abstract and concrete ends. This movement is governed by institu-

tionalized traffic laws and conventions, which pedestrians either follow consciously or due to certain *hexeis*. The path pedestrians use is simultaneously chosen and prefabricated in accordance with the established ways in which pedestrians can or must satisfy their needs and desires through the larger material settings and formations of their urban environment. Depending on the pedestrians' needs and desires, and their concomitant ends, their movement through urban environments represents a self-realization (see section 2.3).

The movements of car drivers also represent outcomes of a serial structuring enabled by cars and road infrastructures alike, one which is eventually realized by the goal-directed actions of those drivers. In the case of cars, the role of technology in the form of practico-inert objects becomes even more apparent for the specific mode of structuring and the form of mediation. A car not only enables drivers to realize their ends in specific ways by supporting and accelerating their spatial movements; depending on whether it is a sports car or a vehicle specifically designed for urban spaces, a car also mediates and thus shapes the spatial experience of its drivers as well as their perceptive relation to the road in different ways (Ihde 1990, 74).

It is not just the concrete movements of people and their perceptions of how they are *on the move* that are mediated by various things, structures, and modes of transportation. Their relation to space and time is inherently mediated as well (Ebert 2020). From a perspective toward the dimension of space, the distribution of bus stations at which people might serially gather is revealed to be mediated by the positions of other bus stations throughout urban areas. The positions of these bus stations again depend on the density of the population in certain areas, and on other factors. The bus stations are connected by bus lanes, and enacted by the totalizing actions of bus drivers and passengers alike. All these interrelations result from the overall form of organization of urban mobility while simultaneously contributing to it (see section 4.3). The concrete sociospatial relations within cities are thus both constituted by and constitutive of the nature of urban mobility (Jessop et al. 2008). This applies even more to large, interconnected networks of streetcars and tracks, which link various points of interest. However, the dimension of space is also inextricably linked to the dimension of time. Schivelbusch (2018) has demonstrated this by showing how traveling by railroad mediates the perception of space and time. Handel (2017) argues that a decrease in travel time between places can cause distant areas to be perceived as closer, whereas areas that are spatially closer but less connected may be perceived as further away (Müller 2021).

Focusing on other, more obscured interrelations between human and non-human elements reveals even more profound modes of structuring. In his article *Do Artifacts Have Politics?*, Winner (1980) claims that a focus on simple use contexts of technologies might obscure the larger, potentially harmful effects those technologies can generate. Winner states that the low-hanging bridges designed by architect Robert Moses to allow cars to travel in and out of Long Island exceeded their supposed use

context. Their height had a discouraging effect on buses that had to run on parkways underneath them. The result was a form of racial segregation in people's ability to reach remoter areas. The fact that black people and other marginalized groups had to rely on buses as an affordable means of transportation, on account of their socioeconomic situation, meant that they could not reach the areas past the bridges. White people who could afford cars had fewer problems going past the bridges. Winner's conclusions have seen some criticisms. He illustrates, however, the fact that material properties of technological artifacts, in combination with other factors and an overall mode of societal organization, can affect the ways people may practically realize themselves.[1]

Edwards (2017) shows a similar situation in the racial coding of public transport in pre- and post-Apartheid South Africa. Although public buses and a railway line used to bring segregated black laborers into white areas, the unreliability of these means of transport forced these laborers to walk. Consequently, the experience of racial inequality is still present in the possible provision of public transportation and its lack in some areas (Müller 2021). In these examples, the serial structuring of people's movements is a direct result of how their historical situation forces them to rely on limited modes of transportation. In doing so, people enact and reinforce the current structures. They totalize the structures that enable them to do so because they posit these structures as their practical field of equipmentality and possibility (see section 4.3).

Paths of Freedom and Necessity

The examples presented above give instances of predominantly serial modes of structuring that enable the harmonized interplay of various modes of transportation in the flow of urban traffic. However, there are examples in which serial, materially prefabricated, and rigid options of travel disturb people's preferred way of movement. For these people, it may be necessary to break out of serial structures and spontaneously form communal structures.

When pedestrians walk through a park, for instance, the deliberately designed paths that link points of interest, such as landmarks and entry points, afford to be used. Signs might even tell pedestrians not to enter certain lawn areas, which further encourages pedestrians to use the path network.

