# TOWARDS HEALTH-FOCUSED URBAN MOBILITY PLANNING

## *A PLANNING PRACTICE ANALYSIS*

Master thesis


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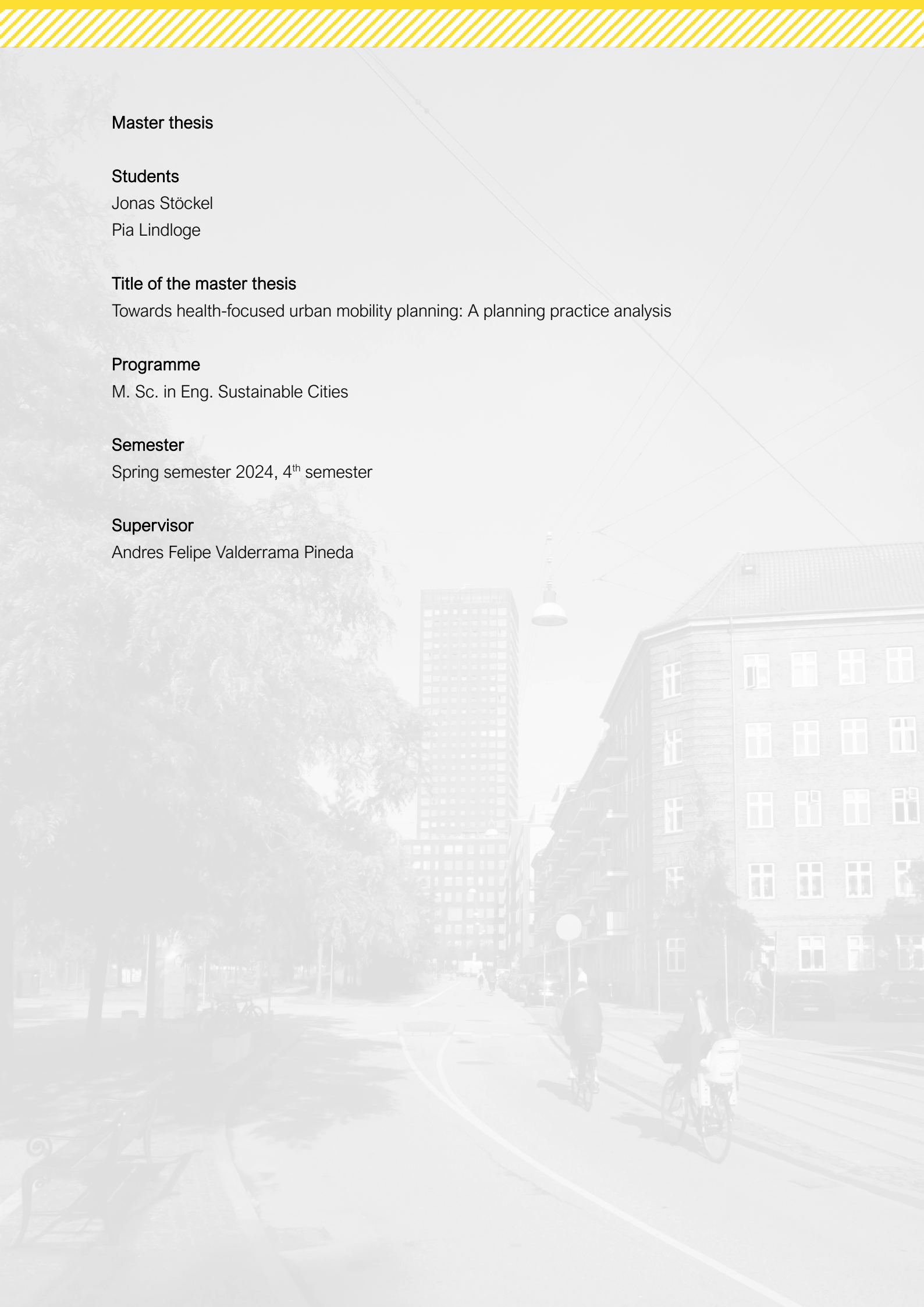

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## Abstract

This thesis investigates the integration and improvement of public health considerations in urban mobility planning by examining two approaches: the Cycle Superhighway Collaboration in Greater Copenhagen and its socio-economic analysis and the Healthy Streets approach. The research aims to understand how these practices can complement each other to enhance public health outcomes and support sustainable urban development. The study begins with an overview of the thematic and local context, emphasising the interconnections between public health and mobility as well as the challenges posed by sedentary lifestyles, environmental pollutants and urban infrastructure. A comprehensive literature review traces the historical development of health considerations in transport planning and highlights the shift from car-centric policies to holistic models that incorporate various health pathways.

The methodological framework of the thesis is grounded in practice theory, which allows for a detailed analysis of the practices and the elements involved in mobility planning. This framework is essential for understanding the routinised behaviours and the interdependencies between materials, meanings and competencies within these practices. The Healthy Streets approach is analysed for its emphasis on human health indicators in street design, promoting cleaner air, inclusive environments and ease of mobility. In contrast, the Cycle Superhighway Collaboration employs a socio-economic analysis to quantify the health benefits of cycling infrastructure, demonstrating significant socio-economic returns and health improvements, such as reductions in sick days and air pollution. The research methodology includes explorative and semi-structured interviews with key stakeholders, the application of the Healthy Streets Check for Designers and qualitative analysis using NVivo. The findings reveal that while the Healthy Streets approach is effective for early-stage planning and community engagement, the socio-economic analysis is suitable for providing economic justification for health-focused mobility projects.

The thesis concludes that integrating these two approaches can form a comprehensive, health-focused mobility planning practice. This integrated approach can address both immediate local needs and broader systemic impacts, aligning with WHO Europe's Essential Public Health Operations and Sustainable Development Goals. By leveraging the strengths of both practices, urban planners can create a more holistic and inclusive sustainable mobility planning framework that significantly enhances public health and urban liveability.



Key words:

Practice theory, Healthy Streets, Cycle Superhighways, public health, socio-economic analysis, sustainable mobility

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# List of Abbreviations

| | |
|---|---|
| BCR | Benefit-Cost ratio |
| CBA | Cost-benefit analysis |
| DTU | Danish Technical University |
| EPHO | Essential Public Health Operations |
| HSCD | Healthy Streets Check for Designer |
| NCD | Non-communicable diseases |
| NZE | Net Zero Emissions |
| PTA WA | Public Transport Authority of Western Australia |
| SDG | Sustainable Development Goals |
| SSP | Shared Socio-economic Pathways |
| TfL | Transport for London |
| WHO | World Health Organisation |
| WHO Europe | European Office of the World Health Organisation |

# 1. Introduction

Copenhagen is widely regarded as a symbol of sustainable urban development and mobility. Much, but not all, of what lies behind this perception takes place on the streets. When envisioning Copenhagen, well-developed cycle paths might be among the first things that come to mind. But the city may also be associated with well-developed public transport, urban greenery and water retention systems. Under the asphalt, extensive energy and district heating networks supply increasingly green energy to meet the city's growing energy demands. (City of Copenhagen, 2024a)

*Figure 1: Dedicated cycling street in Vesterbro, Copenhagen*

Streets play an important role in sustainable cities. This is not only due to their function as carriers of many critical systems within an urban environment, but also to the sheer amount of urban space they occupy. A UN Human Habitat report from 2013 estimates that roads take up between 30 and 35 percent of the space in cities on average (UN-Habitat, 2013).

A person leaving the front door usually perceives the city from the perspective of the streets. Streets form the basic structure of urban space, via which the various locations in the city are accessed. Their layout can be compared to a fingerprint reflective of the unique conditions of life taking place in the city at present and in the past. In other words, streets provide information about social structures and urban coexistence. The remains of city walls, streets and traffic rings around centres of public life reflect historical circumstances and living conditions. The layout of medieval European cities, for instance, with their winding streets and alleys, contrasts sharply with the grid systems of modern American cities (UN-Habitat, 2013). These patterns reveal much about the priorities and constraints of the times in which they were constructed, be it defence and community interaction or the facilitation of efficient movement, urban sprawl and economic activity.

What takes place on the streets and which spaces and people they connect and serve is presumably no less evidence of social structures, priorities and meanings. For instance, the presence of bike lanes and lively pedestrian zones in cities like Copenhagen could highlight a societal emphasis on sustainable mobility and public health. Moreover, the distribution of public transportation networks can indicate economic priorities and social equity, as these networks often aim to provide accessibility and connectivity to diverse urban populations.

In cities around the world, street traffic has influenced not just the physical structure of the urban environment but also the ability of humans to live healthy lives. The World Health Organisation reports that in 2019, approximately 4.2 million people died from causes linked to outdoor air pollution, a significant portion of which originates from motorised vehicles (WHO, 2022a).

We expect that considering the role of streets in urban life more broadly can provide valuable insights into societal priorities and help address contemporary urban challenges. However, when thinking of streets in isolation, we often overlook their role as a precondition for urban life and their intrinsic connection to societal well-being. It is all too easy to perceive streets merely as stretches of asphalt designed for driving and parking cars. Contrasting this common perception, more mobility planning approaches are emerging that recognise streets as human habitats, emphasising their integral impact on health and well-being.

This master's thesis explores approaches to integrating public health aspects into mobility planning, focusing on two cases: the Cycle Superhighway Collaboration's use of a health-adjusted socio-economic analysis in the Greater Copenhagen region as well as the Healthy Streets approach and its application among other places in Australia. The Cycle Superhighway Collaboration serves as a case study to demonstrate how socio-economic analyses can highlight the societal value and return of investment of cycling infrastructure. This approach raises important questions about the benefits and limitations of viewing health through an economic lens. In contrast to the transport-economic approach, Healthy Streets, a planning framework developed in London, provides a way of incorporating health directly into mobility planning (Healthy Streets, 2024a). It focuses on specific, tangible indicators of a street's health performance, such as clean air, inclusive environments and ease of crossing. We quickly assumed a stark contrast between this approach (Healthy Streets) and a transport economic approach, prompting us to explore how the planning model underlying Healthy Streets is implemented and compatible with established ways of mobility planning.

To deepen our understanding, we conducted several interviews with stakeholders involved in both approaches. In Copenhagen, we engaged with the current and former heads of the Cycle Superhighway Secretariat, gaining insights into the local planning context and the application of socio-economic analysis. While there is a lack of experience with the application of Healthy Streets in Copenhagen, our research was enriched by discussions with five Healthy Streets practitioners working in Australia. Despite the different local contexts, these conservations provided perspectives on the integration of health and mobility that could, to a degree, be generalised.

Our exploration revealed that streets can be viewed and planned as integral parts of the urban human habitat. The contrasting approaches of the Cycle Superhighways and Healthy Streets underscore this potential for mobility planning to enhance human health and well-being. Given the externalities of modern urban life, such as air pollution, noise pollution and the spatial demands of

motorised traffic, this perspective is crucial to explore. The risks posed to cities by climate change make this exploration even more important.

Our research is motivated by a desire to understand how a focus on health can serve as a barometer for the overall human-centred orientation of a city's mobility and transport systems and centres around the following main research question:

*How can a health-focused street design and mobility planning practice complement a cost-benefit-driven transport planning practice to contribute to public health improvements in cities?*

By examining the socio-economic rationale behind Copenhagen's cycling infrastructure and the application of the Healthy Streets approach, we aim to uncover the benefits and challenges of these differing approaches and explore their potential to support each other in achieving a shared vision for healthy urban life. Utilising practice theory, we can characterise and differentiate these approaches and understand how they are embedded in complexes of meanings, materials and competencies. Ultimately, this thesis seeks to contribute to the ongoing discourse on how cities can be planned and designed to prioritise human health, liveability and well-being.

# 2. Structure

The thesis begins with an introduction to the topic's circumstances. This includes the thematic context, covering public health and mobility statistics, the local context of Copenhagen, sustainability, climate change, human rights and their intersections with public health. A subsequent literature review covers the latest research on the relationship between urban environment, mobility and health as well as practice theory and planning. This review highlights current issues and situates our work within the existing body of research. From the main research question presented in the previous chapter, additional guiding questions will be developed to further structure the analysis of this study. Chapter four details the methodological and theoretical background, beginning with the theory underpinning the research. We then explain the methods used and the limitations of the research. Chapter five analyses the two mobility planning practices under investigation and their consideration of health. Each practice is analysed separately, examining element clusters and interdependencies within each planning practice. This analysis contributes to the characterisation of the planning practices. Chapter six discusses how the characterised planning practices can lead to public health improvements. The chapter further identifies key distinctions between the practices. Finally, we explore the potential of integrating both practices to enhance public health in cities.

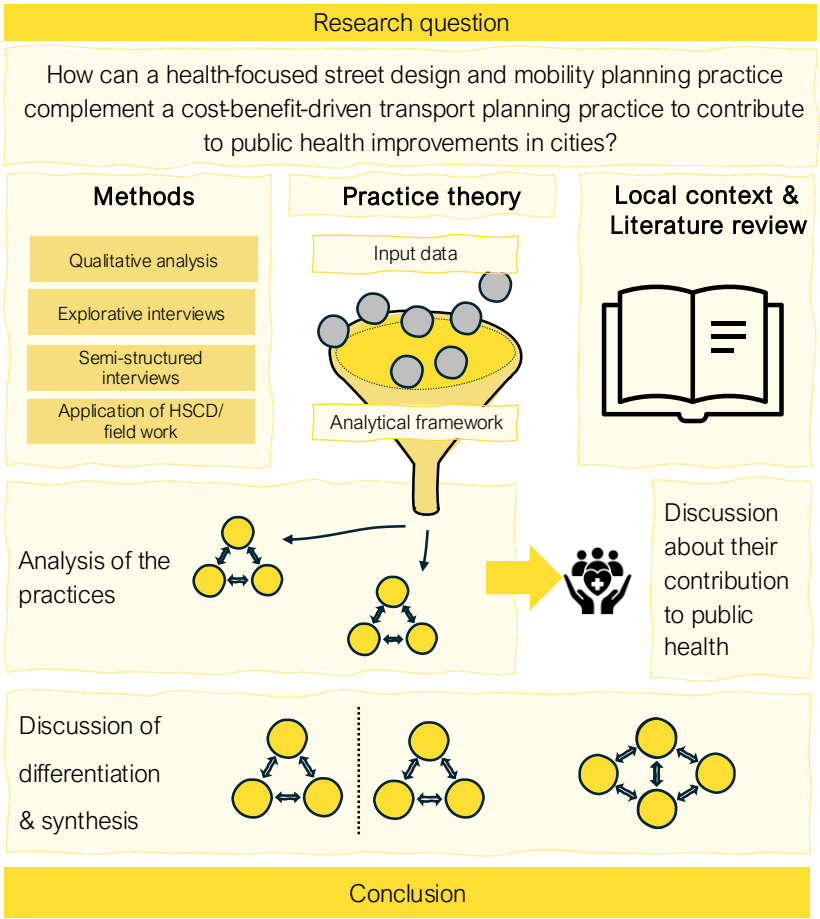


*Figure 2: Research design*

# 3. Problem formulation

Health as a guiding theme in mobility planning has gained increasing attention in recent years due to the rising prevalence of non-communicable diseases (NCDs), sedentary lifestyles and environmental pollutants. This section provides an overview of the topic by presenting the current state of research on the impact of transport on health and offering a working definition of public health. The local context of the research, Copenhagen, is examined, highlighting the city's public health challenges and the strategies employed to address these issues. The chapter further explores the relationship between sustainability, climate change, human rights and health, emphasising their interconnections with mobility. Additionally, we review policies and tools available in mobility planning to promote health. Given the pivotal role of practice theory in this thesis, we explain its application in planning research. These considerations led to the formulation of the research problem that this thesis aims to address.

## 3.1 Thematic and local context

The thematic and local context describe the circumstances and status around public health and mobility globally, in Denmark and in Copenhagen. Furthermore, the role of mobility planning within sustainability, public health, climate change and human rights is presented.

### 3.1.1 Public health and mobility in numbers

#### Health and public health

To understand what is meant by health and public health in the research at hand, it is necessary to clarify the terms. Health, defined as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1946), is determined in part by the mobility of people in cities and the urban structure. Furthermore, public health as a science with a focus on the whole society, not just the sick and injured, plays a role in the connection between health and mobility (APHA, 2024). Public health is concerned with preventing diseases and injuries through promotion and protection of health, such as fostering healthy lifestyles or researching disease and injury prevention (ibid.). At a later point in the thesis, the term is described in more detail, introducing a public health framework by the WHO Europe that is applied to answer the research questions.

#### Health impacts gain more importance

The connection between health and mobility planning in cities gains global importance with an increase in non-communicable diseases (NCDs, diseases not caused by acute infection), physical inactivity, sedentary lifestyles, as well as noise and air pollution (Bentley et al., 2018). The interdependence between urban structure and mobility was also noted by Bentley et al. (2018), who found that urban structure can prevent people from being physically active or creating a walkable

environment, e.g. through large streets separating neighbourhoods. Planning for road safety, air and noise pollution or access to green public spaces can be a way to mitigate these negative effects on health.

A closer look at the nature of non-communicable diseases underlines the role of mobility in their development. The interplay between urban mobility and lifestyle choices impacts the prevalence of chronic diseases related to a lack of physical activity or caused by exposure to environmental pollutants (WHO, 2023). Such diseases encompass cancer, cardiovascular diseases, chronic respiratory diseases and diabetes (ibid.). These diseases accounted for 74% of global deaths in 2023 (ibid.). The World Health Organisation (2023) mentions, among other factors, that physical inactivity, unhealthy diets and air pollution increase the likelihood of dying from non-communicable diseases (NCDs).

#### Ways of addressing health challenges caused by mobility

Addressing health challenges caused by mobility requires innovative strategies. Changes in lifestyle, technology and land use in recent decades have led to a different level of physical activity (Vicioso et al., 2018). Daily exercises are no longer associated solely with people's private and working lives (ibid.). Exercises are rather a choice made by individuals to stay healthy (ibid.). Motivating people to engage in active travel is one way to promote being more physically active (ibid.). Research suggests that integrating transportation into daily routines may be easier than incorporating leisure activities like running (Saunders et al., 2013). Saunders et al. (2013) explain that leisure activities often lack long-term commitment, making their integration more challenging.

### 3.1.2 The local context in Denmark and Copenhagen

#### Public health challenges related to mobility and urban transport in Denmark

General concerns about unhealthy lifestyles related to mobility patterns have been recognised both globally and nationally. Denmark also faces public health challenges linked to mobility and urban transport. The Danish Health Authority (2023) noted significant disparities in physical activity levels across different age groups, genders and socio-economic statuses. There is, for example, a large share of women (73.2%) and men (67.9%) who do not meet physical activity recommendations (Danish Health Authority, 2023). Individuals with lower levels of education are less physically active and more sedentary compared to those with higher levels of education (ibid.). Mobility may be a field of action to address such public health concerns, as over 40% of all deaths in Denmark are caused by environmental and behavioural factors, which include physical inactivity (OECD and EOHSP, 2023).

In addition, the lower the income and level of education are, the higher the risk of obesity (OECD and EOHSP, 2023). In its report on the state of health in Denmark 2023, the European Commission highlights the rising obesity rate among Danish adults, which currently stands at 16%, in line with the EU average, with the risk varying according to socio-economic status (ibid.). Since 1996,

the number of people with type 2 diabetes has tripled. The Danish Diabetes Association (Diabetes Foreningen, 2022) calculated that the annual cost of diabetes for society is a minimum of 31.8 billion DKK. Mental health is another significant public health concern. In 2019, over one in six Danes experienced a mental health issue, a figure comparable to the EU average (OECD and EOHSP, 2023). These statistics highlight the need for action in Denmark.

### Structure of health organisation in Denmark

The organisational structure of health in Denmark influences who feels responsible for integrating health considerations into mobility planning. Responsibility for health in Denmark is divided among the state, regions and municipalities (Birk et al., 2024). The state is responsible for general regulations, supervision and fiscal functions (ibid.). The five regions coordinate policy development, hospital management, financing and planning for primary care services (Birk et al., 2024). The 98 municipalities handle home and institutional long-term care, public health and rehabilitation (ibid.). This division of responsibilities among different levels of government plays a crucial role when cooperation between entities is required to implement health measures across sectors. For example, effective implementation of health promotion measures in policy development and public health necessitates communication and collaboration between these political levels.

### Actions to address public health

After covering the status of health at a global and a national level, we will subsequently describe aspects of the local status of public health in Copenhagen. The capital city, an important site of our research, also deals with obesity and other diseases that can be addressed with mobility planning. As a general framework for the city, in 2015, Copenhagen developed the policy document *Enjoy Life, Copenhagen. City of Copenhagen Health Policy 2015-2025* (City of Copenhagen, 2015). This health policy aims to eliminate health inequality, address health challenges, improve life quality and provide direction for residents' health status in 2025 (ibid.).

### Action to fight obesity in Copenhagen

Currently, in the Capital Region, the risk of becoming sick decreases with higher levels of education, highlighting the unequal distribution of health and disease within society (Lau et al., 2021). 47% of the population of the Copenhagen region is affected by being overweight (ibid.). Furthermore, 2.9% of Copenhagen's adults have diabetes and 4.3% are at risk of diabetes (Diabetes Foreningen, 2022). Copenhagen joined the programme Cities for Better Health organised by Novo Nordisk in 2014 (Cities for Better Health, 2024). As a result of the programme and research, the city developed the Diabetes Action Plan in 2016, focusing on inequalities in diabetes management. A follow-up of the plan, the Action Plan for Diabetes and Heart Diseases 2022-2025 was developed in 2022 (City of Copenhagen Health and Care Administration, 2022).

### 3.1.3 Mobility planning in the context of sustainability, climate change and human rights

The preceding chapters show that health is intrinsically linked to urban living, with mobility playing a crucial role. Mobility affects both the environmental conditions to which citizens are exposed and the lifestyles they lead. Although public health can be viewed as a separate concern, it is deeply implicated in broader sustainability issues. This is illustrated, for instance, when considering climate change, to which an increasing number of public health risks in cities can be attributed (WHO, 2024). Ensuring a healthy life on the planet is a fundamental objective of environmental protection, which includes public health in urban areas. As Meier et al. (2022: 1) state, "global health is inextricably linked to planetary health and safety."

In addressing the public health risks associated with climate change in cities, measures can be taken both in mitigation and adaptation. While adaptation efforts can protect against local threats to public health, mitigation efforts may address the root causes. Both approaches to managing climate change can, in principle, be linked to healthy mobility in cities in the following ways:

Firstly, a population in good health is better equipped to withstand extreme climate conditions, which enhances resilience to climate-related events. Vulnerable populations, particularly the elderly and those with health challenges, are at higher risk during high temperatures, as evidenced by increasing death rates during heat waves and even normal summers (WHO, 2024). In addition, environmental destruction and extreme conditions can increase the risk of contamination and disease outbreaks and lead to severe psychological stress beyond the physical effects (UNEP, 2020; Meier et al., 2022). Sustainable mobility solutions and policies mitigate these risks by reducing air pollution, encouraging physically active transportation modes and providing transport services that are accessible, protected against extreme conditions and locally available (WHO, 2022b). Viewing streets as local environments in the process of mobility planning may direct attention to the potential for streets to offer rest, safe walking, shading and urban cooling, thereby addressing health and climate change adaptation simultaneously.

Secondly, considering health protection in cities over the long term, climate change mitigation becomes crucial. The pathway of global warming we choose will significantly impact public health and can determine the survival of many people (Lee et al., 2018). Shared Socio-economic Pathways (SSPs), as defined in the IPCC's sixth assessment report (IPCC, 2023), offer narratives for potential climate scenarios and illustrate the strong influence of climate change mitigation efforts on urban health (Riahi et al., 2017). SSP1 represents a best-case scenario with successful climate change mitigation and adaptation, increased investments in education and health and economic growth decoupled from resource exploitation and carbon emissions, emphasising human well-being (ibid.). Conversely, SSP3 presents a scenario where both mitigation and adaptation efforts are significantly hampered, leading to resource scarcity and spatial conflicts (ibid.). This severely undermines global public health and exacerbates inequalities, particularly in densely populated areas of developing economies (ibid.). Mobility planning is closely linked to these impacts, as the

transport sector significantly contributes to global greenhouse gas emissions and is, according to the International Energy Agency, significantly lagging in terms of aligning with a Net Zero Emissions (NZE) by 2050 scenario (IEA, 2023).

Addressing the intersection of climate change, mobility and public health, human rights offer an important perspective for shaping the legal foundations for the development and enforcement of equitable climate and mobility policies. Environmental degradation can increase health inequalities and threaten fundamental human rights, including the right to health, water, food and adequate living conditions (Meier et al., 2022). International human rights frameworks can legally support advancing public health in the face of climate change, underscoring the need for global and national policies to incorporate human rights principles to protect the most vulnerable populations (ibid.).

### 3.1.4 Aligning mobility planning with public health and Sustainable Development Goals

It becomes clear that improving public health through mobility planning can be associated with broader sustainability agendas. The integration of public health into mobility planning can further be placed within the agenda of the Sustainable Development Goals (SDGs). This holistic framework of the SDGs aligned with the Paris Agreement on Climate Change provides 17 different goals and offers 169 sub-targets (Sachs et al., 2019). Sachs et al. (2019) have operationalised this framework through the translation of the 17 SDGs and 169 targets into six transformations and key initiatives (Fig. 3)


*Figure 3: The six SDG Transformations (Sachs et al., 2019)*

### Transformation 1: Education, gender and inequality

While this transformation focuses on enhancing education systems, promoting gender equality and reducing inequalities, it is indirectly addressing the integration of health aspects into mobility planning. This includes inclusive and equitable access to transportation services and transport environments that are supportive of the health and well-being of citizens equally, not prioritising the transport needs of one group while another group is exposed to its externalities, i.e., noise and air pollution.

### Transformation 2: Health, well-being and demography

Transformation 2 has the strongest relation to the research topic at hand, emphasising the need for investments in health and well-being and improving the social determinants of health. Sustainable mobility directly relates to this transformation, i.e. by aiming to improve public health, reduce air pollution, encourage physical activity and provide safe and accessible transportation options.

### Transformation 3: Energy decarbonisation and sustainable industry

Though not as directly related to health and mobility, the transformation can cover decarbonising transport through the adoption and promotion of carbon-neutral mobility solutions i.e. cycling and the construction of cycling infrastructure. This could in turn lead to co-benefits for the protection and improvement of public health.

### Transformation 4: Sustainable food, land, water and oceans

While this transformation primarily addresses agricultural practices and biodiversity, it may also intersect with urban planning. Sustainable land use and urban agriculture can enhance food security, reduce urban heat islands and promote green spaces, contributing to healthier urban environments. Mobility planning can support access to local markets and recreational areas such as rivers or lakes, enhancing the quality of life of citizens with potential benefits to public health (i.e. mental health).

### Transformation 5: Sustainable cities and communities

Transformation 5 directly relates to mobility planning by promoting sustainable and efficient urban transportation networks. This transformation aims to create compact, resilient and inclusive urban environments. Sustainable mobility is a cornerstone of this transformation, encompassing public transportation, cycling and walking infrastructure. By reducing reliance on private vehicles, cities can decrease emissions, improve air quality and enhance public health.

### Transformation 6: Digital revolution for sustainable development

Transformation 6 leverages digital technologies to advance sustainable development. In the context of the research topic, such technological development may have an impact on developing

planning tools and approaches that facilitate the integration of health-related issues into mobility planning and deriving meaningful information from the combination of transport and health data.

In conclusion, integrating health considerations into urban mobility planning can be considered essential for promoting sustainability and resilience in cities, aligning with broader goals such as the Sustainable Development Goals and the Paris Agreement. By addressing both climate change mitigation and adaptation, fostering equitable access to transportation and prioritising the needs of vulnerable populations, cities can enhance public health and reduce environmental hazards. These efforts can create more sustainable, inclusive and resilient urban environments.

## 3.2 Literature review

This section provides a comprehensive overview of the current state of research concerning the interplay between health and mobility in urban planning. By examining historical perspectives, existing paradigms and recent developments, this literature review aims to highlight the critical factors and outcomes of integrating health considerations into urban transport strategies. The following subsections explore how transport planning decisions impact public health and identify pathways and tools to enhance health outcomes in urban environments.

### 3.2.1 Health impacts: Interconnections between health and mobility in urban planning

Impacts on health cannot be attributed to a single problem, as various causes often contribute to the emergence of health consequences. Due to the large number of possible interactions between mobility and health, targeted planning approaches must take a complex bundle of factors into account. The following chapter presents the current state of research on the history of health in mobility, the paradigm of the car as a barrier to change, the links between transport and health and the effects of transport planning decisions and urban structures on people and their behaviour.

#### History of health in mobility

Health was not always a concern in the study of transport planning. Widener and Hatzopoulou's research (2016) found that interest in the connection between transport systems and health first increased in the second half of the 20th century. The quantitative revolution in the social sciences after the 1950s and the growing awareness in the fields of engineering and environmental health fostered research on transport and health. More recent research is often based on studies conducted between 1900 and 2010. This research shows that health and mobility are areas of increasing interest worldwide. However, it is not clear how much health is considered in mobility planning in Copenhagen, which calls for further research.

### The car-centric paradigm as an inhibitor of health integration

The influence of car-centric policies and designs on health within mobility planning has been substantial and persistent. Khreis et al. (2016) conducted a study examining the health impacts of urban transport. They identified the key drivers behind the current state of urban mobility and offered recommendations for integrating health considerations into transport planning. Khreis et al. (2016) argue that urbanisation processes and policies have historically favoured car use, resulting in an undervaluation of the negative health impacts associated with motor traffic. These impacts include high rates of premature mortality and morbidity attributable to motorised vehicles. The authors highlight that the emphasis on car-centric development has led to a disproportionate focus on crash severity and fatalities rather than a broader understanding of health impacts.

The research points out that until the 1990s, political attention was largely directed towards addressing crash severity and loss of life (Khreis et al., 2016). It was only in the subsequent decades that rising concerns over physical inactivity, air and noise pollution, the loss of green spaces and increasing temperatures began to receive more significant attention. This shift in focus is attributed to the growing recognition of the broader health impacts of urban transport policies that prioritise motor vehicles. (Khreis et al., 2016)

Khreis et al. (2016) recommend that an awareness of these aspects and car-centricity be created to change attitudes and behaviours. By raising awareness of health integration, preconceptions and patterns of car dependency should be challenged to encourage policymakers to better integrate health considerations into policy. In addition, Khreis et al. (2016) point out that power relations are often not considered in political processes, as car lobbyists can influence car-friendly policies. An alternative to promoting health can be the promotion of walking or cycling to reduce negative traffic impacts and increase physical activity. As health impacts affect many aspects of life, they cannot be considered by one discipline alone. The authors recommend working together across disciplines when developing transport policies, rather than working in silos, to take a more people-centred approach than car-centred (Khreis et al., 2016). As the car-centric paradigm exists in many European cities, the challenges and recommendations mentioned by Khreis et al. (2016) must be taken into account in our research.

### Pathways for connecting transport and health

In line with Khreis et al. (2016), further researchers emphasise the importance of recognising the interrelationship between health and other aspects of life. Lee and Sener (2017) note that the focus is often limited to the impact of mobility on physical health and remind that health must also entail mental health. Furthermore, a "one exposure-one outcome-one intervention approach" (Glazener et al., 2021: 5) may not be sufficient to address most public health burdens. Instead, Glazener et al. (2021) recommend a model that encompasses fourteen pathways between health and transport, including green space and aesthetics, physical activity, access, mobility interde-

pendence, contamination, social exclusion, noise, urban heat islands, road travel injuries, greenhouse gases, streets, community severance and air pollution. This model is intended to show the interaction between health and transport, but Glazener et al. (2021) note that more detailed research is needed on each of the pathways. Changing policies in the above pathways that cause disease due to low socio-economic status can help reduce health inequalities. Awareness of the different pathways to health can support the general understanding of how mobility and transport planning practice foster public health.

### Personal impacts of urban transport decisions

Planning decisions significantly impact how people move within urban environments and the related health outcomes. Nieuwenhuijsen et al. (2016) highlight that infrastructure, such as road networks, often reduces space for green areas. According to the authors, such changes in the urban environments can contribute to cardiovascular disease and poorer mental health (ibid.). Their research demonstrates that current transport planning decisions influence people's lifestyles, particularly by reducing opportunities for physical activity. In another study, Nieuwenhuijsen (2016) explains that an individual's exposure to transport-related health impacts depends on their preferred mode of transportation. Adjusting environmental factors at the community level is more cost-effective than changes at the individual level (ibid.). However, Nieuwenhuijsen calls for more data to understand these interrelationships better and to target measures more effectively (ibid.). Planning practices must consider the impact of planning decisions on individuals, which is crucial when integrating health considerations into mobility planning.

### Impacts of the urban structure and transport behaviour on health

The urban structure and transport behaviour impact people's health. Frank et al. (2004) investigate the relationship between the built environment around the place of residence and people's traffic behaviour. The authors found that every hour that people spend in the car per day increases the risk of obesity by 6%. In contrast, every kilometre walked per day reduces the risk of obesity by 4.8%. Unconnected, mono-structural neighbourhoods lead to more car trips. This research underscores the critical importance of designing urban environments that encourage active transport and reduce car dependency. By diversifying land use and improving walkability, urban planners can significantly influence public health outcomes. This finding is essential for our research as it highlights specific urban planning strategies that can mitigate health risks associated with sedentary lifestyles. (Frank et al., 2004)

In summary, while the development of health-focused mobility planning is well-established in research, there is a gap in understanding how this applies specifically to Copenhagen. Despite advancements, the car-centric paradigm remains a significant factor influencing health considerations, highlighting the need to shift towards a human-centred perspective. To effectively integrate health into mobility planning, research can contribute by analysing the status of health in planning practices. Existing studies have demonstrated that planning decisions and strategies influence

people's behaviour. However, the effectiveness of implementing these decisions and strategies also depends on people's behaviour and beliefs. This is a crucial consideration when examining mobility planning practices aimed at integrating health.

### 3.2.3 Urban health planning: Tools and policies addressing health and mobility in cities

The integration of health considerations into mobility planning can be supported through a variety of policy instruments and tools. This chapter provides an overview of these methods, emphasising their significance in the context of mobility planning. Initially, we focus on their overarching importance, setting the stage for a deeper exploration of diverse strategies. Among these strategies, we highlight approaches related to Healthy Streets and the application of cost-benefit analysis. This section offers insights into the current best practices and solutions being implemented in the field.

#### Health in planning policies

From a historical perspective, the introduction of cars in cities and the increase in traffic, e.g. freight transport on roads, can be considered as having separated interpersonal relationships through physical barriers, e.g. large roads (McIntosh et al., 2021). According to McIntosh et al. (2021), this led to a social alienation of people triggered by the streets. However, social interactions and the mixing of people enable opportunities for safer and more accessible streets, e.g. through social surveillance (McIntosh et al., 2021). If these evaluations are correct and car-focused development substantially interferes with personal relationships, it would be logical to infer that people's health could also be negatively affected.

In his 2020 review on narratives and planning practices for carbon-neutral, liveable and healthy cities, Mark Nieuwenhuijsen (2020) investigates the potential of urban and transport planning to enhance public health. He does this by analysing recent studies on the subject. Planning significantly influences health outcomes. On the one hand, designing cities to be car-centric can contribute to morbidity and premature mortality. On the other hand, planning can promote better health by fostering walkability and enhancing mental well-being. Nieuwenhuijsen (2020: 1) found that to realise healthier cities, it can be beneficial to include in policies "the need for land use changes, reduce car dependency and move towards public and active transportation, greening of cities, visioning, citizen involvement, collaboration, leadership and investment and systemic approaches." The research shows that policies are crucial in planning practices to achieve healthier outcomes.

Hoeben, Otto and Cersich (2023) assessed the extent to which public health is part of European national and urban climate change adaptation policies. They concluded that health is often not fully considered in urban policies. Health is rather seen as a side effect of the performance of other sectors and is not prioritised by the authorities involved. The authors recommend reducing sectoral thinking and increasing co-operation between departments, cities and national governments.

The authors' evaluation suggests that sectoral or silo thinking may hinder the planning practices being studied. This is especially important when considering the integration of health, a topic not typically associated with transport and mobility planning.

### Introducing the Healthy Streets approach

One way of incorporating health into urban planning and mobility planning is the Health Streets approach. The approach was developed by Lucy Saunders from Transport for London (Ede and Morley, 2020). This approach has been applied in London, Barcelona and other cities around the world (Healthy Streets, 2024c). According to our findings, however, the approach has not yet been applied on a significant scale in any Danish city. The approach aims to incorporate health into planning decisions and foster collaboration between transport experts and planners (Ede and Morley, 2020). Further objectives include a reduction of car dependency and health inequalities through transforming streets (ibid.). According to some assessments, Healthy Streets also provides opportunities to make planning inclusive and create a means for commercial and social engagement (McIntosh et al., 2021). Part of the toolbox that comes with the approach is the Healthy Street Checklist for Designers (HSCD), which is used to assess urban streets based on 10 indicators (ibid.). This checklist is also part of our research, as it has been tested on a small scale to provide first-hand experience. Ede and Morley (2020) found that the scoring system underlying the HSCD provides a way of making health more tangible for decision-makers and communicating the complexity of health in the urban environment. McIntosh et al. (2021) emphasise that the purpose of the approach is not to show a romantic vision of potential street design but to provide a long-term vision for the improvement of people's physical and mental health in the urban environment. However, applying the Healthy Streets approach can also be challenging as it requires extensive interdisciplinary collaboration (Plowden, 2019).

### Introducing the cost-benefit analysis

In addition to the Healthy Street approach, cost-benefit analyses (CBA) offer a way of incorporating health into urban planning. In our research, we often use the term socio-economic analysis. Socio-economic analysis is a broader framework that includes CBA and assesses the impacts of a policy, project or measure on various stakeholders, such as governments, households and industries, considering both tangible and intangible effects. (Ministry of Environment Denmark, 2024)

Khreis et al. (2016) assessed the application of CBAs in transport planning and found the following challenges: The authors criticise that CBAs are “embedded in an econometric ontology that associates lower economic benefits and costs with events taking place in the future due to economic depreciation rates” (Khreis et al., 2016: 257). This is because, in economic terms, future events are often seen as less significant due to the principle of discounting, where the value of money or benefits decreases over time. As a result, short-term benefits may be overquantified compared to

the future long-term costs of environmental and health influences. The long-term costs could contribute to the measurement of long-term sustainability impacts (Khreis et al., 2016).
Another challenge is the lack of consideration of the effects on morbidity (ibid.). However, the effects on mortality are part of CBAs (ibid.). This means that while CBAs typically account for the impact on death rates (mortality), they often overlook the impact on illness and disease (morbidity). For these reasons, Khreis et al. (2016) consider CBAs to be instruments that do not target the ultimate goal of health and environmental sustainability. These results emphasise the challenges of the CBAs. These need to be considered when analysing, for example, the meanings of the practices and how they might prevent improvements in public health.

### CBAs for the Cycle Superhighways in Copenhagen

In Copenhagen, CBAs provided an opportunity to include health in mobility planning in monetary terms. In 2008, COWI, a global engineering and consulting company, and Copenhagen municipality developed a method to quantify the costs and benefits of cycling infrastructure, considering transport costs, security, comfort, travel time, health and branding and compared the results with those from automotive infrastructure (Gössling, 2013). The outcomes of these analyses continue to justify the expansion of cycling infrastructure, attesting to a gain of 0.16€ per kilometre cycled compared to a social cost of 0.09€ per car kilometre (ibid.). The analyses for cycling infrastructure are now used as a reason for infrastructural change towards biking (Gössling and Choi 2015). Although the costs of impacts on human health, i.e. from air pollution, are considered, the associated ecological impacts are not part of the CBA as they are hard to assess. Therefore, the respective CBAs should not be misinterpreted as being reflective of all real costs. (ibid.).

In 2018, a cost-benefit analysis was conducted for the extension of Cycle Superhighways, a regional network of cycle paths in the Capital Region of Denmark. The socio-economic return, also considering health gains, was found to be 11% (Incentive, 2018). In calculations from 2021, the return rate increased from 11% to 23% (Rich et al., 2021). This increase indicates that health considerations are becoming more important for transport planning in the Region of Copenhagen (Pineda et al., 2024). It demonstrates that the calculation factor associated with health in the calculations can make a significant difference. According to Pineda et al. (2024), these calculations raise awareness for the health benefits of existing infrastructure. Pineda et al. explain that through the calculation process, the involved parties—the Capital Region, the Cycle Superhighway Collaboration and researchers from the Interreg project—commit to incorporating health into the design and planning process. It was a process of questioning established CBAs with the final goal of focusing on travel time savings towards improving public health through the Cycle Superhighways (Pineda et al., 2024). Therefore, Pineda et al. (2024) highlight in their research the role of design in sustainable transitions, suggesting that design can be a way to change existing regimes. Furthermore, the finding that CBAs are a way to raise awareness of health in mobility planning is relevant to our research in terms of practice and its strengths.

### Inclusion of health in mobility planning in Copenhagen

A major obstacle to implementing health considerations in mobility at the regional level in Denmark is that the regions, such as the Capital Region, have no authority to plan mobility (Pineda et al., 2024). Administration and coordination of health institutions are assigned to the regions (ibid.). This can also be a limiting factor in planning regional cycling infrastructure, although there is a commitment by the Capital Region to link health with other sectors (ibid.). Alcantara (2023) mentions in her research the same issue regarding the lack of a regional planning institution. Therefore, it was challenging to bring many municipalities together for the Cycle Superhighways Collaboration (Alcantara, 2023). The lack of planning responsibility at different levels prevents or complicates the implementation of integrated policies (ibid.). At the municipal level, it is also difficult to implement health as a cross-sectoral concern (ibid.). Although there is a commitment to linking mobility and health in the Copenhagen municipality, old sectoral structures and divided budgets within the departments often impede the connection between health and the mobility sector (ibid.). The barriers to health in mobility planning in Copenhagen are relevant to our research as they reflect where there are gaps in promoting health in practice.

## 3.2.4 Practice theory in planning

### Introduction to practice theory

In the research at hand, practice theory will be applied and later described in detail. According to Shove et al. (2012), practice theory regards a practice as consisting of meanings, competencies and materials and their interconnections. A practice is a routinised self-reproducing human behaviour (Reckwitz, 2002; Shove et al., 2012). The interconnections between the elements can be disrupted, resulting in a change in practice (Shove et al., 2012). The theory does not focus mainly on the individual and their behaviour and actions (ibid.). Instead, the focus lies on the overall actions carried out by society (ibid.).

### The use of practice theory in transport research

Kent (2022) attempted to give an overview of the use of practice theory in the research field of transport by reviewing 38 studies about practice theory and transport. According to this review, practice theory is a way to conceptualise the complex practice of moving around, which is an important field of action for implementing change. For Kent (2022), practice theory can help transport researchers understand the complex interconnections between the different dimensions of travel and convert these understandings into policies. The advantages of practice theory are that it develops an understanding of the interconnections between structures and travelling entities, which is often not part of traditional transport methodologies. However, Kent sees the need for continuous development of the theory to create research outcomes impacting transport system transitions. She also proposes developing practice theory, arguing that its focus often lies too heavily on the elements, disregarding the links between the elements. According to the author, it is these links that either indicate stability or change of practices. Another aspect criticised by Kent is that the meanings of a practice are often not analysed in detail as materials or competencies

because they are subject to interpretation. Also, researchers interpret meanings carefully because they want to avoid individuals' meanings, such as emotions or motivations, taking over, as practice theory considers the meanings of the whole society instead of individuals. Kent's results are relevant to our research, as they suggest that we should analyse the interdependencies between the elements in particular and also take the meanings into account.

### Practice theory applied to planning practices

Most of the literature reviewed on the application of practice theory in the context of transport and mobility focused on mobility behaviours. This posed a challenge for our research, as we sought to explore if and how practice theory could be applied to mobility planning as opposed to mobility behaviours. An important contribution to this kind of application of practice theory is made by the work of Harders (2015). In her PhD thesis, Harders uses practice theory as a foundation to investigate how urban development projects can contribute to sustainable transitions. Importantly, Harders offers a perspective in which plans are not seen as “recipes for actions” (Harders, 2015: 4) but are intertwined with practices and contingent upon meanings. This approach aims to more closely grasp what drives the implementation of plans, how ambitions evolve and how visions meet reality. Harders' work particularly investigates the obstacles and potentials of urban development in sustainable transition processes, focusing on the practices involved in the Carlsbergbyen development project in Copenhagen. She reveals how many stable and established practices and infrastructures often resist change, highlighting a gap between vision and reality. (Harders, 2015) Harders critiques the rational planning approach, which views plans primarily as instructions for action. According to her, plans are part of the practice and must be understood in connection with the meanings people associate with them to address change effectively.

This perspective has been a critical example for us, demonstrating the potential of practice theory as an analytical framework for investigating planning. Harders' methodological insights were influential, although time and scope constraints prevented us from fully adopting her approach. Nonetheless, her emphasis on closely studying the meanings within practices and considering the translation processes required when investigating practices significantly informed our methodological decisions.