In a Sartrean sense, this path network can be understood as a practical ensemble in which a practical field of equipmentality and possibility is predominantly structured in a serial mode. The ensemble enables pedestrians to stroll or to quickly move through the park without obstacles. Depending on the needs and desires of these

1 For a more thorough analysis of Winner's theses and their academic reception, see Joerges (1999).

pedestrians, however, this field of equipmentality and possibility can be more or less restrictive, such as when the path network itself does not directly link two points of interest in a straight line, or when it prohibits access to certain areas. It is common, for instance, in almost all areas in which people walk between two places, to see the formation of *desire paths* or *desire lines* (Furman 2012), also sometimes called *sunken lanes* or *hollow ways*. These paths form when people break free from the restrictive field of equipmentality and possibility given to them through the larger organization of their practical ensemble, choosing instead to form their field of possibility in space through their actions across time. Every desire path initially begins as the attempt to counteract a certain lack of options for action. The term *desire path* even refers to the fact that these paths are perceived to satisfy certain requirements, wants, and wishes that are not satisfied otherwise. The processes that Sartre claims to be in effect in the formation history of practical ensembles can be used to illustrate how such desire paths form as alternative options for human action, re-serialize into roads, and thus generate the need for another transformation. If the processes and mechanics Sartre develops in the context of his practical ensembles are taken as a basis, human need and the totalizing actions to tackle it must provide the entry point for this analysis (see section 4.7).

Everything begins with people's need for movement. This need is somewhat universal, given the constitution of the human body and the human condition in general. People move from one place to another for various reasons. This can be because their scarce environment does not provide them with what they require. By moving from one place to another, these people change how their ensemble scaffolds their options for action. This is the beginning of the formation of a communal ensemble.

Through their actions, these people inscribe themselves both positively and negatively into the material world. They produce positive outcomes for themselves while also producing potentially negative effects (Sartre 1978, 162). In the case of walking, positive outcomes can be, for instance, basic and complex movements through material friction, as well as the general closing of distances. These positive results are necessarily accompanied by certain negating effects in that these positive results, "in so far as they are inscribed in the object, are turned against and into it in the form of objective, negative exigencies" (Sartre 1978, 159). The act of walking also entails various material processes in which humans and instrumental means consume each other. In the spirit of Marx, every production must thus also be understood as a consumption, i.e. a *prosumption* (Marx 1983, 25; Schivelbusch 2016, 15). Inasmuch as humans wear down their shoes in the act of walking, these shoes wear down human feet, so that the skin becomes more callous to withstand pressure. Only after time, when shoes and feet have adapted to each other, will these worn and torn shoes feel like a second skin. This is a concrete, material instantiation of a *hexis* (see section 4.5).

Walking not only wears down shoes and the human body; it also imprints itself into the material conditions it takes place in. When people move from one place to another as a result of certain needs and desires, they leave traces—such as footprints—of the strategies they employed to tackle these needs and desires. These traces deepen when people repeatedly walk from one place to another, like from their home to a well and back. Eventually, these traces amount to the aforementioned desire paths, sunken lanes, and hollow ways. They link two or more places of interest and usually represent the shortest way to travel between those places; they also reflect some of the concrete needs and desires of those who trampled the paths before. As material cues, such visible connectors may represent practico-inert, material signifiers in a Sartrean sense, as these lines refer to the goal-oriented actions of others (see section 3.3). If one meets a desire path, its very existence usually means that something is interesting in one or the other direction.

Through repeated use, such desire paths become more solid and even broader. In Sartrean terms, this means that their practical inertia increases through repeated action over time. This not only represents the beginning of a *path creation* in the sense of a *path dependence* (see section 3.4); it also represents a re-serialization and thus the transformation from a communal into a serial ensemble (see section 4.4). In some instances, desire paths might have been early predecessors of modern road infrastructures. Paving these lines gives them certain material properties, through which these newly paved roads become useful for some use contexts but harmful for others. Their accessibility and utility might be increased. But changing the course of a paved road involves effort. By paving the road, people commit to a concrete course of the road. This entails even more forms of path dependences. Most importantly, the current material form and shape of these roads represent the passive remainder of the concrete strategies of past generations. The specific width of central European roads, for instance, goes back to Roman attempts to build roads wide enough so that two carriages were able to move past each other (Frey 2018, 14).