## 3.3 Problem statement

The relationship between mobility and health involves multiple interrelated factors. Effective mobility planning must consider these complexities, as health is not always adequately integrated into planning practices. Car-centric planning is likely to be an obstacle to the improvement of public health by indirectly fostering physical inactivity, pollution and the loss of green spaces. Despite recent efforts to address these issues, challenges remain due to entrenched car-centric thinking and insufficient interdisciplinary collaboration.

Research highlights that urban design and transport behaviours significantly influence health outcomes. For instance, walking and cycling are beneficial for health, while car-dependent urban structures can lead to negative health impacts. Tools like the Healthy Streets approach and cost-benefit analyses (CBAs) are considered as factors to support the integration of health into planning. However, CBAs often fall short by focusing on short-term economic benefits over long-term health and environmental aspects.

There is a need to analyse how health is currently integrated into mobility planning in Copenhagen. A thorough analysis of the two practices of the Healthy Streets approach and the socio-economic analysis for the Cycle Superhighways will provide insights into potential areas where they can contribute to improving public health in the planning processes.

## 3.4 Research questions

Our research places two different planning practices at the centre: On the one hand, a type of planning practice that directly aims to measure health impacts from the current mobility landscape and interventions in its design and management. As an example of such a practice, we analyse how mobility planning and design practices can be supported by the application of the Healthy Streets approach. This framework, consisting of 10 indicators for street's health performance, is intended to improve public health and well-being by focusing on the design and management of streets (TfL, 2021). The complementary Healthy Streets Check for Designers (HSCD) serves as an instrument for urban planners and designers to implement this approach in their projects (ibid.). In our research, we tested this tool in Tingbjerg, Copenhagen, to put ourselves in the shoes of planners and gain first-hand experience and exposure. It is important to note that it's the experience that is of interest to us in this small experiment, rather than the results of the design check conducted.

On the other hand, we investigate a planning approach that considers health impacts through the lens of socio-economic costs and benefits. Such an approach intends to apply objective monetary value to health, whereby these values are made comparable with other values, such as time savings, labour and construction costs. The planning of the Cycle Superhighways in Copenhagen – Copenhagen's regional cycling network – serves as an example of such an approach. This case illustrates how health benefits associated with the improvement of cycling infrastructure can be included in the socio-economic analysis of large-scale infrastructure projects. The analysis of the Cycle Superhighway project underscores its substantial socio-economic benefits, including a high return of investment and significant health improvements, by quantifying the reduction in sick days and pollution. (Incentive, 2018)

Although the two approaches are not mutually exclusive, we attempt to identify their strengths and find a possible synthesis in terms of their potential to improve public health in cities. This requires first analysing the characteristics of each practice and how the elements are related to each other. Next, the strengths are analysed in terms of their potential to contribute to public health. The socio-economic analysis is an already established tool in Copenhagen and forms the starting point for the synthesis of both practices. Practice theory enables to understand the dynamics and how the practices are built. To achieve this research objective, we propose the following research questions:

Research question:
How can a health-focused street design and mobility planning practice complement a cost-benefit-driven transport planning practice to contribute to public health improvements in cities?

Sub-questions:

1. How can the qualitative assessment of healthy street design and transport economic planning approaches be characterised as planning practices?

2. How can the qualitative assessment of healthy street design and transport economic planning approaches be differentiated in terms of their impact on public health?

# 4. Methodological and theoretical background

In this chapter, we present the methodological and theoretical foundations of our research. We detail the process of translating theory into an analytical framework and describe our use of explorative and semi-structured interviews. Additionally, we discuss the application of the Healthy Streets Check for Designers and the qualitative analysis conducted using NVivo. Finally, we outline the boundaries of our study through a detailed delimitation of our research

## 4.1 The role of practice theory in our research

In this subchapter, we introduce the role of practice theory in our research and its use as an analytical framework. We cover its ability to explain change and stability within human behaviour and explore its relevance for understanding the interplay between human actions and social structures. Finally, we examine how practice theory applies to sustainability, particularly in the context of sustainable transport and mobility.

### 4.1.1 Why practice theory?

The analytical framework used in our thesis draws on practice theory. This theory can provide an understanding of change and stability within complex human behaviours (Shove et al., 2012). Practices are broadly defined as routinised human behaviours (Reckwitz, 2002). Practice theory allows for a detailed analysis of such routinised behaviours. From the wide-ranging theoretical discourse about practice, we draw specifically on the work of Shove et al. (2012) because of its potential to explain change processes.

### 4.1.2 The roots of practice theory

The different iterations of practice theory are rooted in Giddens' (1984) structuration theory, which explains the recursive impact of human actions and social structures on each other (Shove et al., 2012). Social structures of rules and meanings shape human actions and are replicated through these actions. This process is neither determined solely by social structures nor the conscious goals of individuals (ibid.). Giddens points out that actions are not always the result of conscious, independent decision-making, nor are they completely predetermined by existing structures. While people can articulate their motivations, only a few actions are carried out with full consciousness (ibid.).

Maintaining routines in everyday life depends on knowing how to handle tasks, following rules and using societal resources. Giddens argues that people and society are not separate but interconnected parts that work together (Shove et al., 2012.). Individuals do not act independently of these structures; rather, they operate within society, contributing to its development. Planning practices are influenced by overarching structures such as politics and economic decisions and

by the experiences of those affected by these decisions (Kent, 2022). Practice theory, which focuses on practices, incorporates structuration. According to Shove et al. (2012), human activity often reproduces these structures. Therefore, understanding human and institutional activity, the formation and reproduction of practices and the laws and structures that govern them is essential to grasping the concept of structuration.

### 4.1.3 Practice theory and sustainability

In the early 2000s, practice theory (Reckwitz, 2002; Schatzki, 2001; Shove et al., 2012) gained prominence in sustainability disciplines, including sustainable transport research (Birtchnell, 2012; Watson, 2012). This shift is attributed to the recognition that behaviours are not merely the result of individual decision-making or inevitable structural forces (Kent, 2022). Practice theory moves beyond focusing on individual choices to examine broader patterns of change and stability, viewing practices as shared among individuals. Unlike behaviour-focused approaches, practice theory analyses routinised actions as outcomes of societal practices influenced by external forces, personal preferences and decision-making processes (ibid.).

The dynamics of practices, including their flow, circulation, transformation, disappearance and integration, are central to this analysis (Shove et al., 2012). By placing practices at the core of sustainable transitions, this perspective challenges the idea that sustainable change is primarily driven by individual decisions or technological innovation. Instead, it positions practices as the key driver, with technology, individual behaviours and convictions as single elements out of many being at play within these practices. This broader view allows for a better understanding of the factors that influence sustainable change.

## 4.2 The essential components of practices

The concept of practices serves as both a building block for understanding the social world and a tool for explaining its dynamics. At the heart of this concept is the idea that the fundamental components of social reality are neither individual actors nor overarching structures. Practice theory diverges from this duality, focusing instead on practices. So, what is a practice? Colloquially, the term suggests the activity of an entity. As commonly understood, a practice requires a practitioner performing an action. This implies a dynamic nature, as actions require movement and change through time, unlike static structures. However, in practice theory, practitioners are integral to the practice itself, not just enacting or directing the practice.

To clarify practice as a building block of reality and as an object of scientific inquiry, we can break it down into smaller components. Reckwitz (2002) defines practices as routinised behaviours interconnecting elements such as bodily activities and knowledge. He emphasises that practices involve how people move, manage tasks and understand the world. Schatzki (1996: 89) further describes practices as comprising "understandings, […] explicit rules, principles, precepts and

instructions; and […] 'teleoaffective' structures embracing ends, projects, tasks, purposes, beliefs, emotions and moods."

Actions and behaviours refer to individual bodily movements and changes in physical and emotional states, while routines indicate that these actions are practiced, learned and reproduced (Schatzki, 1996). This indicates that practices contain information about how individual actions are connected and forming patterns (Harders, 2015). The respective information can be regarded as the connective tissue between actions and manifests in the social sphere as know-how, intentions or ambitions (Reckwitz, 2002).

This suggests that practices are made up of bundles of qualitatively different components, each playing a unique role but are treated with a degree of equality. Building on Reckwitz and Schatzki, Shove et al. (2012) categorise these components into three categories of elements: meanings, competencies and materials (see Fig. 4). The interconnections among these elements are crucial, as their relationships and development determine whether a practice will prevail or disappear. This framework is used in our own analysis and will be explored in more detail in the following sections.

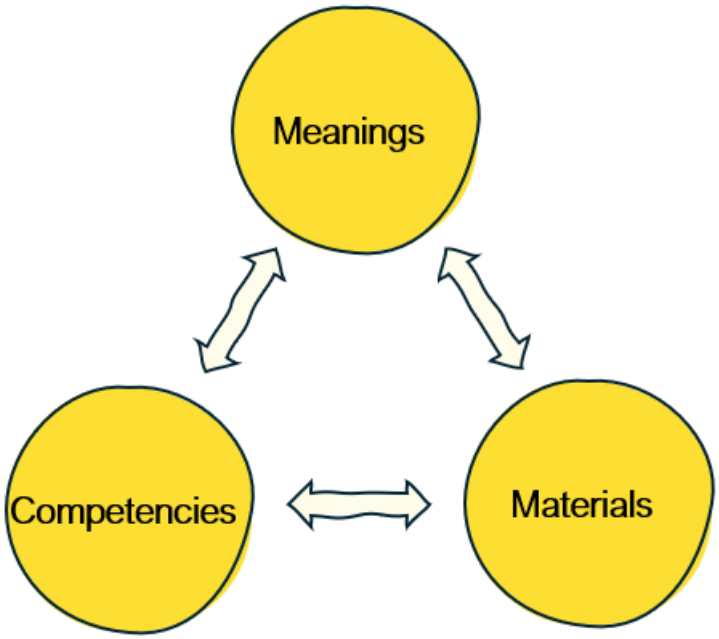


*Figure 4: Practice elements and interdependencies*

### 4.2.1 Meanings

As Harders (2015) acknowledges, "meaning" is a challenging concept to understand due to its broad definition in Shove et al.'s (2012) streamlined practice approach. Harders summarises meaning as an "amalgamation of mental activities, emotions and motivational knowledge" (Harders, 2015: 141, transl. from Danish). This conception of meaning can be compared with Nicolini's (2012) and Schatzki's (2002) concepts of *general understandings*, *rules* and *teleoaffective structures*. *General understandings* refer to the overarching objectives of actions taking part within a practice. *Teleoaffective structures* resemble general understandings but are rather referring to the order of objectives – in other words, the underlying hierarchical structure of goals and subgoals framing the practice. The term can help to express how one task forms the prerequisite for another, finally allowing for the fulfilment of an overall objective. Finally, rules are a key component of the meanings embedded in practice. *Rules* can be seen as explicitly formulated principles that decisively structure and, in certain ways, even dictate the way an action is carried out (Harders, 2015). It should be noted that rules can exist on many different levels and include laws, guidelines, policies, norms and standards. Practice, especially planning practice, is a process that takes place in a regulated manner. The practice-theoretical perspective implies an approach in which these rules, as well as the other dimensions of meaning, not only represent the environment in which a practice takes place but also as a partial element of the practice itself. While we do not explicitly discuss *general understandings*, *rules* and *teleoaffective structures* in our thesis, these concepts indirectly influence our analysis and interpretation of meanings within the practices under investigation.

### 4.2.2 Competencies

Competencies refer to what can also be described as practical knowledge. Practical knowledge describes knowledge that enables an entity to perform an action - a type of knowledge that Reckwitz (2002: 249) refers to as “know-how”. Performing an action often requires a combination of hard and soft skills, such as navigating social complexity and engaging effectively with different human and non-human entities and artifacts. For example, in a planning context, these skills might include knowledge of how to use visualisation tools, knowledge of how to acquire, assemble and analyse relevant data and knowledge of how to engage with different stakeholders. For all of the above, simply knowing a technique or methodology in isolation is not enough. Rather, it requires practiced behaviours and “know-how” (Reckwitz 2002: 249) to respond to the environment and integrate the competence into the broader context of the practice.

### 4.2.3 Materials

The third and final category of elements that constitute a practice is materials. While physical objects used, consumed or created are the most obvious examples, the practice-theoretical approach requires a more nuanced understanding. The actual physical nature of things is not the decisive factor in their consideration as an element of a practice (Shove et al., 2012). Beyond

infrastructures and objects, digital systems and activities can also function as materials in a practice. The role of materials in constituting practice is more central in the practice-theoretical approach than their physical properties (ibid.). Practices include not only activities structured with competencies and meanings but also the *something* towards which these activities are directed and the *something* with which these activities are carried out. This *something* is captured by the concept of material. As Harders (2015) describes, materiality is a central element of practice that both represents the result of practice and characterises its execution. Materiality enables and limits and it sets a framework for the realisation of physical and mental activities (Harders, 2015). Thus, materiality is crucial for analysing the spaces of possibility opened by different practices, such as planning practices.

## 4.3 Additional analytical dimensions in practice theory.

Besides the key categorisations of meanings, competencies and materials, there is an extensive number of analytical perspectives and approaches within the world of practice theory, not all of which can be covered and utilised in this work. Some especially important perspectives that we aim to consider within our research, although not always explicitly, are outlined below.

### 4.3.1 Interconnections in practices

Practice, as explained above, is dependent on the interaction of elements categorised as materials, competencies and meanings. The condition for this interaction is the presence of connections. For instance, using a planning tool (material), such as an Excel-based Healthy Streets Check for Designers (HSCD), necessitates specific experiences (competencies). These competencies extend beyond the direct application to include selecting the tool, identifying the object of consideration and communicating results. The selection of data, in turn, is linked to meanings. Determining relevant data depends on the user's understanding of their role or the developer's perception of the target audience. Many other elements can be integrated into such a practice, making it difficult to isolate one practice from another. What particularly defines such a system as distinct is its ability to reproduce itself. Shove et al. (2012) argue that the elements of a practice are determined by acts and connections of reproduction and that practices persist when their interactions strengthen and reproduce these connections.

### 4.3.2 Changes in practices

Change in practice theory is understood as a dynamic process shaped by the interconnections between elements, structures, individual agency and external impacts. When analysing this process, different aspects must be considered. Elements flow and interconnect within a practice. Disruptions, such as changes in daily routines, can create opportunities for new arrangements of elements and the formation of new interconnections. Elements can move from one context to

another without significant change, while practices evolve through reproduction or transformation. (Shove et al., 2012)

For example, the adoption of digital travel cards has made paper tickets obsolete, requiring users to acquire new skills, such as learning to use the digital cards (Harders, 2015). Concurrently, materials like ticket vending machines are phased out and replaced with digital alternatives (ibid.). This transformation occurs gradually over time (Shove et al., 2012; Harders, 2015). Transformation or stability arises through the mutual impact between practitioners and the practices they undertake. Practitioners' actions are influenced and constrained by structures, but these actions also have the power to change or erase the structures (Harders, 2015).

Analysing the development of elements and their interconnections, also called interdependencies in our research, helps us understand the transformation or stability of practices. When actors perform a practice, they reproduce its elements. Therefore, structure and agency do not need to be regarded independently. (Shove et al., 2012).

### 4.3.3 The role of the individuals and decision-makers in practices

When implementing sustainability goals, the focus often falls on individuals through incentives or disincentives. However, this approach risks overlooking the broader framework of practices and the role of policymakers. Individuals act as carriers of these practices. Behavioural approaches assume that the state, as an external authority, uses tools to encourage citizens to change their behaviour. Yet practices, which encompass behaviour and other elements, are embedded in the complex and evolving processes of daily life. When policymakers create rules or make decisions, they are part of the same patterns and systems they aim to influence. The ideas behind policies and instruments emerge from within the practice itself, not from outside it. Consequently, when policymakers attempt to effect change, their actions influence the practice, whether they intend to or not. These impacts must be understood as integral to the practice. (Harders, 2015; Shove et al., 2012)

### 4.3.4 Recruiting practitioners

The recruitment of practitioners is integral to the sustainability of practices. Whether a practice fades away or continues depends on how people are recruited to undertake it. Understanding change involves examining how individuals join or leave practices, providing insight into how practices function beyond mere rules or individual actions. For instance, transport practices like using a car illustrate how successful recruitment retains participants in a practice. This highlights the importance of public transport and cycling in competing for attention and loyalty. Viewing practices as having recruits emphasises that people typically do not adopt a practice without knowing it's an option. They learn about practices by observing others or hearing about them, showing that practices exist beyond individual actions. (Kent, 2022)

### 4.3.5 Infrastructures

Existing infrastructures can be an important dimension for understanding planning practices in the context of sustainability. Infrastructures can emerge from practices and are interconnected with actions and structures. In urban settings, the simple adoption of new plans and policies for sustainable practices may not be sufficient to ensure the practices' implementation and continuation. It is important to consider the limitations of the current infrastructure, such as car-centric systems or existing planning frameworks, to understand how these infrastructures contribute to or constrain change. Achieving sustainable change requires more than just building new infrastructure or reducing car usage; it involves a comprehensive understanding of how existing infrastructures shape and are shaped by practices. (Harders, 2015)

### 4.3.6 Potentials for change

Spurling and McMeekin (2014) conducted a study on sustainable mobility policies in England, identifying three key interventions that support the shift towards a more sustainable transport system. These interventions are: "recrafting resource-intensive practices, substituting practices and changing how practices interlock" (Spurling and McMeekin, 2014: 79). The first intervention, recrafting resource-intensive practices, involves substituting resource-intensive elements within a practice. For example, this could mean switching from a vehicle with an internal combustion engine to an electric vehicle. The second intervention focuses on substituting entire practices rather than just selecting elements. This might include replacing car trips with cycling trips. The third intervention addresses how practices are interlocked, contributing to the need for unsustainable trips. This requires researchers to reflect on the fundamental need for travel and consider how policymakers can work within the system of practices that create this need. For instance, remote working policies and housing arrangements can significantly influence the necessity of commuting. By understanding and applying these interventions, policymakers and researchers can better support the transition to sustainable mobility systems. (Spurling and McMeekin, 2014)

## 4.4 Methods and analytical framework

Our introduction to the applied methods and analytical framework includes an explanation of the qualitative analysis using NVivo, the initial use of exploratory interviews, the subsequent use of semi-structured interviews and our experimental application of the Healthy Street Check for Designers. We began with exploratory interviews to narrow down our research focus. Once the research topic was refined, we conducted semi-structured interviews, applied the Healthy Street Check for Designers and utilised other documents as source materials for the qualitative analysis with NVivo. NVivo is a qualitative data analysis software that helps in organising and analysing non-numerical data.

### 4.4.1 Explorative interviews

In the early stages of our research, we reached out to stakeholders to gain insights into their experiences with the topic of health and mobility. Informal exchanges and interviews were organised with various institutions. The most important information from the conversations was documented from notes made during the interviews and used for further brainstorming. We had conversations with Søren Have and Charlotte Frejlev Andersen from the think tank Concito, Ashley Dhanani, who works with the Healthy Streets approach, Thomas Hilberg Rahbeck from Novo Nordisk and James Thoem from Gehl Architects.

### 4.4.2 Semi-structured interviews

After the exploratory interview phase and subsequent narrowing of the research topic, we began conducting semi-structured interviews. This approach allowed us to navigate freely through the topic while also structuring the conversations with specific questions to verify the knowledge gathered so far. It ensured a degree of consistency between interviews and transparency in the approaches taken. Semi-structured interviews provide the opportunity to explore topics in-depth and follow thematic developments during the conversation (Magaldi and Berler, 2020).

The flexibility of semi-structured interviews allows for effective qualitative data collection (Magaldi and Berler, 2020). The aim was to make interviewees feel comfortable and provide them with the space to reflect on their experiences and knowledge, which is crucial for investigating practices, particularly the meaning elements (ibid.). Open-ended and improvised questions were integral to the interviews. In some cases, interview guides were sent to the interviewees in advance if they requested them. A sample guide can be found in the appendix 1.

Each interview began with us, the interviewers, introducing ourselves and explaining our research interest. Following this, the interviewees introduced themselves, sharing their personal background, role within their institutions and involvement in the practice under investigation. We then proceeded with questions about their general motivation and day-to-day work. The subsequent sections addressed the different elements of practice, starting with meanings, followed by competencies and materials.

The interviews were conducted both online and in person. Interviewees could choose whether they wanted to be anonymised and whether the interview could be recorded. If they did not wish to be recorded, a protocol was written from notes and memory. Otherwise, transcripts and protocols were created. The transcripts were produced using Microsoft Teams or Notably. The transcripts were carefully checked and corrected by listening to the recordings again.

The following people were interviewed for the semi-structured interviews:

| Interviewee | Role and institution | Date and location |
|---|---|---|
| Sidsel Birk Hjuler | Strategic Mobility Planner at Urban Creators, Denmark | 22 March 2024 in person in Copenhagen |
| Signe Helledi | Head of Office at the Secretariat of the Cycle Superhighways, Denmark | 9 April 2024 in person in Copenhagen |
| Pete Murray | Urban Design Lecture and Tutor, University of Sydney, Australia | 26 April 2024 online |
| Anonymised official | Official from PTA WA, Australia | 30 April 2024 online |
| Christina Noonan | Project Manager Development, Main Roads Western Australia, Australia | 2 May 2024 online |
| Alix Oakes | Principal Transport Planner, Stantec, Australia | 2 May 2024 online |
| Tim Judd | Strategic Transport Planner, PJA, Australia | 3 May 2024 online |

Sidsel Birk Hjuler and Signe Helledi were interviewed due to their significant roles in the cost-benefit analysis of the Cycle Superhighways. As coordinators of the Cycle Superhighway Collaboration, they bring extensive experience in the complex tasks of planning and implementing cycling infrastructure and active mobility as a comprehensive concept and solution for urban mobility in Copenhagen. This involves cycling infrastructure with significant social and political implications and they can provide insight into which levers need to be operated to implement their vision at the regional level. The City of Copenhagen was also requested for an interview (City of Copenhagen, 2024b). Representatives from the city were unable to participate due to time constraints and could not respond to written questions.

To gather more insights on the application of the Healthy Streets approach, we obtained a list of Australian alumni who took part in a training on the approach. Lucy Saunders, the developer of Healthy Streets, was approached but could not make time for an interview. Although the list of European Healthy Streets training alumni was unpublished at the time of the research, the Australian alumni provided valuable insights into the practice of Healthy Streets as well as insights about the cost-benefit analysis, despite not being based in Denmark or Copenhagen.

### 4.4.3 Application of the Healthy Streets Check for Designers and field work

Healthy Streets is a people-centred approach to assessing the level of health in the streetscape. The approach is based on Lucy Saunders' research on the intersection of urban space and human health (Saunders, 2018; Healthy Streets, 2024b). 10 human health indicators show how a street and a proposed new design scheme perform against 31 technical metrics that consider health in mobility planning. Part of this approach is the Healthy Streets Check for Designers (HSCD), developed in collaboration between Transport for London, the local government authority responsible for London's transport network and Lucy Saunders for the city of London.

We applied the HSCD on a small scale ourselves in Tingbjerg, a neighbourhood in the north of Copenhagen, to explore the practice. To gain a wider range of experiences with the tool, we applied the HSCD to three different types of streets. The actual outcomes and scores of the tool are less important in our research. What matters more is the first-hand experience of applying the tool.

### 4.4.4 Qualitative analysis with NVivo

In answering our research question, we are working with interview transcripts, protocols, research reports, socio-economic analysis and planning tools and frameworks. Because we are working with different types of data, we needed to devise a method that would support the integration of these sources into the theoretical framework that underpins our research - practice theory.

#### Analytical approach

Practice theory provides categories and structures into which information extracted from our data can be sorted and analysed. This sorting process will be facilitated using NVivo. Coding is the core functionality that enables this. Essentially, coding is the process of tagging different extracts of our data, thereby creating or imposing a structure of themes within our material that allows for targeted searching and analysis. When applying practice theory to the analysis, it is not only a matter of identifying and describing explicit sentences or words but also of interpreting the elements, as the features are often not explicitly mentioned.

Two main approaches are applied in this coding process (Social change, 2024):

1. Content analysis
   In the content analysis, we use predefined codes from the theory to systematically classify the data. Specifically, words or sentences are labeled as either materials, meanings, or competencies.

2. Thematic analysis

   In the thematic analysis, themes are generated directly from the dataset rather than fitting the data into a predefined framework. This involves assigning a thematic labels relevant to our research question to each previously identified element. Similar labels are grouped into thematic clusters.

The theoretical framework applied in our research already provides a structure with which phenomena in the social world can be described and analysed. It comes with the previously introduced categories of meanings, competencies and materials, comprising the object of our inquiry as a practice. Practice theory, therefore, is a framework that lends itself to content analysis. The existing categories of meanings, competencies and materials can be used in the analysis as predefined codes.

Our analytical approach requires a mixture of thematic and content analysis. To identify, define and structure the sub-level themes - the elements that make up meanings, competencies and materials - we need to let the material speak for itself. This is crucial because the two planning practices examined in our research are not static or predefined. Rather, they are to be discovered and carved out of the combination of themes that emerge from the material collected from two separate content strands.

### Data used in the analysis

Our analytical framework begins with a foundational element: It is structured around two distinct datasets. These consist of one dataset for socio-economic analysis and another for the Healthy Streets approach. Additionally, it incorporates a pre-established theoretical framework outlining two separate practices, the practice of the Healthy Street approach and the socio-economic analysis of the Cycle Superhighways. These practices are to be populated with elements within predefined categories of meanings, competencies and materials. However, the specific elements and their interrelations within our framework remain flexible and not predetermined.

The following data is used in our analysis:

| SET 1: Planning Practice of the Cycle Superhighway Collaboration and the socio-economic analysis | SET 2: Planning practice of the Healthy Streets approach |
|---|---|
| Core data:<br>• Socio-economic analysis of Cycle Superhighways) from 2018<br>• Transcript & Protocol: Interview with Sidsel Birk Hjuler<br>• Transcript: Interview with Signe Helledi<br>• Transcript & Protocol: Interview with Tim Judd | Core data:<br>• Tool: Healthy Streets Check for Designers<br>• Tool experimentation: Akarderne, Ruten and planned Supercykelsti<br>• Interview with Sidsel Birk Hjuler<br>• Protocol: Interview with Pete Murray<br>• Transcript & Protocol: Interview with Official from Public Transport Authority of Western Australia (PTA WA)<br>• Protocol: Interview with Christina Noonan<br>• Transcript & Protocol: Interview with Alix Oakes<br>• Transcript & Protocol: Interview with Tim Judd |

### Coding Step 1: Parent codes – two separate analytical strands

Our analysis begins by establishing two *parent codes* (NVivo's terminology) for both practices under investigation. Parent codes are broad classifications that guide the organisation and interpretation of data within our study. These parent codes correspond to the two planning practices our research aims to define and analyse: SET 1: Planning Practice of the Cycle Superhighway Collaboration and the socio-economic analysis and SET 2: Planning practice of the Healthy Streets approach.

### Coding Step 2: Content analysis

From there, our analytical structure follows these two separate branches, both consisting of meanings, competencies and materials. This separation is important because we are initially looking at two practices in isolation. In the second coding step, we conduct the content analysis by assigning the codes of meanings, competencies and materials to extract our data.

### Coding Step 3: Thematic analysis

From here, we progress to the thematic analysis. The previously categorised extracts from the data are now analysed, interpreted as elements of a practice and labelled according to the emergent themes. The information provided in the collected data is so broad and does not always address or respond to the research questions directly. It therefore requires a level of processing and interpretation. In our coding process, we cannot merely rely on the description of what is

already expressed in the data, although we seek to let the data speak for itself wherever possible. Instead, the coding process requires continuous interpretation during the thematic analysis, in which the codes emerge from the material. Once a code has been defined for a specific theme based on the interpretation of one part of the material, the code then also needs to be reused for matching content. This process prevents duplication and ensures a stringent analytical structure. Nevertheless, it must be emphasised that this reuse of predefined codes will only be conducted within the respective material set (SET 1 or SET 2), as both associated practices will be defined in separation. A simplified analytical framework as applied in our research can be visualised as follows (see Fig. 5):

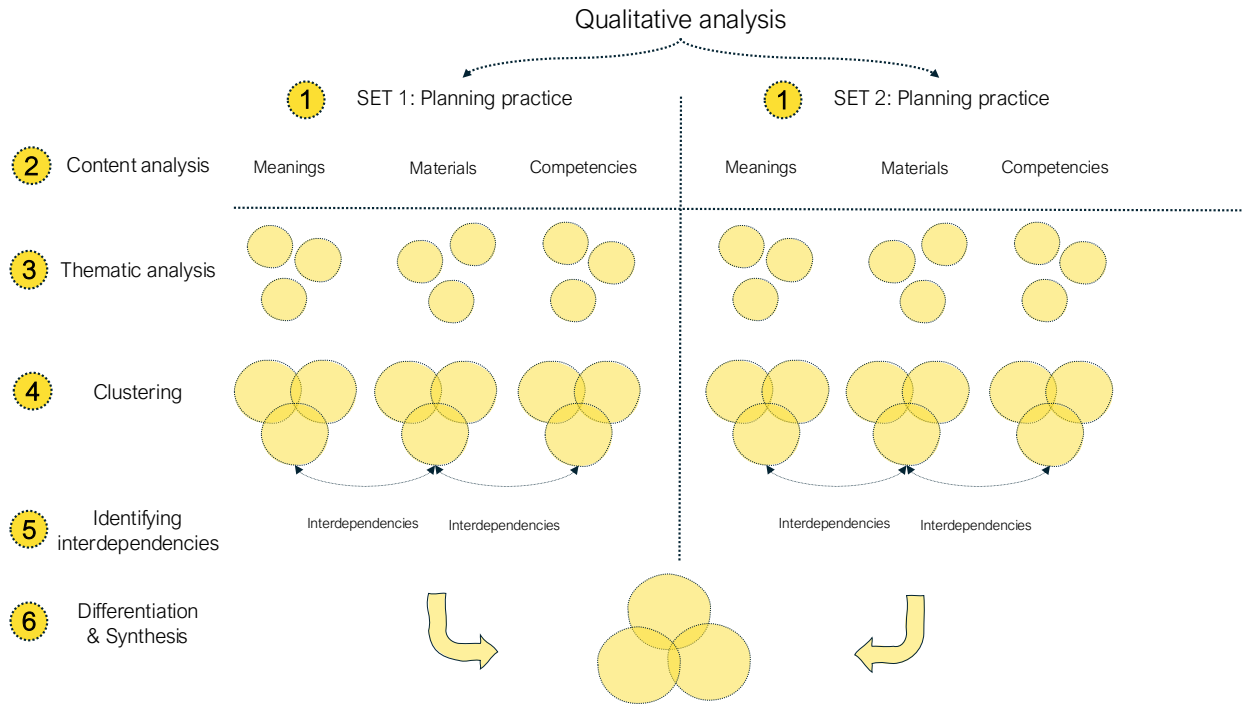


*Figure 5: Methodological approach of the qualitative analysis*

### Step 4: Clustering: Analysis outside of NVivo

Once all the extracts were labelled with themes, we clustered the labelled thematic elements. This is conducted outside of NVivo on a digital whiteboard in a brainstorming process.

### Step 5: Identifying interdependencies

When identifying interdependencies that connect elements, we are not working on the smallest scale with individual elements but rather focus on connections between clusters. These connections are identified across the broader categories of meanings, competencies and materials, as opposed to within these categories. This approach has been chosen because the clustering process – bundling individual elements within a category i.e. meanings – has already involved connecting different elements of meanings.

### Step 6: Differentiation and synthesis

As our analysis progresses, we will explore the possibility of integrating these two separate branches to uncover potential synergies between the two practices.

## 4.5 Delimitation

The practice around the Healthy Streets approach enables us to examine a human-centred approach that considers health from the perspective of pedestrians and cyclists, rather than car drivers. However, according to the City of Copenhagen and our research, this approach has never been applied in Denmark or Copenhagen. To compensate for the lack of experienced local practitioners, we need to leverage the expertise of practitioners working in different geographies and circumstances. Initially, we applied the HSCD in Tingbjerg. However, not being professionally trained in the approach, we encountered limitations, such as finding the right data and interpreting the results. Our trial in Tingbjerg served primarily as a test of the tool, allowing us to learn about the challenges involved and to put ourselves in the shoes of other users.

Regarding the socio-economic analysis for the Cycle Superhighways, our research did not aim to understand the economic calculations in detail, as neither of us has an economic background. Instead, it focused on how to incorporate health into the decision-making processes for transport planning.

When examining the two practices, the aim is not to draw a direct comparison between them as competing practices for the same goal. This would have been impractical because both are embedded in different local contexts and pursue distinct professional objectives. The Healthy Streets approach focuses on neighbourhood-level benefits around a street, whereas the socio-economic analysis conducted as part of the Cycle Superhighway Collaboration addresses a larger scale.

# 5. Practices of mobility planning

This chapter investigates the two mobility planning practices by analysing the characteristics of each of them separately. In doing so, we answers the first sub-question of the research: *How can the qualitative assessment of healthy street design and transport economic planning approaches be characterised as planning practices?* As a starting point, the clusters of meanings, competencies and materials of a practice will be examined in accordance with Shove et al. (2012). This will be followed by an analysis of the interdependencies between the clusters of elements.

## 5.1 Healthy Streets approach

### The Healthy Streets approach

The Healthy Streets approach was developed by Lucy Saunders based on her research on the intersection of the urban realm and human health (Saunders, 2018; Healthy Streets, 2024b). The first practical implementation of the approach was conducted in London. In collaboration with Transport for London (TfL), the evidence-based approach was included in London's Health Action Plan in 2014 (Greater London Authority, 2014). In 2016, the Mayor of London and the TfL commissioner agreed to use the approach (Saunders, 2018). The key intention of adopting the approach is to position people and human health at the starting point of all planning and management of public space decisions (TfL, 2024).

10 indicators for Healthy Streets form the heart of the approach, all of which consider people's experiences of the streetscape. To enable practical implementation of the approach, Transport for London has developed the Healthy Streets Check for Designers (HSCD), which we tested ourselves in our research as well as gathered insights about from several practitioners. The HSCD originally aimed to support private and public sector planners in the London region in applying the approach. The HSCD is an Excel spreadsheet and provides the opportunity to test new street designs to see if they will bring improvements against the 10 indicators compared to the existing streetscape. It also allows the public to see how, through interventions, the street might change in terms of its impact on human health. (TfL, 2024)

Before initiating the use of the HSCD, specific data needs to be collected, such as classified traffic counts or $NO_2$ concentrations. Then, 31 technical metrics are scored within the 10 different indicators (Fig. 6). For each technical metric, the score ranges from 0 or 1 to 3, with each value accompanied by a specific description. Ultimately, the street can achieve a score between 0 and 100, indicating its health performance against each indicator. (TfL, 2021).

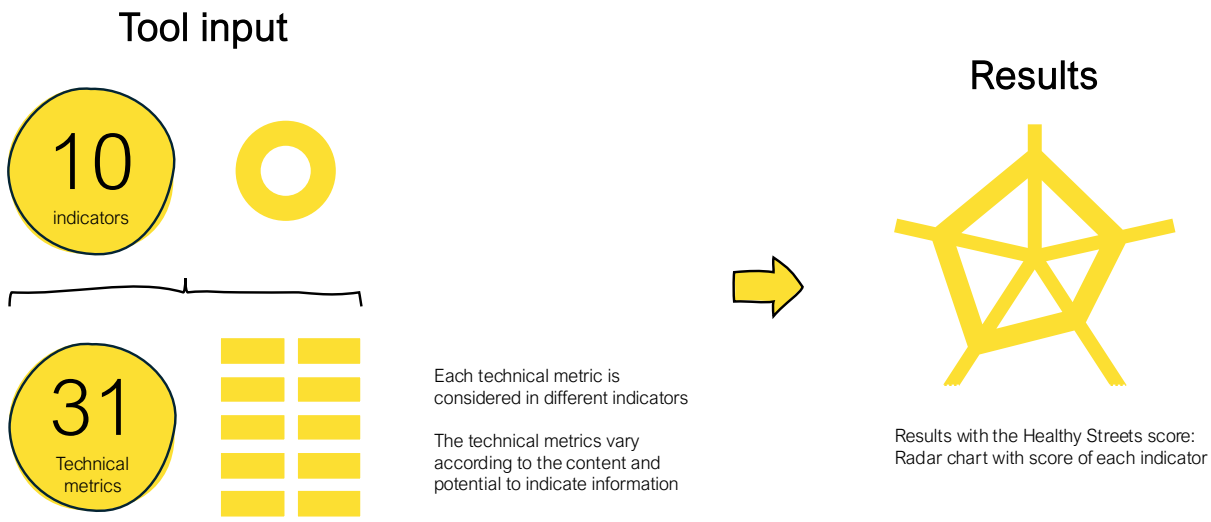


*Figure 6: Structure of the Healthy Streets Check for Designers*

In addition to the Healthy Streets Check for Designers (HSCD), further services around Healthy Streets are offered under the Healthy Streets approach. Several of these offers have been applied in cities around the world, including Barcelona, Budapest or Perth (Healthy Streets, 2024a).

We applied the Healthy Streets Check for Designers (HSCD) as part of the Healthy Streets approach in Tingbjerg, a neighbourhood in Copenhagen. Three street types (Fig. 7), chosen to identify differences, were the subject of the HSCD: a planned Cycle Superhighway with pedestrian walk, Ruten, a main street in the neighbourhood, and Arkaderne, a side street in the neighbourhood. The conducted HSCD assessments can be found in Annex 2.

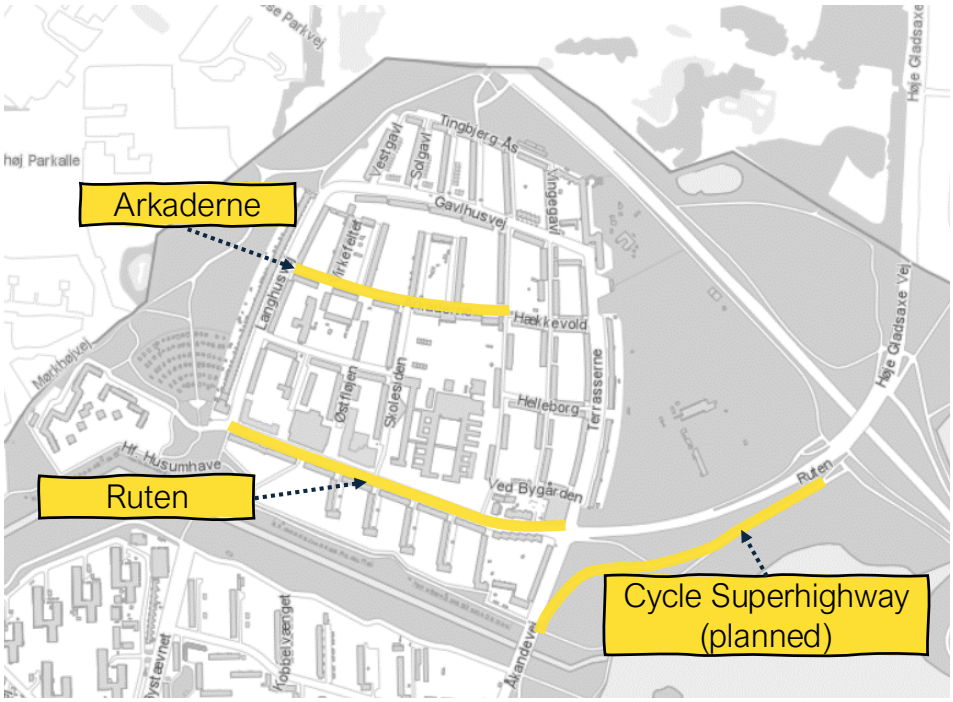


*Figure 7: Streets of investigation for the HSCD (own presentation; Københavns Kommune, 2024)*

The HSCD, a specific tool included in the Healthy Streets approach, was chosen for further exploration in our research because it is publicly available on the Transport for London website. This accessibility allowed us to evaluate the approach without needing additional tools that were not publicly available. However, there are limitations to applying the HSCD in Copenhagen. Most of its assumptions and rules are based on design standards for London and the United Kingdom, not for Denmark or Copenhagen. Additionally, the tool has been modified for different countries, such as Australia (Judd, 2024). Due to the lack of online data available for the review, data had to be collected through site visits and observations, such as pedestrian movements. Furthermore, we had no new street design proposal to compare with the existing road design.

To further analyse the practice behind the Healthy Streets approach, we considered various documents. The first data set includes the blank Excel sheet of the HSCD, the self-assessment of the HSCD with filled-out sheets for the streets Ruten and Arkaderne and a part of a planned Cycle Superhighway neighbouring Tingbjerg (see Fig. 7). The blank Excel sheet also includes guidance for scoring streets.

### Tingbjerg as a testing ground

The neighbourhood Tingbjerg is part of the district Brønshøj-Husum in Copenhagen Municipality. It is located near Highway 2 (Langer, 2024). It was built from 1950 to 1972 with the idea of a modernist and rational residential area and, back then, as an alternative to the congested centre of Copenhagen (ibid.). However, over time, the perception of the area changed unfavourably, according to Catherine Langer (2024) from the Danish Architecture Center.

The neighbourhood faces the challenges of different negative impacts on health. Tingbjerg is exposed to high levels of noise and air pollution due to the neighbouring motorway, especially at the fringes of Tingbjerg. For example, the $NO_2$ concentration is 42 µg/m at the motorway and the neighbourhood streets are 10 to 15 µg/m (Fig. 8; Københavns Kommune, 2024). Noise pollution in the area is between 58 and 68 dB (Fig. 9; Københavns Kommune, 2024).

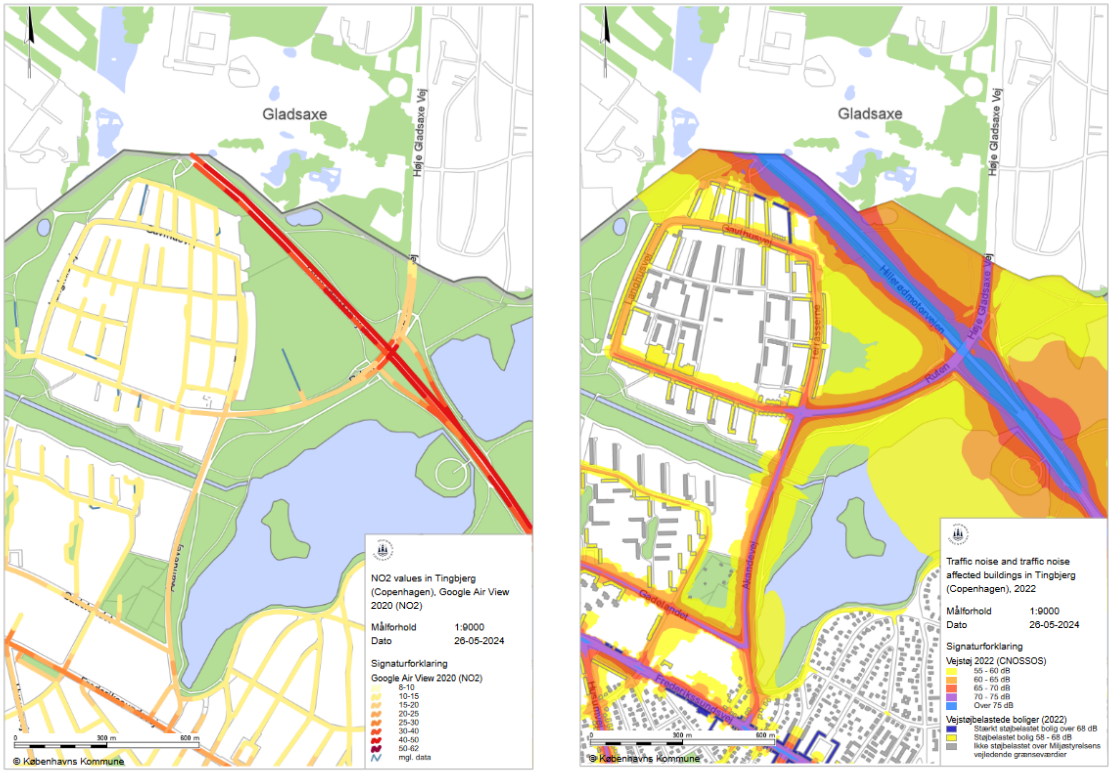


*Figure 8: $NO_2$ values in Tingbjerg (Copenhagen), red indicate higher values (København's Kommune, 2024)*
*Figure 9: Traffic noise in Tingbjerg (Copenhagen), blue and purple indicate higher values (København's Kommune, 2024)*

The number of people living in Tingbjerg with low gross incomes ranges between 41% and 48% and people without a qualification accounted for 52.6% in 2016, which is high compared to other areas in Copenhagen (Københavns Kommune, 2016). The unemployment rate in the area ranges between 6 and 9 % (Nabolagsatlas, 2024).