Paved road segments can connect to other road segments, which are paved in return to increase flow. When the interrelations between these road segments are structured through things, people, or rules, modes of travel are institutionalized. At this stage, road networks represent serial modes of structuring that afford people the chance to satisfy their requirements, wants, and wishes through the materialized action possibilities these roads provide. This is one way in which ontologically free, yet inherently goal-directed actions of individuals accumulate inertia over time, and eventually form practical ensembles that act back on those individuals in return.

5.3 Disturbances, Disruptions, and Crises

This section focuses on the various grades of disturbances, disruptions, and crises in urban mobility. The practical ensemble framework does not just provide principles to scrutinize the concrete relations between people and the material conditions they are situated in. It also provides tools to analyze how certain structured interrelations may influence each other, and how this might affect the structuring of these interrelations in return (see section 4.6).

Disturbances and Disruptions

Against the larger context in which the interrelations between road users and transport users take place, it becomes apparent that they affect each other's movements. For instance, depending on how the respective actions of pedestrians and car drivers are structured, how these modes of structuring interconnect, and how agents relate to this overall structuring, the interrelations between pedestrians and car drivers are more or less balanced and reconciled. Given, for instance, that pedestrians use pedestrian lights or crossings, and given that road users tend to obey the rules of traffic, their interrelations can be understood as balanced. However, such ideal cases of balanced and functioning safety and prevention measures in traffic do not necessarily represent reality.

In the case of jaywalking, the interrelations between road users are not reconciled despite possibly being otherwise balanced by certain modes of structuring. Jaywalking occurs when pedestrians cross busy streets while disobeying the established rules that regulate this crossing. Pedestrians might do this either because they do not know the traffic rules, they do not care, or they have a habit of doing it (Zhuang & Wu 2011; Xu et al. 2013). They can also jaywalk because it is faster. In Sartrean terms, they form a practical ensemble with the road that has a communal structure, to increase their options for action (see section 4.4).

However, by jaywalking, pedestrians materially intrude into the structured interrelations of other road users, such as car drivers and bicyclists. These road users must again deviate from their otherwise structured interrelations to avoid an accident. Eventually, this causes a disturbance in traffic flow, which can be transformed through proper responses to avoid accidents and by resuming structured and balanced interrelations. If accidents happen and pedestrians get injured for jaywalking, their injury can be understood as a counter-finality. Their action returns to them through the effects they caused in the structured interrelations between themselves, the road, and other road users (see section 4.6).

Although such accidents might initially represent disturbances for local flows of traffic at individual road segments, these disturbances can amount to a larger disruption in the overall flow of urban traffic. This might be the case, for instance, when

critical road segments are blocked or when traffic jams occur. Such disruptions can even be caused by exogenous events, such as natural disasters or system-wide infrastructure failures. Especially regarding networked urban infrastructures, these disruptions may lead to cascading events—events with the potential to cause further problems at all levels of constellations that rely on the service provision and the proper functionality of the infrastructures (Little 2002). Cascading effects happen because of the inherent interdependency of infrastructure systems and their critical role as lifelines of society (Rinaldi et al. 2001; BMI 2009). These systems not only enable flows of traffic and access to concomitant options for actions; the services they provide are also associated with the continued existence of societal forms of organization.

Counter-Finality and Crisis

Beyond the internal effects that a larger form of urban mobility might have on its elements and structures, there may also be greater external effects that potentially act back on the current state of urban mobility in the form of counter-finalities (see section 4.6). Undoubtedly, anthropogenic climate change represents a global counter-finality that affects not only those who are predominantly responsible for it but also all life on earth. The first condition for counter-finality—the disposition of matter—is given by the dynamic changeability of weather. Low- and high-pressure areas alternate constantly, and solar radiation is reflected by ice surfaces or warms up large land masses during the day, which then release the heat overnight. Even the confluence of cold and warm water masses in the Atlantic and Pacific Oceans affects distant weather events.

The second condition of counter-finality—the becoming-inert of human *praxis*—is given by the fact that contemporary national economies have grown to rely on international flows of goods and individualized traffic, both mainly accomplished by cars, trucks, ships, planes, and other technologies with combustion engines. The historical development of global market flows, traffic, and transport is complex and itself situated in interlocking constellations of economic interests, industrialization, narratives of modernization, and a technological push and pull among many factors. The car, for instance, developed from a luxury object for tinkerers to a fast and reliable means of transport for the middle class, until it became a given that one is supposed to own a car in modern western societies (Heßler 2012, 103–107). In this context, Merki (2008) stresses the fact that it is almost impossible to disentangle the forward and backward linkages between the economy, industry, technology, and society (22–25). Nowadays, the core modes of production and mobility in modern economies are inextricably linked to large technological systems. These widely branched and networked systems of roads, highways, tracks, fuel stops, cars, storage buildings, and other elements represent the inert and long-