Health data for Tingbjerg are only available on a regional level for the district Brønshøj-Husum. 15% of people in Brønshøj-Husum are severely overweight, compared to the capital region average of 11%. In addition, 38% of the inhabitants of Brønshøj-Husum state that they are physically active at least once a week, even though green spaces are in the immediate vicinity. The average for Copenhagen residents is 45%. Poor mental health (15%) and high stress levels (27%) are also higher in Brønshøj-Husum than the Copenhagen average (poor mental health 12% and high stress levels 21%). (Robinson et al., 2014)

Our experience using the HSCD in Tingbjerg has shown that, contrary to its public reputation, the neighbourhood possesses many elements indicative of a healthy and welcoming street environment. Applying the tool required close interaction with the urban environment and helped us gain a sense of its atmosphere from observations and a personal conversation with a resident. These insights would not have been accessible solely through desk research. The process demanded

courage and initiative, as we, as researchers, entered an unfamiliar space and attracted attention. Despite being limited to a few days, these experiences influenced our assessment of the Healthy Streets approach, reinforcing the notion that it provides an engaging perspective on the health of a street or neighbourhood.

### 5.1.1 Elements of the practice

In the process of qualitative coding within NVivo, relevant segments of text, be it a paragraph, a sentence or a word, were classified under one of three predefined categories of meanings, competencies and materials. Subsequently, all the coded segments were labelled as specific elements that would describe and comprise the practice. These elements were then grouped back into larger clusters within the categories of meanings, materials and competencies. The following sections describe these clusters in detail. In addition, all of our research-coded elements are in italics.

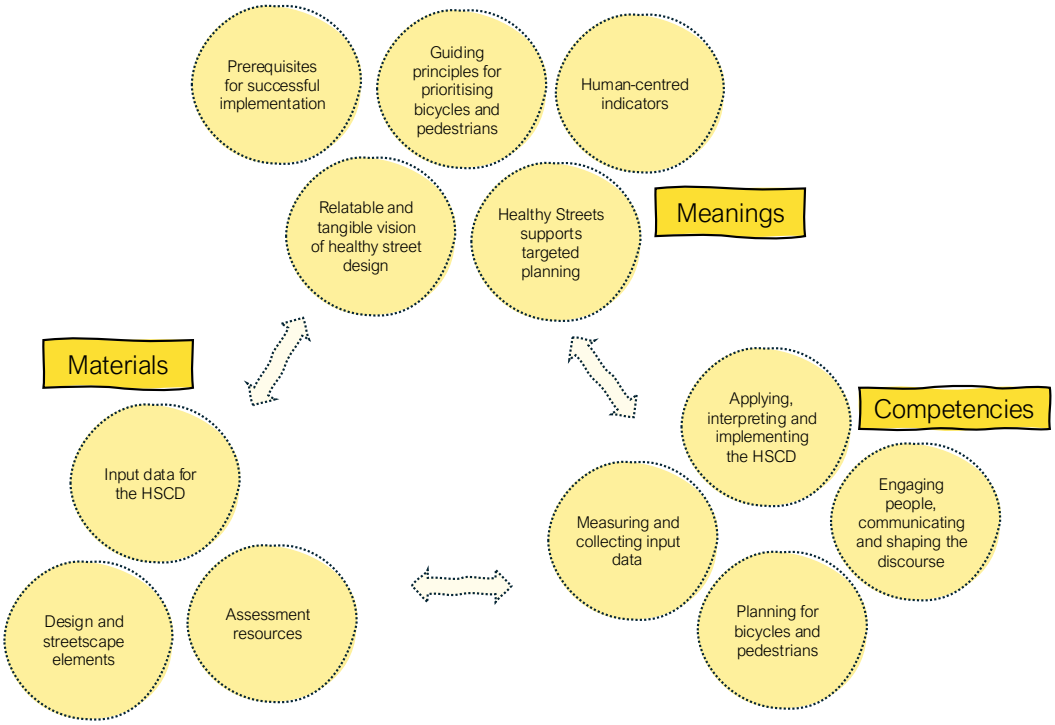


*Figure 10: Overview of the element clusters of the practice around the Healthy Streets approach*

### Meanings

The meanings in the Healthy Streets approach practice are a starting point as determinants for materials and competencies. They entail symbolic meanings, ideas and aspirations, according to Shove et al. (2012).

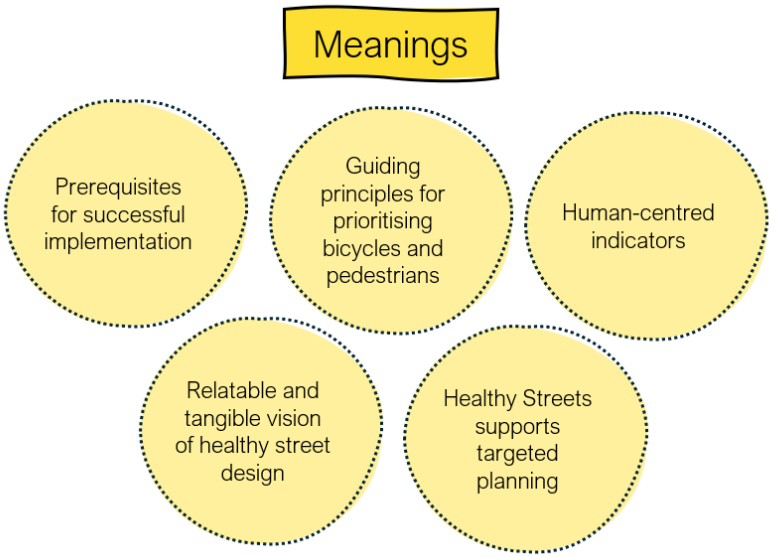


*Figure 11: Overview of the meanings clusters of the practice around the Healthy Streets approach*

### Meanings cluster 1: Human-centred indicators

- Places to stop and rest
- People feel relaxed
- Equality, public space should be healthy for everyone
- Easy to cross
- Not too noisy
- People choose to walk or cycle
- Everyone feels welcome and inclusivity
- Clean air
- Things to see and do
- Shade and shelter contribute to a healthy street
- People feel safe

The research suggests that a meanings cluster revolves around *human-centred indicators*. The developers of the approach came up with 10 indicators for Healthy Streets to set the direction for the approach (TfL, 2021). These indicators focus on the human perspective rather than the vehicle driver's perspective, as can be seen below (ibid.). The indicators encompass *places to stop and rest, people feel relaxed, people choose to walk, cycle and use public transport, people feel safe, things to see and do, not too noisy, clean air, shade and shelter, pedestrians from all walks of life* and *easy to cross* (Fig. 12; ibid.). The prioritisation of the human perspective is indicated, as it is stated that the HSCD "aims to make our streets healthy, safe and welcoming for everyone" (TfL, 2021).

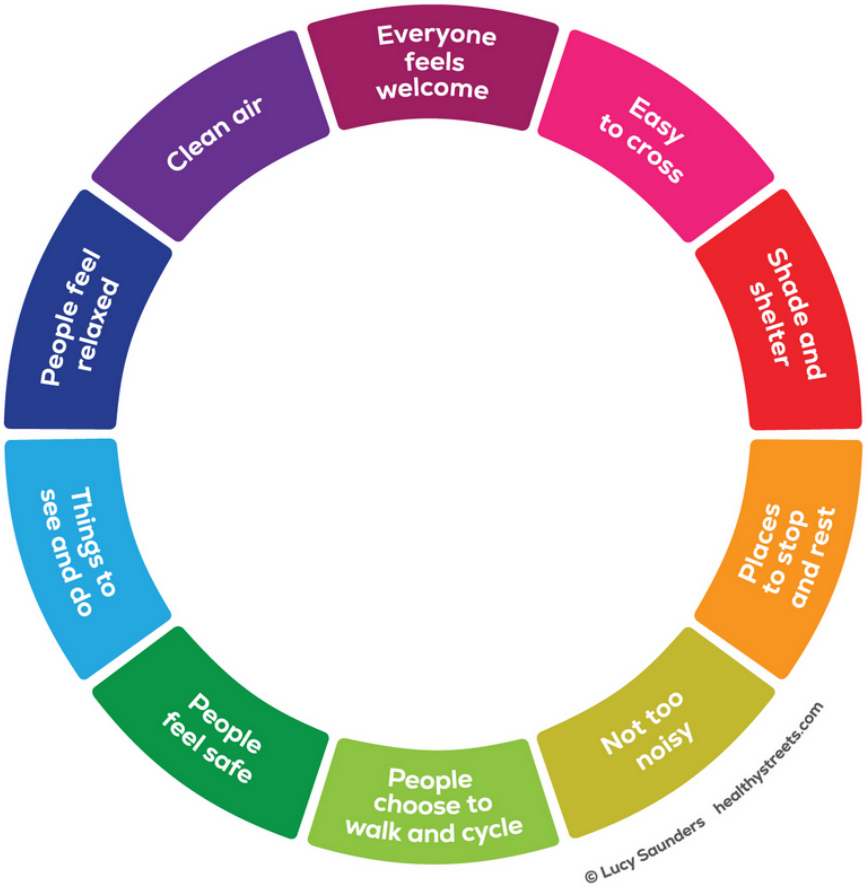


*Figure 12: 10 indicators of the Healthy Streets approach (Healthy Streets, 2024a)*

Despite the fundamental objectives and convictions underlying the application of the Healthy Streets approach, there are variations in emphasis depending on regional and cultural contexts. The aspect of health prioritised in mobility planning can vary from country to country and city to city, based on local challenges (Judd, 2024). This flexibility can affect the application of the HSCD and its acceptance in different locations. For example, in London, air quality is a priority, whereas in Australia, shelter, shade and weather are primary concerns (ibid.). London's prioritisation of air quality is highlighted by the adoption of the *Air Quality Positive* approach in 2023, which addresses poor air quality in London by reducing local air pollution and its sources in major projects (Greater London Authority, 2023).

The human-centred perspective also includes addressing physical and mental health. Physical health may be affected by indicators such as *pedestrians from all walks of life, easy to cross, places to stop and rest* or *clean air* (TfL, 2021). The approach aims to measure how people on the road are affected by motorised traffic and restricted in their freedom of movement, e.g. by high

vehicle speeds or a lack of pedestrian crossings (ibid.). Pedestrians and cyclists should be enabled to walk along the street and stop when they cannot go any further, rather than being restricted by barriers (ibid.). This should improve their physical well-being (ibid.).

Mental health could also be impacted by the above outlined indicators but may be even more strongly addressed in indicators such as *people feel safe, people feel relaxed, not too noisy, places to stop and rest* or *things to see and do* (TfL, 2021). Less noise and the opportunity to pause for a moment can help people feel more relaxed, especially older people who may no longer be able to move quickly. Technical measures such as the *surveillance of public spaces* to prevent criminal activities or *street trees* contribute to relaxation and thus contribute to the feeling of safety correlating with mental well-being (ibid.). To conclude, the tool addresses "what humans need" (Judd, 2024).

Meanings cluster 2: Relatable and tangible vision of healthy street design

- The check presents a vision of local healthy streets
- The check can help to promote a healthy street and improve health
- Data-driven communication is crucial to shift the dialogue towards prioritising health in urban planning
- The check is applicable to cities in different countries

Besides the focus on humans, another identified meanings cluster points to a *relatable and tangible vision of healthy street design*. One of the central ideas underpinning the Healthy Streets approach appears to consist of providing a vision of how a street can become healthier (TfL, 2021). By showing in which areas the performance is low, people can identify and imagine where and how they need to take concrete action to improve the streetscape in terms of its contribution to human health. For example, once the HSCD has been carried out, a radar chart (Fig. 13) can be used to see which existing street conditions fall short of or are better than the proposed street design (ibid.).

According to Pete Murray (2024), the Healthy Streets approach has the potential to shift the discourse towards greater consideration of health in urban planning. This influence can be achieved through quantitative evidence from HSCD results and qualitative support by helping communities visualise healthier streets (Murray, 2024). Tim Judd (2024) experienced in Western Australia that the Healthy Streets approach resonates with different people because it provides evidence and serves as a persuasive tool to convince residents and local council members who approve projects. For example, in a corridor improvement project in Australia, the Healthy Streets results convinced councillors and residents by demonstrating how tangible improvements could be achieved through better scores (Judd, 2024). Judd noted that people were convinced because the proposed measures and design of the Healthy Streets approach did not follow standard methods and templates but instead proposed a tailored design solution that was relatable to the audience (ibid.).

Another dimension of relatability results from the adaptability of the tool to regional and national contexts, which has been demonstrated in London, Barcelona, Budapest and Australia (Healthy Streets, 2024c). In doing so, the approach addresses local challenges. However, the characteristics of an area or a neighbourhood need to be understood to communicate and act accordingly (Murray, 2024).

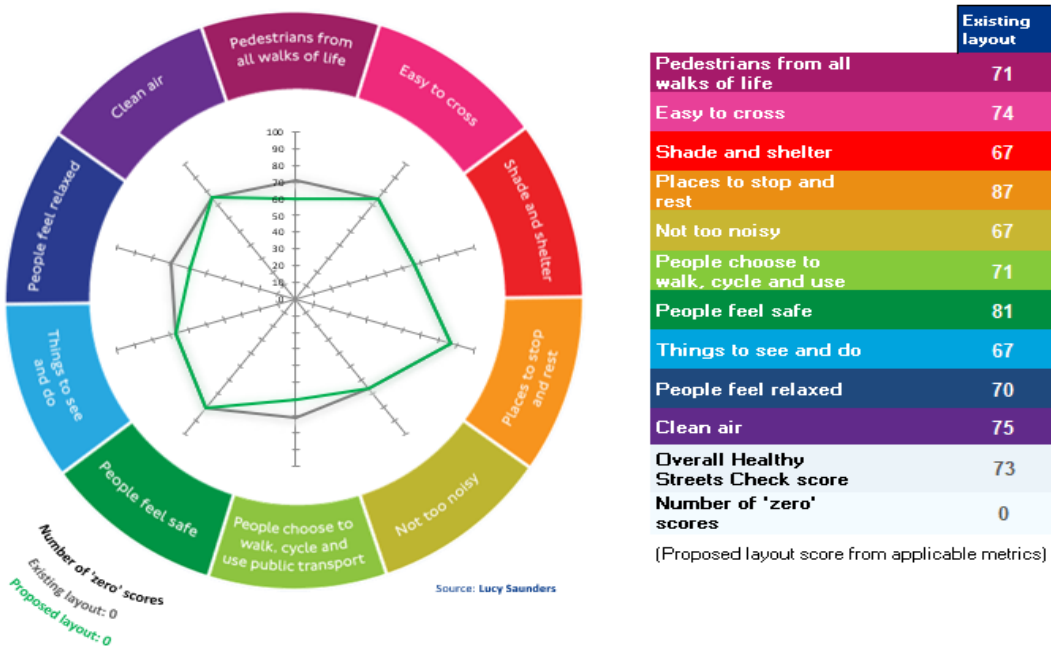


*Figure 13: Example of the radar chart from Ruten, Tingbjerg (TfL, 2021).*

### Meanings cluster 3: Prerequisites for successful implementation

- The check should be primarily applied by people with expertise
- Basis data and the quality must be reliable
- The community's support for politicians', decision-makers' and planners' decisions is important as economic variables
- Low-performance results of the check can collide with political agendas
- Research, regulations and scoring support defining, identifying and planning healthy streets

Our analysis suggests that a cluster of meanings can be drawn around the prerequisites for successful implementation. One prerequisite is that the HSCD can better be applied by trained individuals such as planning practitioners or decision-makers, as interpreting the results or applying the assessment requires expertise (TfL, 2021). The application of the HSCD includes, for example, knowledge of where to obtain the right data, how to clean data sets and how to assess its reliability.

Pete Murray (2024) explains that political and community support are as crucial as economic viability in a democratic system for the successful implementation of health improvements. He elaborates that the acceptance and will of community members are essential for interventions aimed at better health in urban areas since their success depends on these members as the

bearers of health (Murray, 2024). This is related to the audience to whom the HSCD results are addressed (ibid.). Introducing a score and visualising a healthier street can be more convincing and relatable to community members than focusing solely on the return of investment of a project, which only indirectly affects them (ibid.). The HSCD helps advocate for their support by visualising the check results (ibid.). Judd explains that political support can depend on the political orientation of a local government. His experience indicates that more "liberal, open-minded governments" (Judd, 2024) are inclined to work with the Healthy Streets approach, though this does not exclude economically weaker areas from also adopting it.

Meanings cluster 4: Guiding principles for prioritising bicycles and pedestrians

- Public transport and its connectivity contribute to more health
- Street design is a means to prioritise pedestrians and bicycles in the street
- Greenery contributes to human well-being
- Long-term exposure to environmental pollution causes negative health impacts
- Humans should be in the centre for healthy streets design instead of car favourism
- Limiting and restricting cars in speed, movements and volume contributes to a healthy street

Several *guiding principles for prioritising bicycles and pedestrians* could be derived from the analysis. The research indicates the use of planning principles such as greenery as a contribution to human well-being or limiting and restricting cars' speed, movements and volume for greater safety. Examples of how these principles are involved in the HSCD can be seen in the *Scoring Guidance* of the HSCD, which explains why each technical metric is important and how it is measured (TfL, 2021). For example, in the technical metric reducing private car use, it is stated that car dependency should be reduced to increase the number of people walking, cycling or using public transport. The authors of the HSCD explain that more car trips are harmful to physical health and the environment due to a lack of exercise and increased congestion and pollution (ibid.). By taking this criterion into account in the assessment process, the benefits for cyclists and pedestrians can be increased by limiting car traffic (ibid.). The visual experience of more green elements could also have an impact on people's relaxation (ibid.).

Furthermore, the central role of people in the design of Healthy Streets, rather than favouring cars, demonstrates that the developers of the Healthy Streets approach follow their convictions. These convictions or guiding principles are inevitably embedded in the tool. This becomes particularly interesting when considering any potential discrepancies between implicit and publicly expressed convictions.

Providing a score through the HSCD conveys a sense of objectivity. Tim Judd touched on this when he mentioned that the developers of the tool aimed to present a benefit-cost ratio (BCR) without conducting a full economic analysis. He stated, “We […] showed them this […] ‘BCR without being a BCR’ and […] the increase in the healthiness of the street [and] started getting a

bit of traction for the approval authorities" (Judd, 2024). This projected objectivity helps in gaining acceptance and support from various stakeholders for existing convictions.

*Figure 14: Bike path and pedestrian walk at Ruten in Tingbjerg, Copenhagen*

### Meanings cluster 5: Healthy Streets supports targeted planning

- The check helps to identify unhealthy elements and where to improve
- The check allows for cost-effective testing of ideas
- The check serves decision making processes
- Dependence on knowing the characteristics and dynamics of the area of intervention for adequate implementation

*Healthy Streets supports targeted planning* summarises another identified cluster of meanings. The purpose of the approach is also to identify where action needs to be taken to improve health performance in the indicator areas (TfL, 2021). Planners can get an idea of where and how to prioritise health in public spaces based on evidence (ibid.). But the results also provide decision-makers with a product they can sell to target audiences to promote health and visualise the importance of health interventions (Murray, 2024). Murray (2024) also sees it as an advantage of the Healthy Streets approach, that different ideas can be tested quickly and cost-effectively to see how they affect the indicators. However, any intervention requires knowledge of the characteristics of a neighbourhood for successful implementation (Murray, 2024).

### Competencies

Competencies include skills, know-how and techniques, according to Shove et al. (2012).

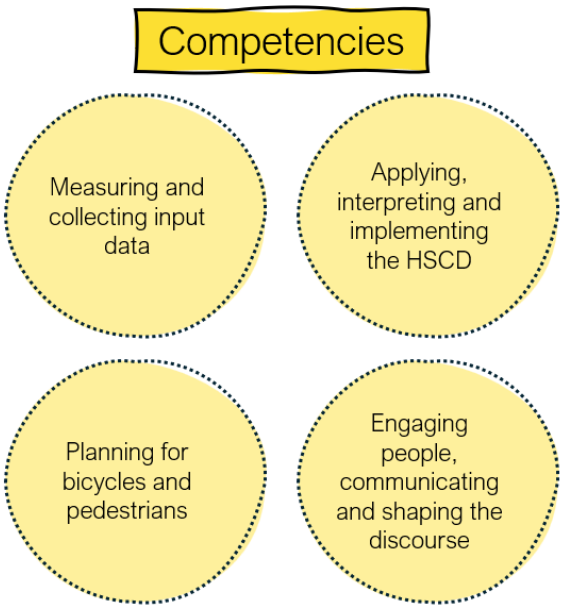


*Figure 15: Overview of the competencies clusters of the practice around the Healthy Streets approach*

### Competencies cluster 1: Measuring and collecting input data

- Ability and knowledge about how to measure pedestrians' and cyclists' movements
- Ability and knowledge about how to measure and (reduce) noise and air pollution and the related health impacts
- Knowledge from observations and on-site visits and about people's experience using the street
- Ability and knowledge about how to measure vehicles' movements

The first cluster of competencies derived from the data can be summarised as *measuring and collecting input data*. The application of the HSCD requires a range of different data. Those applying the HSCD and working with the Healthy Streets approach more broadly need to know where to source this data and how to assess its quality and reliability (TfL, 2021). However, as Murray (2024) notes and our own experimental experiences confirm, the required data is not always available or of high quality in every city, particularly when it comes to open-source data and data not collected by government institutions. In Copenhagen, traffic counts for vehicles, pedestrians and bicycles existed, but not always in the granularity needed. As a result, in our experimental application of the HSCD, we had to collect our data.

Competencies cluster 2: Planning for prioritising bicycles and pedestrians

- Ability and knowledge about how to plan bicycle parking
- Ability and knowledge about how to increase physical activity
- Ability and knowledge about how to maintain street environment for safety
- Ability and knowledge about how plan for people to feel safe
- Ability and knowledge about how to plan resting points and protected areas
- Ability and knowledge about how to restrict and reduce vehicle's speed and access
- Ability and knowledge about how to plan public transport and stations (safety, accessibility, punctuality, connectivity, operation)
- Ability and knowledge about how to plan greenery

The second identified competencies cluster is *planning for prioritising bicycles and pedestrians*. This competence relates to considering factors that enable pedestrians and cyclists to move safely through their environment. The indicator that *people feel safe* entails technical metrics such as *surveillance of public spaces* measures whether places are visually obstructed, crowded or otherwise impact people's sense of security (TfL, 2021). Another example is the *ability and knowledge about how to restrict and reduce motorised traffic* (ibid.). This competency relates to knowledge of mitigation measures in cases where problems are assessed. Such measures could i.e. include time-based access restrictions for cars or exclusive access for resident vehicles and can be implemented to influence and reduce the volume of car traffic (ibid.). In the HSCD, such measures could in turn be assessed with the technical metric of *reducing private car use* (ibid.). Streets with these restrictions are valued higher in the HSCD than those without restrictions (ibid.).

Competencies cluster 3: Applying, interpreting and implementing the HSCD

- Ability and knowledge about how to develop a scoring system for healthy streets
- Ability and knowledge about how to apply the tool
- Ability and knowledge about how to interpret the results, testing ideas and taking action on them
- Ability and knowledge about how to prepare the required data and understand the data
- Ability and knowledge about identifying the characteristics of the area or neighbourhood of intervention

The third competencies cluster can be summarised as *applying, interpreting and implementing the HSCD* (TfL, 2021). On the webpage of Healthy Streets, training on the Healthy Streets approach is advertised (Healthy Streets, 2024d). The HSCD Guidance further expresses that it "is a technical tool that requires a good understanding of street engineering and traffic management to use it" (TfL, 2021).

Part of this cluster is also the *ability and knowledge about how to interpret the results, testing ideas and taking action on them*. For example, Murray (2024) highlights the importance of testing ideas for fostering healthier streets using the HSCD. He views this approach as both cost-effective and quick compared to traditional socio-economic analyses (Murray, 2024). By employing the HSCD, stakeholders can quickly assess design proposals for streets and ascertain whether they enhance the street's health performance (ibid.). An official from the Public Transport Authority of Western Australia (PTA WA) (2024) emphasised that design testing should occur in the early

stages of the planning process. They noted that making adaptations becomes more expensive and difficult as the project progresses. Furthermore, interpretation and implementation of the HSCD require the *ability and knowledge about identifying the characteristics of the area or neighbourhood of intervention*. Murray (2024) explains that the characteristics of each neighbourhood are different. Therefore, identifying these characteristics is important to effectively develop interventions for an urban area and ensure that community members support the proposed ideas.

### Competencies cluster 4: Engaging people, communicating and shaping the discourse

- Ability and knowledge about how to show, communicate and imagine about an improved healthy street environment and shaping the discourse about it
- Ability and knowledge about how to engage people

The fourth cluster of competencies can be summed up as *engaging people, communicating and shaping the discourse*. According to Sidsel Birk Hjuler (2024) and Pete Murray (2024), the Healthy Streets approach provides a foundation for discussions and visions about healthier streets. Communicating and managing the discourse is part of the Healthy Streets process. Therefore, understanding and interpreting the results is essential for effectively communicating them and responding to questions about the HSCD. Planners, decision-makers and citizens can use the results of the HSCD to understand how healthy a street can be and grasp the impact of design changes on the urban environment (TfL, 2021; Murray, 2024). A central component of the application is effective communication with various stakeholders. The tool facilitates this through its inclusive language (Official PTA WA, 2024), implying the ability to communicate clearly and simply. Since the tool's success depends on community support, it is necessary to engage with people, gather their feedback and help them envision their new environment (Murray, 2024). However, this engagement can be challenging, especially when reducing space for cars, as people may resist such changes (Official PTA WA, 2024).

### Materials

According to Shove et al. (2012), the materials of practice include things, technologies, tangible physical entities and the stuff that objects are made of. In this research, the term material is not limited to physical objects but also includes non-objects such as health factors or activities in the streetscape. The reason for this extension is that the practice consists of planning with these non-objects.

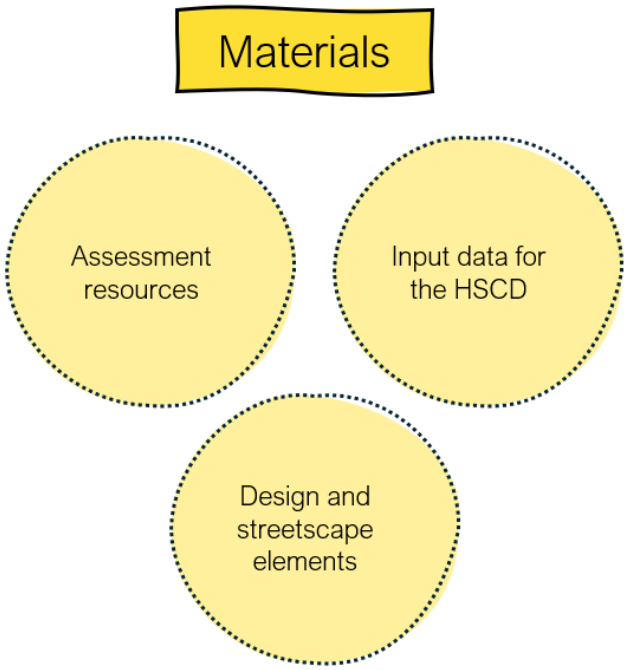


*Figure 16: Overview of the competencies clusters of the practice around the Healthy Streets approach*

### Materials cluster 1: Input data for the HSCD

- Health factors, burdens and benefits and diseases
- Regulations for design
- Measurements of pedestrian and cyclist movements and countings
- Open data
- Characteristics of an area or neighbourhood (socio-economic, power dynamics etc.)
- Measurements of vehicle movements and countings

The first materials cluster consists of the *input data for the HSCD*. To assess the existing situation, measurements of vehicles or pedestrians or open data must be available (TfL, 2021). Given regulations for design, they also characterise the practice of what is possible to implement or how the measurement of vehicle movements can be carried out (ibid.). In addition, the characteristics of an area or a neighbourhood, including socio-economic or power dynamics, are materials that are part of the practice as they determine how the communication and public participation processes should be approached (ibid.). Health factors, burdens and benefits and diseases as factors to be improved or reduced are included in the practice.

Materials cluster 2: Design and streetscape elements

- Moving entities (car, pedestrians, cyclists, etc.)
- Public transport services and installations
- Restrictions for speed and access of vehicles
- Roads, paths, lanes, streets
- Greenery
- Activities in the streetscape
- Street design elements (pavement, etc)
- Measurement of pollution (air, noise, environmental data)
- Plans and drawings
- Street furniture

The second identified cluster of materials is labelled as *design and streetscape elements*. The entire streetscape as an object of inquiry for the HSCD and the Health Streets approach more broadly are considered in this cluster. This includes, i.e., greenery, street furniture or street design elements, including various pavements or lines on the carriageways (TfL, 2021). Measurements of pollution (air, noise and environmental data), plans and drawings also function as materials in the practice (ibid.). Moving entities such as cars, pedestrians or cyclists and activities in the streetscape are additionally grouped in this materials cluster as important subjects towards which the planning and assessment practice can be directed (ibid.).

*Figure 17: Urban greenery, pathways and street furniture in Vesterbro, Copenhagen*

Materials cluster 3: Assessment resources

- Digital tools
- Indicators, results and data from the check
- Research
- Feedback and community engagement

*Assessment resources* summarise another materials cluster derived from the data. Digital tools such as the HSCD Excel spreadsheet provide the framework for conducting the check (TfL, 2021). To assess what is healthy for humans, research is needed to form the basis for decisions (ibid.). The indicators, the results and the data of the check are the variables that are processed in the practice (ibid.). In addition, feedback and community engagement are used for communication purposes (TfL, 2021; Murray, 2024).

### 5.1.2 Interdependencies between the elements

This chapter describes the interdependencies between clusters of elements within the practice of the Healthy Streets approach and their relationships to each other. Understanding these interdependencies is crucial, as they form the foundation of the practice. The connections between these elements hold the practice together, yet there is always potential for rearrangement and the emergence of new interdependencies within any practice. The following analysis of the interdependencies highlights the most important connections between the identified clusters and aims to reflect the broader quality of interactions between meanings, competencies and materials.

#### Meanings and competencies

Interdependencies between meanings and competencies determine the success of the implementation of the Healthy Streets approach. As shown in Figure 18, a *relatable and tangible vision of healthy street design* (meanings cluster 2) requires *competencies in engaging people, communicating and shaping discourse* (competencies cluster 4). This relationship highlights how effectively communicating the benefits of healthy street design is essential for gaining public and political support. Planners and officials must translate technical and health-related information into relatable and understandable terms, such as the benefits of noise reduction, increased shade and better seating. These competencies in communication and engagement ensure that the vision for Healthy Streets is accessible to a broad audience, fostering community support and facilitating the successful implementation of health-oriented urban planning measures. Effective communication is essential for engaging people and shaping discourse, particularly regarding the Healthy Streets approach.

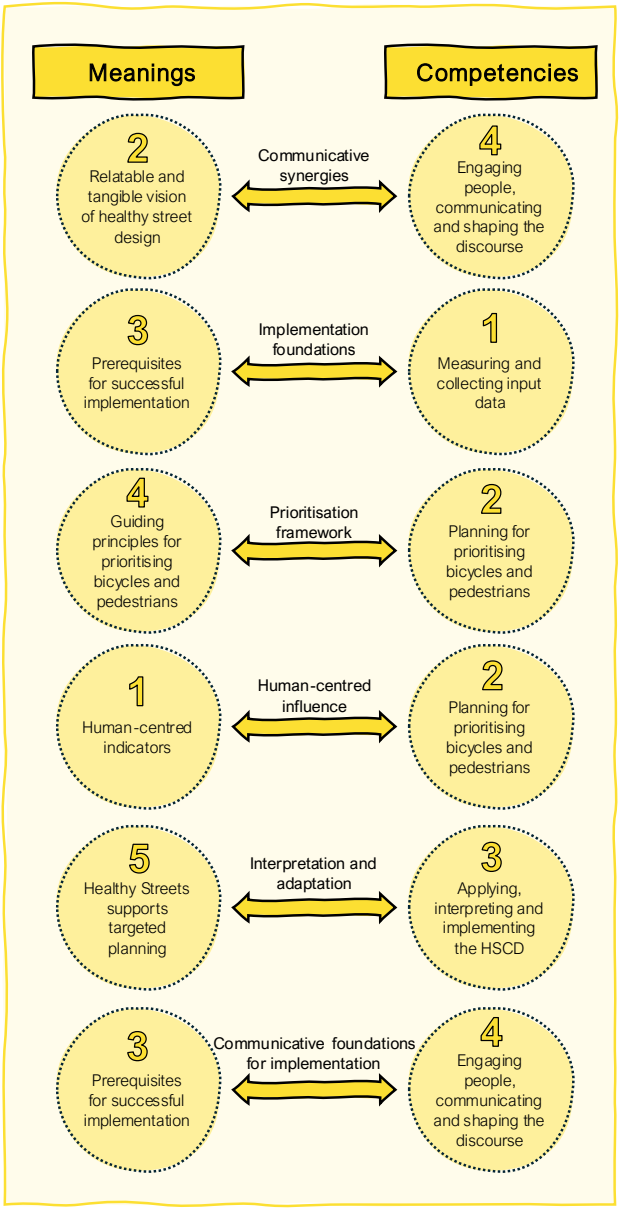


*Figure 18: Interdependencies between meanings and competencies*

Raising awareness about Healthy Streets can also help to further embed this approach in policy documents and institutions. Alix Oakes

(2024) noted that in the UK and London, the Healthy Streets approach is already integrated into some policy documents and official planning procedures, whereas in Australia, local councils are just beginning to demand Healthy Streets in tenders and proposals. Political support often hinges on the knowledge and convictions of city governments. According to Oakes (2024) political orientation can influence communication strategies, but effective communication can also shape opinions. Interviewees like Judd, Oakes and Noonan express that prioritising health in mobility planning through the Healthy Streets approach is closely linked to how its benefits are communicated to persuade others (TfL, 2021; Judd, 2024; Oakes, 2024; Noonan, 2024). These dependencies on advocacy and communication can be regarded as reflective of the need to recruit practitioners, according to Kent (2022), both in the form of fellow planners and in realms outside of the planning offices. Recruitment in this sense may be a critical dependency when it comes to ensuring the adaptation, survival and success of the practice under investigation.

### Meanings and materials

The relationship between meanings and materials is illustrated through the *guiding principles for prioritising bicycles and pedestrians* (meanings cluster 4) and their impact on *assessment resources* and *design elements* (materials clusters 2 and 3) The guiding principles, which emphasise the importance of prioritising non-motorised traffic, shape the selection and application of materials used in urban planning. For instance, the assessment resources, such as research-informed metrics, are developed based on these guiding principles. These metrics, which include measures of air quality and $NO_2$ concentration, direct the attention of the planning process. Consequently, the materials chosen for street design reflect these health-oriented priorities. This interplay ensures that the design and streetscape elements not only comply with but actively promote the guiding principles, thereby reinforcing the importance of health and well-being in urban environments. (TfL, 2021)

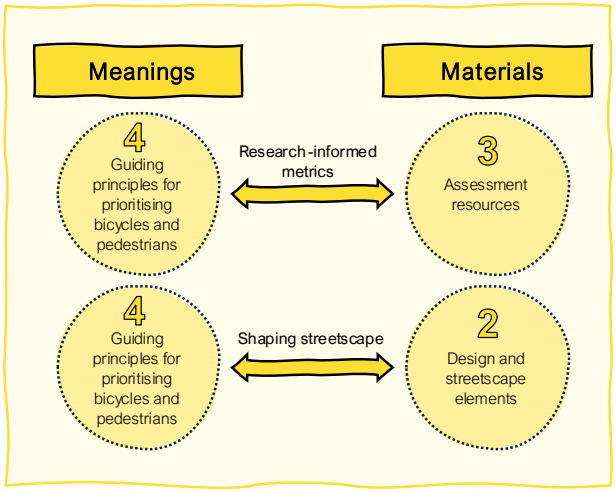


*Figure 19: Interdependencies between meanings and materials*

### Competencies and materials

The interrelation between competencies and materials within the Healthy Streets approach is critical for effective urban mobility planning. As depicted in the provided illustration, the competencies required in planning for bicycles and pedestrians (competencies cluster 2) are directly applied to the design and streetscape elements (materials cluster 2). This connection means that the practical skills and knowledge of urban planners and designers are utilised to select and implement specific design elements that can for, instance, promote safety and accessibility for non-motorised traffic. In this sense, competencies in urban design and traffic engineering guide the selection of materials such as traffic calming features like speedbumps, street narrowing, dedicated bike lanes and pedestrian crossings, all of which are essential for creating a safe and welcoming environment for cyclists and pedestrians. These design elements are informed by the planners' expertise and are essential in translating abstract planning goals into concrete, physical changes that enhance urban health and safety. (TfL, 2021)

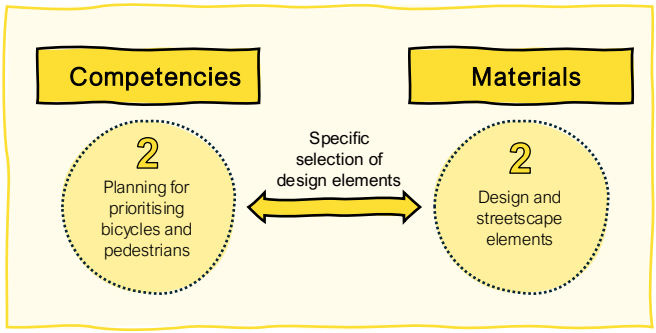


*Figure 20: Interdependencies between meanings and competencies*

## 5.2 Socio-economic analysis and the Cycle Superhighway Collaboration

Our analysis of the use of the socio-economic analysis in informing mobility planning and addressing public health impacts centres around an example from the Region of Greater Copenhagen. Specifically, we are analysing how the socio-economic analysis as a method has influenced the Cycle Superhighway Collaboration in the region. This effort is being led and coordinated by a central Cycle Superhighway Secretariat which manages the Cycle Superhighway Collaboration. Its work revolves around the shared effort of individual municipalities to expand the regional cycling infrastructure network. This network has been growing over the course of the last decade and currently consists of roughly 850 km of bike paths (Fig. 21). (Birk Hjuler, 2024; Incentive, 2018)

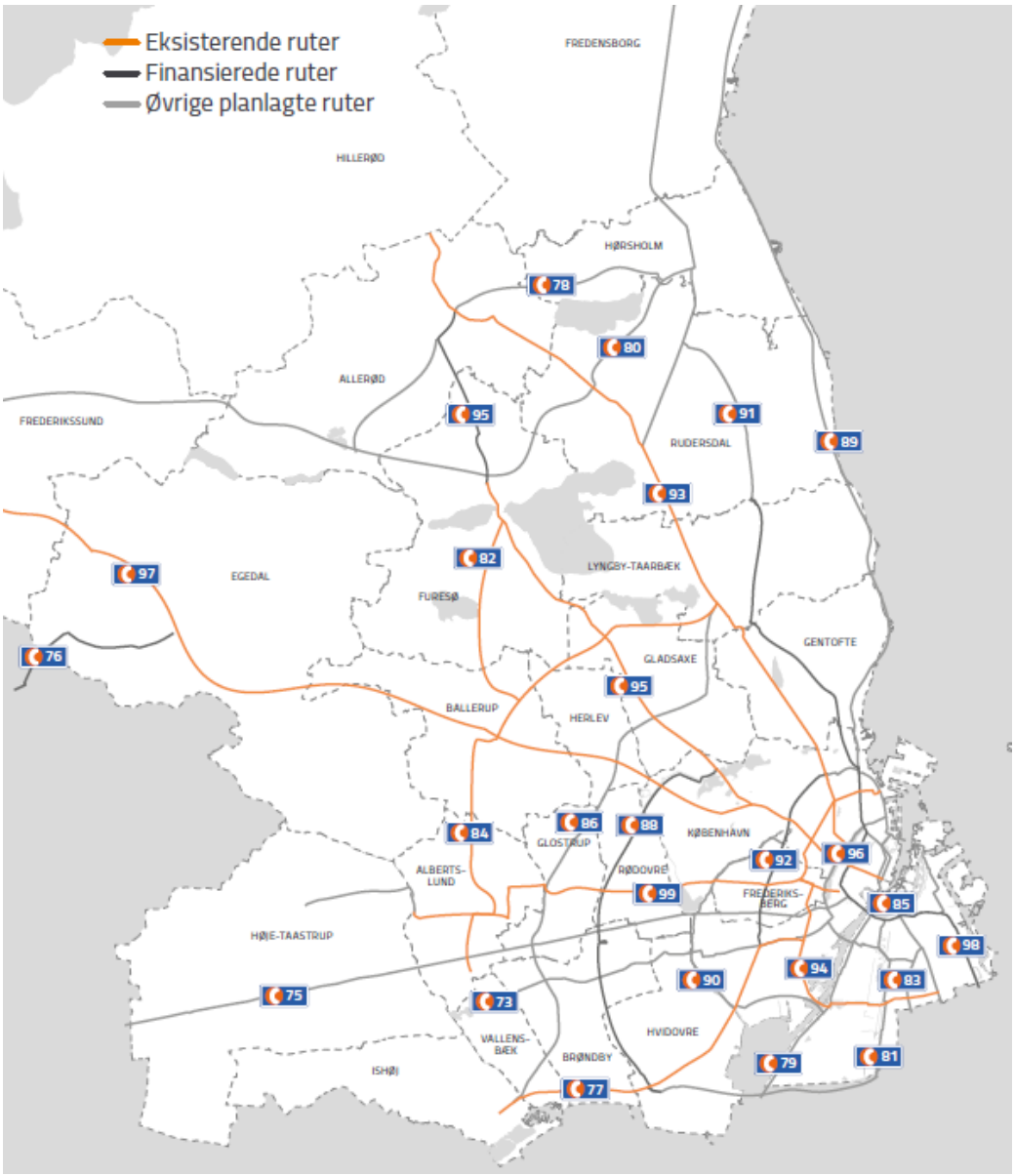


*Figure 21: Network of Cycle Superhighways 2017 (Supercykelstier, 2017)*

The socio-economic analysis has been part of the efforts undertaken to gain funding and achieve this expansion. Our analysis of this approach is primarily based on a report of the *Socio-economic analysis of the Cycle Superhighways* (Danish: Samfundsøkonomisk analyse af supercykelstierne) from Incentive (2018), which is the official document summarising the methodology and results of the second socio-economic analysis conducted in this regard. For our analysis, this document has been translated from Danish to English. An initial analysis of the socio-economic impact of the Cycle Superhighways was conducted in 2013 - the first attempt of a suitable assessment methodology by the consulting firm Incentive (Incentive, 2018).

In addition to the analysis of the respective document, we are considering two interviews with key stakeholders of the Cycle Superhighway Collaboration. Firstly, Signe Helledi, the current Head of Office of the Secretariat of the Cycle Superhighways and Sidsel Birk Hjuler, who has formerly been in the same position and is now an outspoken advocate and expert for cycling and active mobility as a board member of the European Cyclist Federation.

Besides these interviews dedicated specifically to the planning of the Cycle Superhighways in Copenhagen and focusing heavily on the integration of health into transport economic considerations, the interviews with Healthy Street practitioners in Australia provided additional context. Despite the different planning environments, the contrast drawn in this report between transport economics and *unfiltered* approaches to integrating health into mobility planning was familiar and relevant to all interviewees in Australia, who shared their personal experiences within this field of tension.

The Cycle Superhighway Collaboration in Denmark originated from the structural reform of 2007, which led to the closure of the regional transport planning authority. Initiated in 2009, this collaboration aimed to help municipalities plan and realise a regional-scale infrastructural vision (Birk Hjuler, 2024). Without this collaboration, municipalities would have faced significant challenges. In Denmark, there is no regional road authority at the regional level, only at the state or municipal level (Helledi, 2024). The collaboration is viewed as a "gentleman's agreement" (Birk Hjuler, 2024) between the Capital Region of Copenhagen and 28 municipalities, with no binding contract. The Capital Region contributes to the costs despite normally having no authority over roads, thereby seizing an opportunity to promote its interests in health and accessibility (Birk Hjuler, 2024; Helledi, 2024).

In the past, socio-economic analyses for infrastructure projects considered factors like climate, noise and time savings (Birk Hjuler, 2024). The first socio-economic analysis for the Cycle Superhighways, which also included health, was conducted by Incentive in 2013 (Incentive, 2013 and 2018). This 2018 analysis was based on the methodology developed by the Danish Ministry of

Transport, Building and Housing in 2013, which created the TERESA spreadsheet model for socio-economic analysis in the transport sector (Incentive, 2018). The 2018 analysis builds on the Vision Plan for Cycle Superhighways (ibid.).

Compared to socio-economic analyses for larger infrastructure projects, the analysis for the cycling network faces higher uncertainty. This is due to the lack of comprehensive traffic count data for the entire network and the greater influence of weather on cycling data compared to car traffic. Additionally, the impact of developing Cycle Superhighways remains uncertain (ibid.). There are plans to develop a new socio-economic analysis for the Cycle Superhighways (Helledi, 2024).

The socio-economic analysis considers health in terms of external costs, such as savings from higher tax revenues due to fewer illnesses (Incentive, 2018). It also includes factors like air pollution, climate, and noise (ibid.). However, the costs associated with sedentary behavior in cars are not considered (Birk Hjuler, 2024). Similarly, the effects of public transport and accident risks are excluded due to a lack of known values (Incentive, 2018). Overall, the 2018 analysis reported a socio-economic rate of return (internal rate of return) of 11%, while the Danish Ministry of Finance sets a 4% threshold for classifying an infrastructure project as socio-economically viable (ibid., Fig. 22).