lasting infrastructures of modern economies. They are the material foundations around which most contemporary societies are structured. According to Rogers Gibson (2017), paved roads have an average lifetime of around 10 to 20 years, whereas bridges last around 50 to 100 years (6). In the historical becoming of these systems, multiple developmental paths crossed, blocked and reinforced each other up until the present time (Hughes 1987; Mayntz & Hughes 1988). During this process, some forms of individual and supraindividual needs and desires could be satisfied, whereas others were created and even promoted. The contemporary constitution of modern societies is thus the materially inert product of path-dependent processes. These processes are themselves permeated by human needs and desires, material demands and requirements, and the materialized strategies to harmonize them.

Following Sartre's thoughts on the persistence of practical constellations, people's *hexeis* also play an essential role in these path-dependent processes. In section 4.5, it was mentioned that Sartre's conception of *hexis* combines aspects of Aristotelian *hexis*, habitual behavior, and habituation. As an action disposition, *hexeis* may even represent attitudes in the sense of a *habitus*. Especially with regard to private traffic, travel habits and familiarity with certain means of transportation seem to play a major role in travel-mode choice (Møller & Thøgersen 2008; Middleton 2011). In the case of car driving habits, Brette et al. (2014) argue that behavioral inertia not only reduces stress and anxiety; it even contributes to the perception that driving is itself a pleasant activity. Following the findings of section 4.5, those authors further emphasize the role of contextual cues that trigger certain patterns of behavior. When the car is taken as the means of transportation for reaching the workplace, the car will most likely remain the primary mode of transportation, given the same context. Because transportation habits intermingle with various other patterns of behavior—such as buying groceries after work in the same area, visiting friends, or going to the gym—travel habits are hard to change (415–417). Although habituated behavior might not necessarily yield negative consequences on its own, the same behavior can yield such consequences when performed by a group of people on a larger scale. The habit of using a car to get to work, for instance, does not just potentially obscure other more sustainable travel options for individuals. Usually, it is also more carbon-intensive than other modes of transportation (Schwanen et al. 2012, 527). This circumstance already points toward the third condition of counter-finalities.

The third condition of counter-finality—serial ubiquity—is given by the fact that global market flows and motorized traffic have indeed promoted both national economies and modern ways of life, especially in the northern hemisphere. This makes them attractive strategies for promoting a nation's wealth. Furthermore, this entails that other aspects accompanying these strategies—such as the presence of roads or owning a car—are associated with modernity and wealth. In the case of Peru, Harvey and Knox (2012) argue that road infrastructure has become associated

with speed, connection, and other promises of emancipatory modernity (523). Edwards (2003) even claims that the building of infrastructures has been constitutive of the modern condition (191). Larkin (2013) refers to the conceptual roots of infrastructures in the Enlightenment and the fantastical evocations and fantasies that seem to accompany infrastructure projects (332–334). Consequently, global market flows and individualized traffic become attractive for nation-states and individuals alike. Because the dominant technologies around which globalization and individualized traffic are structured also emit large quantities of CO_2 during normal operation, global CO_2 rises. In 2014, transport as a whole was responsible for 23% of all CO_2 emissions worldwide (Santos 2017).

If all three factors come together, the basic conditions for climate change as a counter-finality are met. Owing to the material and bodily inertia of infrastructure systems, and promises of economic progress and connection, the reliance on combustion engines becomes *serially ubiquitous*. The global rising of CO_2 emissions contributes to the greenhouse effect, which, in combination with dynamic weather conditions, results in global climate change and potentially catastrophic weather events (Gesang 2011, 16–18). These events may put systems into crisis, cause potential disruption, or even create global disasters. To avoid such catastrophes, the core structures around which modern economies and individual transport are structured must be transformed.

Although these examples represent simplified representations of urban mobility, global economics, transportation infrastructures, and anthropogenic climate change, they illustrate the potential of the practical ensemble framework to deconstruct structured interrelations in complex constellations, such as cities, from multiple levels, and even to analyze the contribution of individuals for system-wide effects.

5.4 Infrastructures as Needful Structures

This section offers a more focused analysis of urban infrastructures in general, and urban mobility infrastructures in particular, through Sartre's practical ensemble framework. Again, the perspective on human needs and desires is central.

Urban Infrastructures

Urban infrastructures are remarkable constellations of practico-inert things, structures, and practices that organize societal interrelations in fundamental ways. In modern cities, infrastructures and their concomitant structuring are omnipresent, although often unnoticed. Drainpipes and power cables stretch under widespread street networks and enable a constant flow of water, electricity, information, and

power, and send those things across the borders of human settlements, nation-states, and even continents. Some of these structures, like streets, water supplies, and sanitation, date back to ancient civilizations. Compared with these old constants of human settlements, electric power, and digital information technologies are relatively new. However, these modern systems have had profound impacts on the constitution of the modern condition. In most countries, even rural areas are connected to some sort of infrastructure systems, such as roads, electricity, or information systems.

Owing to their ubiquity, historicity, and practical inertia, infrastructures do more than their basic functional roles would suggest (see section 5.3). These structures not only support and manifest forms of societal organization; they also store power relations (Engels & Schenk 2014), and produce complex intermittent fluctuations of temporalities (Engels 2020). However, in most cases, especially given proper functionality, infrastructure systems are usually obscured by everyday routine and intentional design decisions. In modern societies, infrastructures represent instantiations of background technologies. Most people relate to them without noticing it (Ihde 1990, 109–111). However, for experts and maintainers, and when everyday users are affected by infrastructure disruption, infrastructures shift to the foreground and can generate the immediate need for preparatory and preventive measures.

This illustrates the challenging manner of appearing of infrastructures (Müller 2021). On the one hand, material infrastructures provide the ever-present "artificial environment" (Edwards 2003, 189) of urban life. On the other, these technological systems become somewhat opaque in cases of emergency, catastrophe, or disruption. Five out of nine properties that Star (1999) identifies regarding infrastructures relate directly to their manner of appearing. These are *embeddedness*, *transparency*, *learned as part of membership*, *embodiment of standards*, and *becomes visible upon breakdown*. According to Star, these properties are essential to infrastructures. From a technical perspective, a certain infrastructure transparency is intentional. These systems are supposed to be unobtrusive for everyday users while still allowing technicians and engineers to maintain critical elements (Müller 2021). Edwards (2017, 2019) approaches the challenging manner of appearing of infrastructures differently, by focusing on habituation processes as well as on the habits and skills of their users—which potentially render infrastructures transparent or invisible throughout their use context. Edwards points out that people may become habituated to the service provision of infrastructures, given that this service provision is somewhat reliable:

> Evolution designed human attention first and foremost to detect immediate danger, so our brains always focus most urgently on things that change, rather than those that remain constant. You cannot avoid noticing a fast-moving object that

> enters your field of vision, but you must work rather hard to see the end of your own nose, even though it is always visible. You notice the refrigerator's hum when it starts up, but after a few seconds it fades entirely from your consciousness—until it stops and you briefly notice it again. The same phenomenon makes infrastructures you use every day unnoticeable: they are always there, and they always do the same thing, so your mind has better things to do than focus on them. (Edwards 2019, 358)

Furthermore, users interiorize the social norms and routines of urban mobility through repeated and even daily practical interrelation with things and structures. In so doing, they cultivate a *hexis* that allows them to satisfy their material or immaterial needs and desires efficiently and effectively (see section 4.5). Despite being an acquired practical interrelation between a person's *hexis* as an action disposition and a practico-inert technological artifact or structure as material disposition, the routinized realization of this interconnection in everyday activities becomes normalized as an integral part of how the practical ensembles work. As "[h]uman attention naturally focuses on what changes, rather than what remains constant" (Edwards 2017, 329), infrastructures seem to shift in and out of everyday awareness, depending on both whether experts or laypeople interrelate with them and what extent these people routinize this interrelation and habituate it (Müller 2021).

The core characteristic that seems to constitute the very concept of infrastructure is illustrated by the fact that these systems and institutions, which are usually considered to be infrastructures, provide specific services, knowledge, or other items that other sometimes more complex services, structures, institutions, individuals, and the general public depend on (Müller 2021). This explains not only their fundamental role in the structuring of modern societies but also their manner of appearing. Furthermore, it underlines the fact that things, structures, and even institutions derive their significance from the place they adopt in larger constellations. Sartre's practical ensemble framework comes into play here. In rather abstract ways, what constitutes an infrastructure is its relative importance as a result of the barely substitutable services it provides in a practical constellation. This conception can apply to almost every element in such constellations.