**Socio-economic results of the super cycle paths**

| Mia. DKK, 2018 prices | Present value |
|---|---|
| **Construction costs incl. residual value** | **- 2.2** |
| **Operating costs** | **- 4.6** |
| **Profits for cyclists** | **7.5** |
| of which existing | 7.2 |
| of which new and transferred | 0.3 |
| **Nuisance for motorists** | **- 0.8** |
| of which priorities and involved areas | - 0.9 |
| of which congestion gains | 0.1 |
| **Accident** | **0.1** |
| **Health** | **4.6** |
| of which state in total | 2.8 |
| of which state via region | 1.5 |
| of which municipalities in total | 1.8 |
| of which municipalities via region | 0.7 |
| **Air pollution, climate and noise** | **0.0** |
| **Tax Consequences** | **1.0** |
| **Labor supply effect** | **0.2** |
| **Total** | **5.7** |
| **Socio-economic return (internal rate of return)** | **11%** |

*Figure 22: Socio-economic results of the socio-economic analysis for the Cycle Superhighways (Incentive, 2018: 7)*

### 5.2.1 Elements of the practice

The following chapter describes and defines the planning practice surrounding the work of the Cycle Superhighway Secretariat in Copenhagen – with a particular emphasis on transport economic considerations and the integration of health in socio-economic analysis. We consider the entire planning cosmos in and around the Secretariat. While the analysis of the planning practice focuses on the role of socio-economic analyses, we are not limiting the analysis to planning procedures strictly connected to this assessment. Our interest lies in understanding the role of socio-economic analysis within the broader planning context, as exemplified in the Capital Region's development of the Cycle Superhighways. (See Fig. 23)

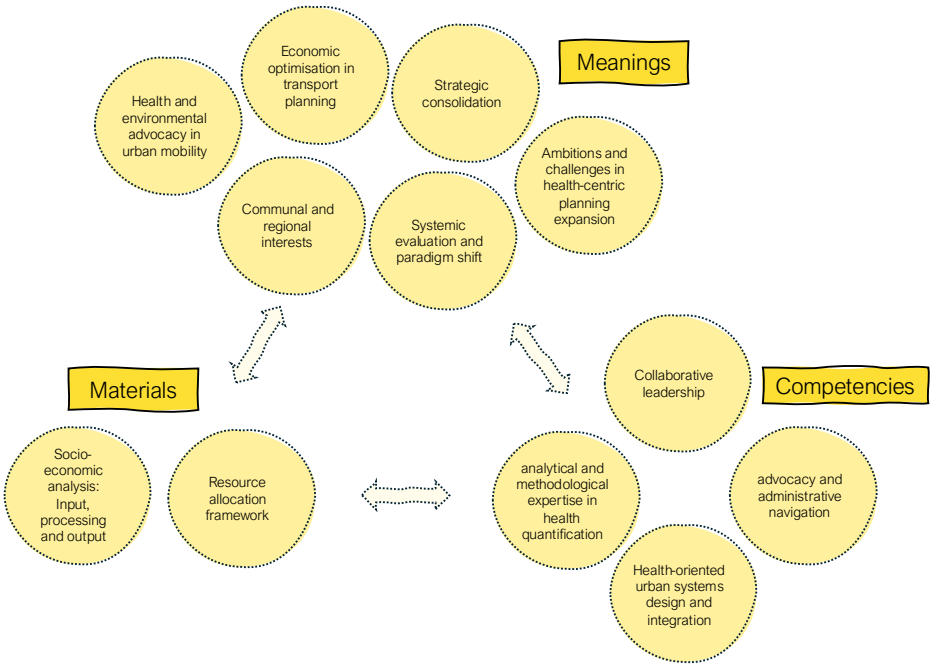


*Figure 23: Overview of the element cluster around the practice of the Cycle Superhighway Collaboration and the socio-economic analysis of the Cycle Superhighways*

Meanings

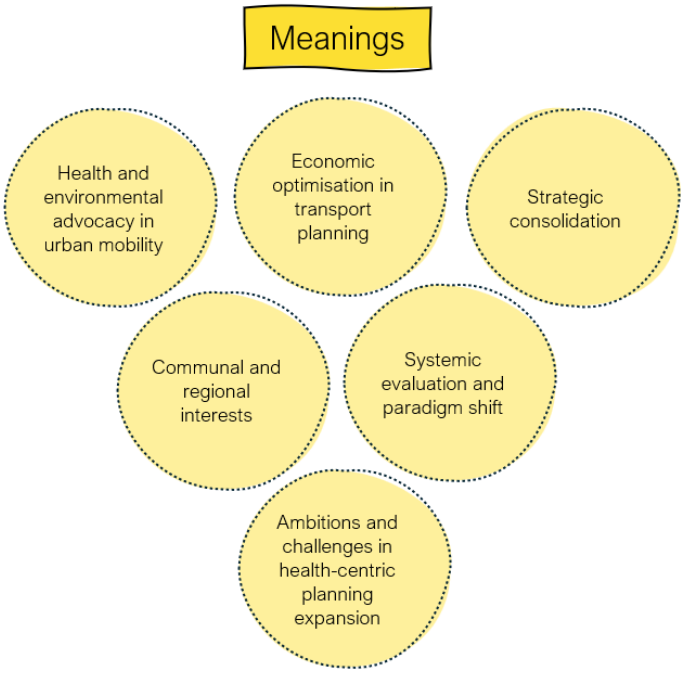


*Figure 24: Overview of the meanings clusters around the practice of the Cycle Superhighway Collaboration and the socio-economic analysis of the Cycle Superhighways*

### Meanings cluster 1: Ambitions and challenges of the health-centric planning expansion

- Ambition to push cycling towards being a long-distance mode of transportation
- Anticipation of criticism and challenges
- Limited number of health indicators
- Ambition to expand scope of socio-economic analysis towards a more fair, holistic analysis

Our analysis highlights key elements underpinning Copenhagen's Cycle Superhighway Collaboration. A central theme is the ambition to promote cycling as a viable long-distance transportation mode, moving beyond its traditional perception as a short-distance, leisurely activity. Despite the fact that cycling is very well established as a means of commuting in Copenhagen, both Birk Hjuler and Helledi emphasise the role that more traditional perceptions play in the planning of large-scale cycling infrastructure projects (Birk Hjuler, 2024; Helledi, 2024). In particular, there are challenges in ensuring that cycle lanes are considered and treated on an equal footing

*Figure 25: Cyclists and cars on the morning commute in Vesterbro*

with other infrastructure projects. The interviewees therefore express a strong ambition to shift perceptions, addressing what they understand as a historical underestimation of cycling's potential for longer commutes in Denmark (ibid.). Incentive, the consulting firm hired by the Cycle Superhighway Secretariat to conduct the socio-economic analysis, also expresses in its 2018 assessment an intention to break up these pre-dominant perceptions. It describes ambitions "to create better conditions for cyclists across municipal boundaries and to make cycling an attractive form of transport for commuters, also over long distances." (Incentive, 2018: 5)

Birk Hjuler (2024) and Helledi (2024) emphasise the health benefits of cycling, including mental clarity and reduced sedentary lifestyle risks. The interviewees therefore call for reevaluating funding procedures for infrastructure projects, advocating for methodologies that better account for health costs and benefits. Birk Hjuler notes that traditional evaluations prioritise time savings, often overlooking the negative health impacts of car travel (Birk Hjuler, 2024).

The discussion highlights the need to expand health factors in planning, incorporating mental health benefits into socio-economic analyses. This approach aims to challenge and reform traditional views, promote cycling as a viable, healthy mode of transport and push for more comprehensive and equitable evaluations.

Meanings cluster 2: Systemic evaluation and paradigm shift

- Use of old system or preexisting paradigm
- Numbers and quantification as a crucial basis for political decisions in the current system
- Change of system culture and agenda as a contrasting or complementary pathway

The elements in this cluster highlight the reliance on established systems and quantification for decision-making. Helledi (2024) and Birk Hjuler (2024) emphasise these as critical in their work, particularly for socio-economic analysis in promoting the Cycle Superhighway Collaboration. Despite recognising systemic preconditions and the need to optimise them, both aspire to overcome these limitations.

Their ongoing dependence on and reassessment of political and administrative frameworks reflects a desire to enhance urban planning decision-making. Helledi (2024) acknowledges the challenge of adapting projects, their framing and ambitions to fit existing systems. Nonetheless, both Helledi and Birk Hjuler engage in political and social advocacy, using unconventional methods to promote health and liveability, such as conducting health surveys before and after the construction of Cycle Superhighways or helping municipalities design sustainable streets (Helledi, 2024).

When talking to both interviewees about alternative planning approaches and the typical use case for the Healthy Streets approach, this dichotomy between an old and a new paradigm came up repeatedly. Birk Hjuler sees Healthy Streets as a way to envision liveable neighbourhoods and

prioritise health. Yet, for her, the question remains how to apply this tool at a regional level and supplement it with figures. She emphasises the need for robust numbers to convince politicians, asking, “how will you use this argument as something that doesn't just become kind of a hippie happy fairy tale. You need more hardcore numbers. [...] What is it worth compared to the highway [...]?” (Birk Hjuler, 2024).

These inquiries show that planning practices for the Cycle Superhighway Collaboration focus on utilising existing political processes and funding mechanisms to expand the regional cycling network. Emphasising numbers and quantification is essential and with a strategic approach, these elements can advance this goal rather than hinder it.

### Meanings cluster 3: Health and environmental advocacy in urban mobility

- Ambition to improve cycling conditions
- Improving safety and preventing accidents
- Ambition to reduce environmental impacts
- Ambition to reduce sick days

The meanings cluster of *health and environmental advocacy in urban mobility* focuses on enhancing and expanding cycling infrastructure to increase safety, mitigate environmental and health impacts and reduce socio-economic costs like sick days. This link between mobility planning and health outcomes, highlighted by stakeholders and the 2018 socio-economic analysis by Incentive, is reflected in the perspectives of Birk Hjuler (2024) and Helledi (2024). Both express a strong commitment to sustainable mobility and its health benefits. Helledi (2024) further details a long-term project plan for the development of the Cycle Superhighway Collaboration. This plan states the intention to integrate health and climate considerations more deeply into planning, funding, communication and evaluation processes (Helledi, 2024).

Although not the sole focus, health and environmental advocacy also permeate the analysis by Incentive in 2018. This analysis forecasts an increase of 6 million new bike trips annually, a decrease of approximately 1 million car trips per year, a reduction of $CO_2$ emissions by nearly 1,500 tonnes annually, $NO_x$ emissions by about 2,500 kg per year and a decrease in sick days by just over 40,000 annually. Birk Hjuler (2024) emphasises the effectiveness of providing quantifiable evidence that "cycling equals good health," which has been crucial in convincing politicians to continue funding the project every few years.

*Figure 26: Cycle Superhighway at the highway 2 at Tingbjerg, Copenhagen*

Meanings cluster 4: Economic optimisation in transportation planning

- Implicit prioritisation of economic benefits
- Ensuring profitability
- Competition for transport investment and funding
- Saving or reducing construction costs
- Maximising benefits
- Thresholds for socio-economic return
- Health related returns as an argument for funding
- Saving or reducing operating costs

The focus of a fourth meanings cluster influencing the overall planning practice under investigation involves economic optimisation alongside social and environmental concerns, guiding the Cycle Superhighway Collaboration. This means striving for profitability, managing costs effectively and meeting socio-economic return targets (Helledi, 2024). Socio-economic analyses serve to prioritise inputs, balancing monetary and non-monetary values with outputs expressed in financial terms, aiming to surpass the 4 percent threshold.

In this framework, the socio-economic value of time savings, outlined by Incentive (2018), is crucial. It assigns a monetary value to time saved through infrastructure improvements, enabling comparisons. For instance, saving an hour of travel time is more valuable if it frees up work time, reflecting the possibility of accounting for such differences in the impacts on productivity. Specif-

ically, improvements to cycle paths that save a cyclist one minute per trip can be quantified economically - approximately DKK 1.5 socio-economic gain for each minute reduced during commute times. This demonstrates both individual benefits and broader economic impacts through infrastructure improvements.

Incentive (2018) estimates the Cycle Superhighway project's socio-economic return at 11 percent. According to Helledi (2024), more up-to-date assessments have been able to estimate that a 23 percent return of investment is possible once the whole network is established. This voluntary nature of the analysis conducted by the Cycle Superhighway Collaboration underscores its importance for the Collaboration, as noted by Helledi (2024). Birk Hjuler highlights the role of the analysis in convincing regional politicians to continue supporting the project. Helledi (2024) also mentions that part of this emphasis on economic return is linked to internalised conceptions and understandings of value being tightly linked to economic growth.

### Meanings cluster 5: Communal and regional interests

- Municipal interests improving urban livability and regional connectivity
- Prioritisation of local citizens

The meanings cluster labelled as *communal and regional interests* captures the local government's interest in improving urban quality of life and enhancing regional connections through mobility solutions. It emphasises local priorities and the impact of urban planning decisions on communities' liveability. As it is expressed in the report on the socio-economic analysis conducted for the Cycle Superhighways, "it is the citizens of the municipalities, the cyclists, who achieve the greatest gains" (Incentive, 2018: 9). It is important to recognise when conducting a socio-economic analysis, that it considers a very brought societal scale, but does not necessarily end up affecting society in a homogenous way.

Although the Cycle Superhighway Collaboration aims to demonstrate a socio-economic return of investment, it is also concerned with direct impact, both in terms of the benefits of cycling infrastructure to local citizens and the services that the Collaboration can provide to communities. Helledi (2024) outlines a process where recommendations for the design of Cycle Superhighways are documented. This involves a desktop screening using Google Street View to identify upgrades, followed by consultants and colleagues cycling the routes to assess the real-life experience and feasibility. This example illustrates that it is not just the regional-scale expansion of the cycling network and its socio-economic return of interest for the Cycling Superhighway Collaboration but also the experience of the local streetscapes and urban environment. While Birk Hjuler focuses in the following statement on larger scale benefits, it is again illustrated that the political interests to navigate within the planning practice are more complex than just the interest in a socio-economic return of investment. Birk Hjuler (2024) explains that regional political decision-makers also have "smaller area[s] of interest, green mobility, a connected region […], work and living. […] They

need to […] focus on the coherency of the region [on] many different levels [i.e.] good education systems." Both Birk Hjuler (2024) and Helledi (2024) recognise that there is an interest in addressing local benefits and "trying to help envision a local regeneration", as Birk Hjuler (2024) puts it.

### Meanings cluster 6: Strategic consolidation

- Consolidation of several small projects in one socio-economic analysis as a tool for recognition
- Hypothetical arbitrary nature of assessment – blackbox
- Vision for cycling as a superior form of transportation and introducing strategic prioritisation
- Value and mission-driven work
- Improving health

Meanings cluster 6 encapsulates a strategic approach to consolidating municipal power and securing funding for cycling infrastructure, as articulated by Helledi and Birk Hjuler. They advocate for a visionary plan: A regional cycling network stretching over 850 kilometres. This vision is not only a goal but also a selling point, akin to major national projects. Birk Hjuler (2024) articulates the magnitude of the Cycle Superhighways undertaking, comparing it to major national infrastructure projects like bridges and highways, thus underscoring the necessity of bundling multiple smaller projects into one comprehensive socio-economic analysis to enhance recognition by the Ministry of Transport and secure funding.

Moreover, the cluster emphasises the need to navigate bureaucratic frameworks and advocate for shifts in project assessment methodologies to accurately reflect the value of cycling infrastructure (Helledi, 2024). Despite only 1.8% of national transport funds allocated to cycling, Helledi (2024) and Birk Hjuler (2024) stress cycling infrastructure's substantial socio-economic benefits, surpassing traditional transportation projects. This persuasive power is important in ongoing discussions with regional and national politicians, especially when seeking to establish cycling as a viable and essential component of urban and regional planning. Additionally, Helledi (2024) calls for shifts within planning and funding agencies to prioritise investments based on health and environmental outcomes. She suggests to "incorporate demands or more like a strategic prioritisation, when you invest in cycle infrastructure" (Helledi, 2024). Overall, meanings cluster 6 underscores the necessity of visionary transportation planning coupled with pragmatic strategies to redefine the role of cycling in urban mobility and secure essential funding and policy influence.

Competencies

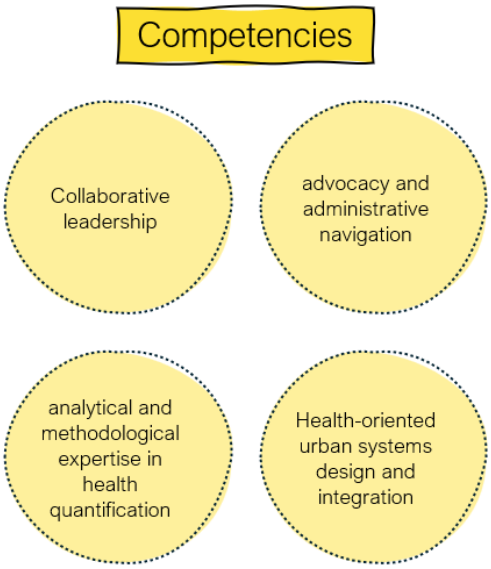


*Figure 27: Overview of the competencies cluster around the practice of the Cycle Superhighway Collaboration and the socio-economic analysis of the Cycle Superhighways*

### Competencies cluster 1: Health-oriented urban systems design and integration

- System integration towards healthier cities
- Design and implementation support
- Systems change towards heathier cities

The competencies cluster 1 *health-oriented urban systems design and integration* concerns the balance of operating within an existing framework while striving to innovate and transform it to foster healthier urban environments. This involves both adapting to existing systems and forging new pathways for healthier urban environments. Helledi highlights the necessity of working within the constraints of the existing system, explaining the necessity to “fit this project for cycling infrastructure into the old system because it's the old system that is in place right now" (Helledi, 2024).

A transformative aspect underpinning the planning practice is discussed as an important objective. This must be balanced with the previously outlined adaptation to the existing system: "One of the things we are trying to do in the collaboration, we are trying to change a culture and agenda […]. That's […] the more qualitative way […] to make the system all brand new to another system" (Helledi, 2024). Here, the goal is to shift the overarching cultural and procedural paradigms towards more health-focused urban development. Furthermore, Helledi (2024) highlights a need to focus more explicitly on health benefits, expressing an ambition to address this issue. For instance, when launching a Cycle Superhighway, they conduct evaluations with pre- and post-measurements and surveys involving at least 400 participants each time to gather feedback on the project (Helledi, 2024). Helledi acknowledges the potential of these surveys to focus on tangible health benefits rather than just the return of investment. However, this remains a complex challenge that

requires expertise, quantification methods and administrative cooperation, often hindered by siloed work cultures and structures.

These insights from Helledi (2024) illustrate a dual approach within the competencies cluster: Working within and beyond the existing urban systems and infrastructures to promote healthier, more sustainable urban environments. This blend of strategic adaptation and innovative transformation is essential for the integration of health-oriented goals into the broader urban fabric and is a key challenge within the planning practice conducted at the Cycle Superhighway Secretariat.

Competencies cluster 2: Analytical and methodological expertise in health quantification

- Research and methodological development and refinement
- Quantification of health benefits
- Quantification of traffic flows
- CBA Core Analysis

This competencies cluster encompasses skills in research, method development and specifically the quantification of health impacts and traffic flows within cost-benefit analysis frameworks. It emphasises the technical and analytical abilities required to measure and articulate the health benefits of urban mobility projects. As stated in the Incentive (2018: 4) socio-economic analysis, there is "no general and well-established method for calculating the social economy of cycling initiatives and key figures for the effects are still under development." Utilising such assessments in the work cannot rely on well-tested and established methodologies but requires a degree of pioneering and research that can only be achieved in collaboration with experts. In the case of the Cycle Superhighway Collaboration, the Danish Technical University (DTU) has been an important partner in this regard, enabling work that has been recognised by both Birk Hjuler (2024) and Helledi (2024) as complex and technical. When talking about the role of external expertise and the DTU, Birk Hjuler described the repeated collaboration with DTU, both in the initial socio-economic analysis, as well as in a later analysis intended to cover the entire network: Birk Hjuler (2024) explains that the DTU is "involved in making the numbers, […] the transport unit numbers that you put into the machine, all of these things, right? […] So, we really wanted them to […] see what do you think about this analysis?".

Competencies cluster 3: Advocacy and administrative navigation

- Campaigning for active mobility
- Lobbying to ensure or improve political support and funding
- Ability to navigate administrative and governmental structures
- Managing different levels of road authority

Competencies cluster 3 involves essential skills for promoting and implementing cycling initiatives within political and administrative environments, which are crucial for driving the Cycle Superhighway project. Helledi (2024) discusses the challenges of advocating for cycling, both to the public and politicians, highlighting the difficulty in quantifying its health benefits. She underscores the

need to translate qualitative benefits into compelling arguments for quantitative-minded stakeholders. Additionally, navigating administrative landscapes involves aligning departmental plans and securing specific funds, which can be challenging due to the siloed nature of government funding. Helledi explains: “So to try to plan across departments and get money that is allocated for disease prevention measures, health-related money, that's very difficult” (Helledi, 2024).

Birk Hjuler (2024) emphasises the need to continually convince regional politicians of the socio-economic benefits of cycling infrastructure to secure ongoing support and funding. She highlights the importance of coordinating with municipalities, which hold road authority, to effectively manage and implement cross-regional cycling infrastructure projects.

### Competencies cluster 4: Collaborative leadership

- Ability for institutional collaboration
- Leadership skills
- Interlocution, connecting, mediating

The elements emerging from the cluster of *collaborative leadership* highlight competencies required in managing the different institutional relationships and interests that are all encompassed under the Cycle Superhighway Collaboration. Birk Hjuler (2024) highlights the importance of non-binding agreements, which she calls “gentlemen's agreement”. These agreements are central to aligning each of the participating municipalities behind the goal of creating a cohesive network of cycling infrastructure across the region. Her statements underscore the reliance on the good faith of involved parties to facilitate cooperation across municipal boundaries, reduce bureaucratic hurdles and streamline project development despite the lack of a central, authoritative leadership. Even though the Cycle Superhighway Secretariat - an “office that consists of five people who every day do a lot of things to make sure that this works and all of these 28 municipalities work together" (Birk Hjuler, 2024) – may be regarded as centralised, its role is rather one of a facilitator. The practical aspects of collaborative support are further emphasised by Helledi (2024), who points out the logistical coordination required across different municipalities: "And so when you have a regional route, you have to coordinate between the different municipalities so that they set money aside at kind of the same time and if they do not, then they need to hurry up to put money aside. If one of the municipalities is starting to construct." This coordination ensures that funding and construction efforts are synchronised, which is crucial for the seamless execution of interconnected infrastructure projects.