However, the material focus of Sartre's practical ensemble framework, as well as the needfulness understood to pervade all levels of practical constellations, allow one to ground the concept of infrastructure in the practically inert systems that serially structure, support, and prefabricate societal forms of organization based on human needs and desires. Larkin (2013) describes this conjunction as follows: "Infrastructures are matter that enable the movement of other matter. Their peculiar ontology lies in the facts that they are things and also the relation between things" (329).

Infrastructural Inertia and Resilience

Section 5.3 already indicated the critical role of infrastructures. With regard to urban mobility, that role can be further scrutinized regarding the way material infrastructures support and structure the formation and consolidation of urban mobility cultures through the interplay of their inert elements. Urban mobility cultures describe dominant modes of transport in connection to predominant socioeconomic conditions in cities. Klinger et al. (2013) identify these dominant modes according to certain indicators, such as spatial arrangement, density, population size, available transport infrastructure and supply, travel habits, attitudes of citizens and commuters, and so on. They cluster German cities, for instance, into cycling cities, auto-oriented cities, walking cities, and transit cities, among other types. Cycling cities, like Bremen or Leverkusen, are characterized by having a below-average population size and settlement density. Generally, cycling cities are smaller than auto-oriented cities such as Aachen and Wiesbaden, which, in return, have greater than average car-related businesses and fewer travel options besides cars. Transit cities, such as Augsburg or Dresden, are characterized by lower-priced tickets for public transport as well as a generally lower household income.

A similar concept to urban mobility cultures is that of urban fabrics. Newman and Kenworthy (2015) develop this concept to consider ways in which patterns of land use change and react to the transport infrastructures and to what they call the *priorities of cities*. The authors use a clustering similar to that in Klinger et al. (2013) and distinguish between walking cities, transit cities, and automobile cities to illustrate the interplay between material arrangements of urban spaces and the population's basic and more complex requirements, wants, and wishes. The authors use Marchetti's constant as a basis for their research. According to Marchetti's constant, humans have a somewhat fixed travel-time budget of around one hour, on average, per day that they are willing to commute. Based on this constant, the authors conclude that cities grow in relation to the speed with which people can commute through them. According to the authors, walking cities have represented the most common urban form for 8,000 years, and most city cores still retain the characteristics of walking cities.

Through the lens of the practical ensemble framework, this fact can be interpreted according to the needs, desires, and capabilities of a city's human elements as well as the composition of their practical field of equipmentality. Walking cities generally have narrow streets and shorter block sizes for optimal walkability and reachability of places in less time. Given that walking, riding, or traveling by cart or carriage were the dominant modes of transportation for the majority of human history until the industrial era (Merki 2008, 16), the material arrangement of cities represents the technological possibilities of those times. Automobile cities, on the other hand, oblige their inhabitants to own cars or to switch to other modes of transporta-

tion, as streets are generally wider and blocks further apart (Newman & Kenworthy 2015).

The interplay of the inert elements of urban mobility can be further scrutinized through the concept of *resilience*, a key idea in critical infrastructure research (J.I. Engels 2018a). Resilience is understood as the "capacity of a system to absorb and cope with perturbations" (Elsner et al. 2018, 31). The concept can be understood in terms of a *bouncing back* to its initial mode of operation, or in terms of a *bouncing forward*, an adaptation, to another mode of operation. According to Sartre's view on practical ensembles, both aspects of resilience can and even must be understood through the practical interrelations between their human and non-human elements.

The material side of infrastructures is usually built to last from 10 to 20 years, in the case of paved roads, to up to 100 years in the case of water distribution and sewage systems (Rogers Gibson 2017). Their relative durability renders these material infrastructures fairly resistant to change. Moreover, given that their specific properties provide a wide range of options for action, these material infrastructures can even be used throughout changing societal and political transformations. Roads, bridges, and sewage systems scaffold fundamental practical fields of equipmentality and possibility. They represent modes of serial structuring that enable the processing and consummation of various forms of societal organization. Simultaneously, in being continuously used, these material infrastructures are totalized as the necessary conditions of possibility for the practical ensembles that build on them. In this regard, such material infrastructures also represent the necessary conditions of possibility for a *bouncing forward* in the form of an adaptation of the larger practical ensemble. The previous chapter mentioned that serial and communal modes of structuring overlap and mutually enable the other modes to be realized through human action. Throughout history, the same roads have been used for needy and desiring people, tanks and soldiers, military parades, and freedom marches. The material foundations remain and enable different forms of societal constellation.

The human counterpart of material infrastructures is human *hexis*, in the sense of the routinized action dispositions cultivated by the repeated use of these infrastructures. Section 4.5 mentioned that practical ensembles persist through the *hexeis* of their human elements because it is those elements that enact the conditions of possibility of their actions by performing them. Because human elements rely on the goods and services their infrastructures provide or enable them to produce and perform, these elements stabilize the predominant modes of structuring for their respective practical ensembles. Such *hexeis* exhibit a high inertia themselves.

Criticality and Vulnerability

The criticality of infrastructures lies in the fact that the services they provide are directly linked to the satisfaction of individual and societal requirements, wants, and wishes. Movement has already been noted as an essential part of the human condition (see section 5.2). Owing to how serial modes structure flows of people, goods, and information, urban mobility infrastructures represent the concrete *interests* of urban dwellers. This is because of the positions both urban dwellers and infrastructures adopt in the larger form of organization for urban mobility (see section 4.3).

The practical inertia of urban mobility infrastructures, as well as the serial structuring that these infrastructures manifest, prefabricates a field of possibility that urban dwellers have to make use of to satisfy their needs and desires. In this way, urban mobility infrastructures are associated and even equated with continued human existence. This, in turn, leads to a concatenation of human and non-human elements, which together amount to a mutual functional criticality (Lukitsch et al. 2018, 16).

In critical infrastructure research, the concept of *criticality* is used to assess and analyze the dynamics of how infrastructures derive their societal significance. Criticality has its roots in the Greek *crisis* as discussed in section 4.6.

In the context of urban infrastructures, the concept of criticality has a long history. Folkers (2017, 2018) dates the concept to the idea of *Daseinsvorsorge*, or *existential provision* developed in Nazi Germany in the 1930s. This idea, like other structures and institutions from that time, found its way into the Federal Republic of Germany's welfare state paradigm. *Existential provision* refers to the idea that modern conditions and urban environments challenge pre-modern ideals of self-sustenance, which is why the state must provide for the structures and services that individuals require to live productive lives. During and after World War II, the criticality of infrastructures was reassessed in accordance with their relative importance for warfare, given the fact that some structures are vital points when attacked by the enemy. In the US, for instance, this so-called vulnerability mapping and the concomitant attribution of criticality to certain structures and systems was most prominent during the Cold War. In this way, the concept of criticality and critical infrastructure found their way into the civil sector (Collier & Lakoff 2008).

In all these contexts, criticality is used descriptively to identify and measure the relevance of certain features of society. Nowadays, the *existential provision* from the state, and the *critical vulnerabilities* of society in the case of war, have yielded to more systemic thinking about the importance of infrastructures. Technological innovation, rationalization, networking, and functional differentiation have led to a more sociotechnical conception of infrastructures that complicates a clear assessment or a clear hierarchy of which structures and systems are more critical than others and why.

The COVID-19 pandemic brought increasing difficulty in determining which parts of the population to protect, on which structures and institutions to rely, and how to fairly distribute social responsibility, workload, financial compensation, and vaccination, both on national and international levels. For instance, most protective measures taken during the pandemic were meant to avoid overstraining health infrastructure while predominantly relying on transport and information infrastructures for maintaining supply chains and social connectivity. Societies wish to avoid the collapse of their health infrastructure not just because it would mean loss of life but also because they require a large workforce to maintain other infrastructure systems. Health infrastructure is thus disclosed as a critical infrastructure, because it provides services that keep other infrastructures running in one way or another for those infrastructures, like the electrical grid, to keep health infrastructures running, and so on.

To reassess the potential of the concept of criticality, J.I. Engels (2018b) identifies three dominant perspectives on infrastructural criticality in infrastructure research. They differ regarding the strategic contexts in which criticality can be used as an analytical concept. The first perspective is concerned with systemic criticality. Systemic criticality is a bottom-up perspective that highlights single components as critical for system functionality. From a systemic perspective toward criticality, for instance, roads are understood as critical for traffic, water supply is critical for living, and wastewater disposal is critical for public health. This perspective is mostly concerned with the relation between infrastructures as individual parts of a sociotechnical totality and the general functional interplay of parts and wholes.

The second perspective is concerned with consequence-based criticality. Consequence-based criticality highlights societal consequences in the disruption of individual infrastructure systems. While the systemic perspective toward criticality also considers potential consequences via the functionality of the whole, consequence-based criticality represents a top-down perspective toward individual components. From a consequence-based perspective on criticality, infrastructures are essential because their disruption potentially threatens the well-being of individuals or even society as a whole.

The third perspective is not a strategic perspective *per se*, as it is mostly concerned with how criticality emerges in political discourse. J.I. Engels remarks that infrastructural criticality is in some sense always a product of an ascription or an attribution within a specific discourse. As such, criticality is always, in a sense, ideological. What is important for whom and why is not only a result of system features or potential harms and consequences, but also a result of political decision-making and, most importantly, ideological framing. Similar to processes of *securitization* (Balzaq 2005; Balzaq et al. 2016), J.I. Engels refers to scientific approaches that analyze processes of *criticalization*, through which societal relevance is ascribed to certain infrastructure systems. In this way, criticality can become a powerful tool for

exercising power by framing specific discourses. By attributing criticality to certain infrastructures, these structures transform from *matters of fact* into *matters of concern* (Latour 2004).

Based on his reflections on the analytical perspectives for criticality, J.I. Engels does not advocate for criticality as a measure or property of infrastructures that describes their importance or relevance. Instead, he sees criticality as an expression of the degree of relationality of individual components within networked systems. According to J.I. Engels, the relevance of a component or an infrastructure is expressed in the number and significance of its relations. Criticality is thus largely an expression of the density and causal quality of networking (J.I. Engels 2018b).

In the context of Sartre's view on practical ensembles, the condition of possibility for an infrastructure's density and causal quality of networking, which may be called their *sociotechnical relationality,* is grounded in two things. One is the intricate and practical interrelation between the goal-directed actions through which human beings satisfy their requirements, wants, and wishes. The second is the things they instrumentalize and thus associate as the stable means to meet their ends. The conditions of possibility for infrastructural criticality are thus inherent in the systematic provision of essential goods and services both in and through practical ensembles.

Against the background of Sartre on practical ensembles, the concept of criticality is closely connected to vulnerability, another key concept of critical infrastructure research (J.I. Engels 2018a). The concept itself evokes images of open wounds and inherent vices. Because the criticality of specific infrastructure systems is expressed through the high sociotechnical relationality of individual components and systems, this criticality also reveals the spots that may cause harm or even cascading collapse to the functionality of other systems in the case of disturbance or failure. In the continued operation of sociotechnical systems, a certain dialectic can be identified—the very conditions of possibility enabling these systems to function in accordance with their intended requirements also render these systems prone to fail when those conditions are harmed. Through this dialectic in the operation of urban mobility infrastructures as practical ensembles, certain structured interrelations are revealed as weak spots that are therefore in need of protection (Kröger & Zio 2011, 5).

There is an inherent interconnectedness in urban mobility, understood as a strategic constellation to satisfy individual and supraindividual needs and desires. The integrity and functionality of those structures support this form of organization and enable this satisfaction, and is thus equated with people's continued existence. Consequently, people experience their own vulnerability through the susceptibility of urban infrastructures to disturbances, disruptions, and crises. The inherent needfulness of human beings is thus expressed in the needfulness of their infrastructures, and vice versa.

5.5 Concluding Remarks

This chapter explored how Sartre's view on practical ensembles can be applied to deconstruct and better understand some of the challenges of the human condition in modern societies. In this view, urban mobility represents a multilayered system of structured interrelations as well as a complex network of people, things, structures, and regulations. The material rigidity of urban mobility infrastructures enables the flow of goods and people through space. This flow is itself a complex product of how the actions of individuals are mediated by and for each other. Despite this rigidity, however, people, especially pedestrians, have the opportunity to blaze their paths where the current practical field does not suit their needs and desires.

The most important aspect of urban mobility infrastructures is their criticality and vulnerability. The inherent needfulness of the human condition works its way into the structures that were produced to tackle this needfulness in the first place. From the complex entanglement between humans and non-human things in the consummation of practical ensembles, the needful structures act back on the human elements again by exposing them to more complex requirements and material demands. The oscillation of liberation and necessitation can thus be found on all planes of human reality and history—in the complex sociotechnical relationality of modern societies, and the fundamental structure of human existence.