## Materials

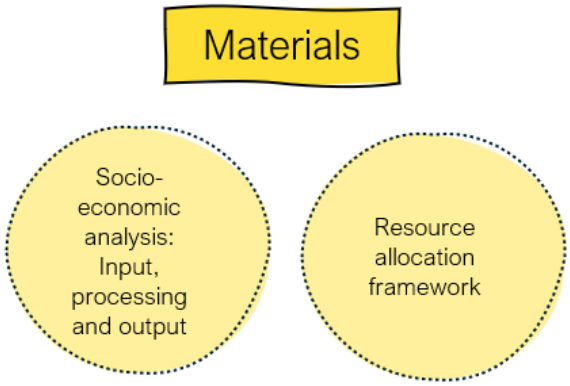


*Figure 28: Overview of the materials clusters around the practice of the Cycle Superhighway Collaboration and the socio-economic analysis of the Cycle Superhighways*

### Materials cluster 1: Socio-economic analysis

| INPUT | PROCESSING | OUTPUT |
|---|---|---|
| · Input Data<br>· Environmental Impacts<br>· Surveys<br>· Research<br>· Changes in traffic flows and mobility transfers<br>· Traffic flows<br>· Cycling network subject of the analysis | · Core analysis<br>· Strategies, rules and guidelines for the analysis<br>· Socio-economic model<br>· Unit prices | · Scenarios<br>· Gains<br>· Losses<br>· Economic impacts and costs<br>· Environmental costs<br>· Social impacts and costs |

### Input

The materials cluster of *socio-economic analysis INPUT* encompasses the wide range of data types used to evaluate how social and environmental factors, along with traffic patterns and efficiency improvements, of cycling networks translate into economic gains for society. First, a key material is the cycle path itself - more precisely, the status quo versus the scenario of the implemented Cycle Superhighway infrastructure. In other words, upgraded and extended cycle paths are designed to improve accessibility, comfort, safety and security (Incentive, 2018). These paths aim to facilitate cycling as an easy and comfortable mode of transportation, connecting crucial nodes like residential areas, educational institutions and workplaces (ibid.). Helledi (2024) details the current extent of the Cycle Superhighways, noting that 28 municipalities and the Capital Region collaborate on this expansive network, which currently spans approximately 850 kilometres. The socio-economic analysis further considers metrics such as the number of bike trips per year, with data collected on commuter versus non-commuter bicycle tours, average trip lengths and time savings. Next to this transport data, noise and pollution are also considered input data.

But the planning practice under investigation is not just characterised by the data considered but also by the data that is not considered. Challenges are i.e. highlighted by Incentive (2018) concerning the robustness of input data on traffic counts across the entire cycling network, suggesting a dependence on less reliable data. In addition, Birk Hjuler (2024) discusses the complex evaluation of cars in socio-economic terms, likening the sedentary lifestyle they are associated with to "the new smoking,". Additionally, Helledi (2024) emphasises the importance of continuous research and feedback mechanisms, such as surveys conducted with at least 400 participants before and after the realisation of cycle paths. This approach is part of a wider effort to quantify the health benefits of cycling, recognising the substantial body of research that supports the health benefits of regular physical activity (Helledi, 2024). This has yet to be fully integrated into the assessment of the socio-economic costs and benefits of infrastructure development.

### Processing

This materials cluster consists of the core tools and methodologies used in the socio-economic analysis of transport projects. It focuses on implicit strategies, utilised economic models, the integration of pricing units used to evaluate the cost-effectiveness and socio-economic benefits of transportation interventions and various modes of transportation measured, i.e. in costs or gains per kilometre a person has travelled. Processing underscores the technical and methodological materials that underpin economic assessments in urban planning. At the core of the socio-economic analysis lies the previously mentioned transport model that is developed by the Ministry of Transportation, Building and Housing in the form of a spreadsheet tool. This model, considered Teresa v. 4.051, has been used in the socio-economic analysis conducted by Incentive in 2018. (Incentive 2018)

### Output

Elements in this materials cluster deal with the projection and evaluation of potential outcomes from transportation projects. As opposed to the previously described cluster of input data, this set of elements focuses on the outcomes of the socio-economic assessment. It includes scenarios that forecast various futures, as well as assessments of potential gains, losses, economic, environmental and social costs. This includes construction costs, incl. residual value, operating costs, profits for cyclists, tax consequences, labour supply effects and construction costs, but also results relating to changes in sick days, nuisance for motorists, accidents, health, and average trip length. (Incentive, 2018)

Materials cluster 2: Resource allocation framework

- Old paradigm
- Validation list
- Budgets, funds and resources

The elements in this cluster focus on the financial and structural resources available for transportation planning and the overall framework and mechanisms in place for allocating such resources. This includes what has been considered and discussed with Helledi (2024) as an "old paradigm" that currently governs resource allocation, the specific budgets allocated for projects and recommendation lists that influence the allocation of resources. Furthermore, it includes what has been discussed with both Birk Hjuler (2024) and Helledi (2024) as the validation list, a list of infrastructure projects on which a socio-economic analysis has been conducted that is intended for official validation. This kind of validation is not mandatory for the Cycle Superhighways but has been emphasised as a concern and a matter of lacking recognition by Birk Hjuler (2024). Helledi (2024) further expressed that if the Cycle Superhighways and the produced socio-economic analyses were to be placed on such a validation list, "it would be like a huge […] tab on the shoulder that they also recognise regional cycling infrastructure as a big infrastructure investment - and on the same level as a highway" (Helledi, 2024).

### 5.2.2 Interdependencies between the elements

#### Meanings and competencies

The interdependencies between meanings and competencies are essential for realising health-oriented urban and mobility planning. The ambition-driven integration of health-centric planning addresses a broad range of competencies. Our interviews revealed a demand to be realistic and pragmatic in navigating funding mechanisms and regulations while holding on to higher ambitions, striving to redefine cycling as a long-distance transportation mode (Helledi, 2024; Birk Hjuler, 2024).

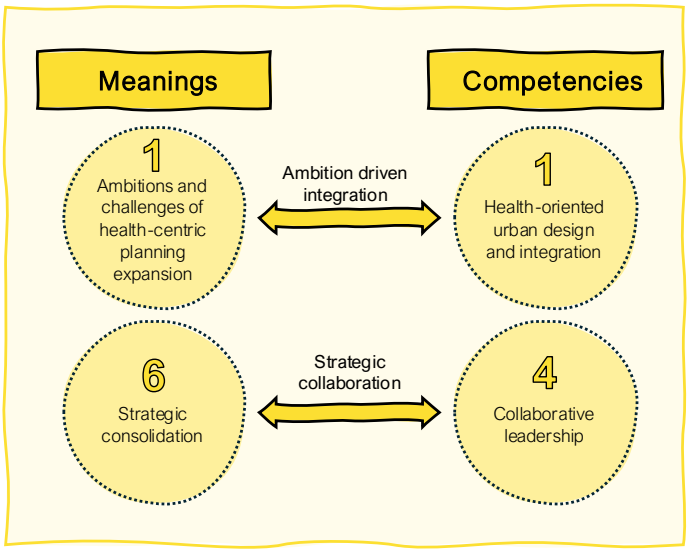


*Figure 29: Interdependencies between meanings and competencies*

Concurrently, the strategic consolidation of cycling projects into a regional network emphasises the importance of collaborative leadership. Effective collaboration across municipalities, facilitated by strong leadership, ensures synchronised efforts and supports the broader strategic vision of health-centric urban environments.

These interrelations demonstrate how practical competencies intersect with the overarching goals of urban planning, driving holistic transformations towards sustainable cities.

### Meanings and materials

The connections between meanings and materials revolve around a demand for reliable data inputs and comprehensive analyses of an increasing number of social and environmental factors that can be affected by the expansion of cycling infrastructure. Especially the ambition to include health metrics in socio-economic analyses necessitates expanding the scope of data inputs to encompass long-term health outcomes and environmental impacts. This expanded input supports the strategic goals of promoting health-centric urban planning by providing the necessary evidence to justify initiatives such as the Cycle Superhighways.

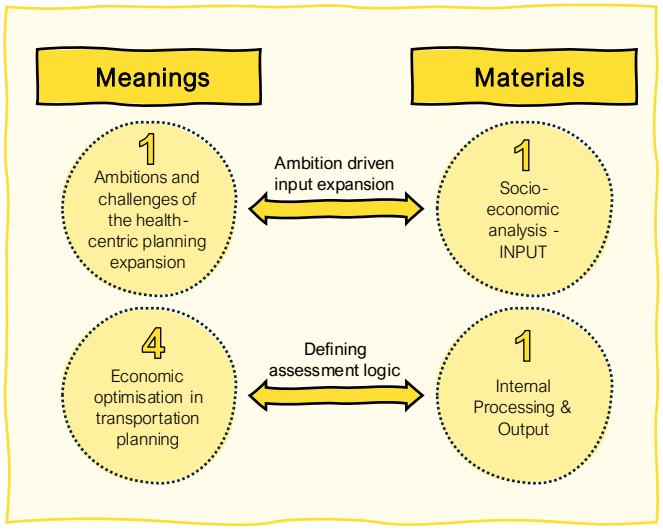


*Figure 30: Interdependencies between meanings and materials*

An impetus remains for economic optimisation. To realistically evaluate the profitability of a project on a societal scale against the backdrop of changing societal and environmental conditions (i.e., demographic changes, climate change) requires precise data to evaluate cost-benefit scenarios, ensuring infrastructure investments' profitability and economic viability. The interrelation between meanings and materials underscores the need for transparency and rigorous data to integrate health benefits into economic models effectively.

### Materials and competencies

Lastly, the interdependencies between materials and competencies emphasise the need for specialised skills and advocacy in urban planning. Socio-economic analyses require analytical and methodological expertise to quantify health benefits accurately and integrate them into broader evaluations. This expertise ensures that complex data translates into actionable insights, supporting health-oriented planning. Furthermore, navigating administrative and legislative

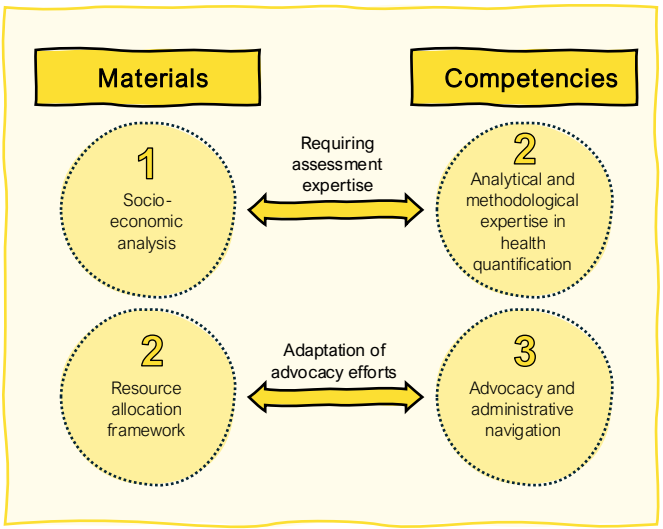


*Figure 31: Interdependencies between materials and competencies*

structures to secure funding necessitates strong advocacy and administrative navigation competencies. Effective advocacy leverages socio-economic data to demonstrate project value, align efforts and secure support. These interdependencies highlight the importance of technical and advocacy skills in translating analyses into actionable plans, crucial for implementing health-oriented transport and mobility projects and achieving sustainable urban development within an existing planning infrastructure.

# 6. Discussion

The discussion will address the second sub-question: *How can the qualitative assessment of healthy street design and transport economic planning approaches be differentiated in terms of their impact on public health?*. The 10 Essential Public Health Operations (EPHOs) developed by the WHO Europe guide the discussion and help in assessing the potential for public health improvements in cities. The strengths of each practice in terms of their contribution to public health are presented.

Building on this discussion, we can answer the main research question: *How can a health-oriented street design and mobility planning practice complement a cost-benefit-oriented transport planning practice to contribute to public health improvements in cities?*

### Public health framework under consideration

Since the inception of public health as a concept of scientific and political concern, its definitions have been subject to change (Azari and Borisch, 2023). In the 18th century, public health was concerned mainly with sanitary conditions and the control of communicable diseases (WHO Europe, 2012a). The origins of a concrete definition of public health go back to Charles-Edward A. Winslow (1920), whose definition was further developed by Donald Acheson (1988) (Azari and Borisch, 2023). Acheson (1988) defined public health as “the art and science of preventing disease, prolonging life and promoting health through the organised efforts of society." The WHO Europe (2012b) also follows Acheson's definition (1988). The European Public Health Association (EUPHA, 2024), which brings together public associations and institutes in Europe and is co-funded by the EU, shares this definition but adds that health services, research, health service delivery and health system design play an important role.

The European Office of the World Health Organisation (WHO Europe) explains that a key challenge in protecting public health is that societies and their public health issues are changing constantly. Therefore, public health is required to “ensure that services adapt and respond to these changes and reflect the current and future public health threats and risks.” (WHO Europe, 2012b: 2). Changing conditions for public health can emerge not only from an economic crisis but also from climate change. Furthermore, the COVID-19 pandemic as a public health crisis drew attention to the dependence of societal and governmental rather than individual action in public health management (Azari and Borisch, 2023).

To explore how the planning approaches can contribute to public health, we utilise Essential Public Health Operations (EPHOs) defined by WHO Europe (2024). This framework includes 10 measures (EPHOs) to support states in realising sustainable health and well-being:

- EPHO1: Surveillance of population health and well-being
- EPHO2: Monitoring and response to health hazards and emergencies
- EPHO3: Health protection including environmental occupational, food safety and others
- EPHO4: Health Promotion including action to address social determinants and health inequity
- EPHO5: Disease prevention, including early detection of illness
- EPHO6: Assuring governance for health and well-being
- EPHO7: Assuring a sufficient and competent public health workforce
- EPHO8: Assuring sustainable organisational structures and financing
- EPHO9: Advocacy communication and social mobilisation for health
- EPHO10: Advancing public health research to inform policy and practice

## 6.1 Planning practices and their contribution to public health

### 6.1.1 Healthy Streets and relation to public health

#### Human-centred perspective to address social inequalities

This practice centres on a human-centred approach to street design, shifting away from a car-favouring perspective (TfL, 2021). The Healthy Streets approach not only addresses the health impacts on drivers, such as physical inactivity, but also considers external effects like pollution and noise on non-drivers' mental health (ibid.). By covering a wide range of disease sources, including non-communicable diseases linked to physical inactivity, the Healthy Streets approach aligns with EPHO5: *Disease Prevention, including early detection of illness*, which emphasises early detection and management of illnesses (WHO Europe, 2024). This requires professionals to be trained in evidence-based treatments and modern equipment. In mobility planning, Healthy Streets provides tools and training to increase awareness of health determinants, enhancing public health outcomes through more informed urban planning practices.

The EPHO4: *Health Promotion, including action on social determinants and health inequity*, aims to "promote the health and well-being of populations by addressing inequities and the wider social and environmental determinants" (WHO Europe, 2024). The Healthy Streets approach aligns with this operation by considering the external effects of motor vehicle use, such as the impact on those who cannot afford cars but are affected by air and noise pollution (Judd, 2024). Healthy Streets indicators like *clean air* and *not too noisy* (TfL, 2021) address these externalities, targeting both environmental and social determinants. By incorporating these factors, the Healthy Streets approach helps redesign physical environments to meet community needs and mitigate health risks. This is particularly beneficial for neighbourhoods with limited advocacy power and low-budget communities, thereby addressing social inequalities and promoting health equity (Judd, 2024).

### Accessible through easy language

Healthy Streets offers a relatable and tangible vision useful for communication purposes, contributing to EPHO9: *Advocacy, communication and social mobilisation for health*. EPHO9 emphasises using modern communication methods to support leadership and community engagement (WHO Europe, 2024). It also aims to help people and communities understand health risks (ibid.). Healthy Streets simplifies complex issues, making health risks in the environment accessible to the public (Judd, 2024). By using clear language, it mobilises people and shows how interventions impact their health, even for those not professionally involved in health (Official PTA WA, 2024). The EPHO4: *Health Promotion, including action to address social determinants and health inequity,* emphasises the importance of integrating health considerations into all policies, including transport and health (WHO Europe, 2024). The EPHO4 recognises the interdependencies between various planning domains, such as health and mobility, rather than focusing on a singular issue and proposes *health in all policies*. By extension, this can also entail involving professionals from diverse fields in the policy development process (WHO Europe, 2024). The Healthy Streets framework supports this by using clear, accessible language that avoids professional jargon, making it understandable across different disciplines (Official PTA WA, 2024). This facilitates informed decision-making by policymakers from various backgrounds, enabling them to comprehend the tool's outcomes.

### Research and evidence to inform policy-making

The EPHO10: *Advancing public health research to inform policy and practice* from WHO Europe (2024) recommends that policies be based on research and evidence. The Healthy Streets approach aligns with this by being an “evidence-based assessment” (Murray, 2024). By collecting and processing data, this approach helps identify areas where decision-makers need to act to improve health through streetscape interventions. Rather than using a standardised template, each Healthy Streets planning process gathers unique evidence to make tailored suggestions for street design. However, the quality of the Healthy Streets results can vary, as the quality of the available input data varies (ibid.).

### Identification of health risks with the approach

Public health in mobility planning can be enhanced by interpreting data to identify where health risks occur. This aligns with EPHO2: *Monitoring and response to health hazards and emergencies*, but at a local level (WHO Europe, 2024). Once identified, measures can be introduced to minimise or eliminate these risks in the street environment. The Healthy Streets approach, as applied in various contexts like Australia, demonstrates its adaptability by weighting factors such as shade, shelter and weather more heavily to address potential health hazards and emergencies (Judd, 2024). This method enables the identification of specific health risks and the necessary measures to address them.

### 6.1.2 Socio-economic analysis and relation to public health

#### Ambition to include additional factors in socio-economic assessments

The ambition to include additional factors such as health in socio-economic assessments conducted in transport and mobility planning aligns well with the public health operation EPHO4 of *Health Promotion* as defined by WHO Europe (2024). EPHO4 emphasises that "supportive environments need to be created [...] to empower individuals and populations to have healthier lifestyles and behaviours" (WHO Europe, 2024). This aspiration is akin to the promotion of walking and cycling as viable modes of transportation. Supportive environments in this regard can also be the policies and procedures that govern funding allocation and project approvals by various public authorities. Updating the guidelines and rules about how the socio-economic value of infrastructural investments is evaluated can create supportive environments for decisions that may ultimately empower individuals and populations to adopt healthier behaviours. The connection to public health is underlined as EPHO4 explicitly describes health promotion as "pursuing healthy and sustainable transport" (ibid.). It supports countries in "defining and managing healthy mobility policies and promoting healthy and sustainable transport through a health in all policies approach." This operation further helps countries "make health and environmental considerations a more explicit criterion for decision-making on transport" (ibid.).

#### System evaluation and paradigm shift

Helledi (2024) and Birk Hjuler (2024) emphasise using socio-economic analysis to promote the Cycle Superhighway Collaboration while also expressing a desire to evolve these systems. EPHO6: *Assuring governance for health and well-being* aims to ensure public health governance by engaging stakeholders in strategic policy development to define health goals and activities. This public health operation aligns with the planning approach of the Cycle Superhighway Collaboration, which evaluates existing governance systems for health and well-being. By leveraging these systems, the collaboration makes a case for expanding cycling infrastructure.

#### Socio-economic analysis and public health research

The socio-economic analysis for the Cycle Superhighways involves collecting and processing data on environmental impacts, traffic changes and other socio-economic factors to project potential scenarios and outcomes. By using guidelines, unit prices and economic models derived from research, this analysis provides a data-driven foundation for decision-making. EPHO10: *Advancing public health research to inform policy and practice* emphasises the importance of using research findings to inform evidence-based policymaking. Integrating diverse data points and methodologies enhances the understanding of public health impacts and supports the development of new research methods. Partnerships between regional administrative organisations, like the Cycle Superhighway Secretariat and academic institutions, such as the Danish Technical University, exemplify this integration (Incentive, 2018).

### Advocacy and administrative navigation

Advocacy and administrative navigation play a critical role in advancing walking and cycling initiatives within complex political and administrative landscapes. Helledi (2024) underscores the challenges of quantifying health benefits but emphasises the importance of qualitative and quantitative arguments for garnering political backing. EPHO9: *Advocacy communication and social mobilisation for health* stresses the need for strong communication strategies to articulate the health benefits of cycling and walking. Enhancing the communication of socio-economic assessments to the public could bolster advocacy efforts and community support by making them more relatable and understandable.

## 6.2 Differentiation and synthesis of the practices

The previous chapters have allowed the characterisation of two types of mobility planning practices that share a common ambition to promote health. These practices, as the previous analysis revealed, address mobility planning and health in different ways. The differences are associated with unique strengths but also challenges of implementation, highlighted in the tables below.

| Strengths | |
|---|---|
| Healthy Streets approach | Cycle Superhighway Collaboration and the socio-economic analysis |
| • Focuses on understandable and inclusive language, improving public health literacy, visualising direct health benefits<br>• Can improve community inclusion and support<br>• Provides a human-centred perspective, offering a counterpoint to car-centric planning<br>• Can expand the scope of transport planning and policymaking by considering additional factors of health<br>• Accounts for externalities of car-driving, such as air and noise pollution, affecting non-drivers<br>• Supports advocacy for urban environment improvements<br>• Can identify hotspots at street and neighbourhood level, guiding attention and interventions; potentially identifying and addressing local health inequities and neighborhood character<br>• Visualises healthier street designs, providing tangible, evidence-based suggestions<br>• Enables testing of different street design options and their health performance | • Incorporates additional factors into socio-economic analyses, emphasising public health more strongly within a well-tested and established method; supporting existing decision-making process in urban planning<br>• Well-adapted to the existing system, providing measurable and comparable outcomes<br>• Proven applicability to cycling infrastructure<br>• Enables proof of socio-economic benefits of cycling infrastructure<br>• Integrates mobility into broader public health considerations<br>• Lends itself to intersectoral governance, as health benefits are translated into broader societal benefits<br>• Supporting regional-level arguments for health-focused infrastructure projects<br>• Provides economic justification for health investments, making it easier to secure funding and political support<br>• Translates environmental and social factors into economic scores, facilitating decision-makers' understanding and support for health-related investments; enabling comparison with other public investments |

| | |
|---|---|
| • Allows for the development of small-scale interventions and trials that require minimal resources<br>• Takes a holistic approach to health; addresses both physical and mental health aspects without explicit prioritisation<br>• Useful as an early-stage design tool, especially in the initial design and project scoping phases | |

| Challenges | |
|---|---|
| Healthy Streets approach | Cycle Superhighway Collaboration and the socio-economic analysis |
| • Limited economic considerations, challenging to convince decision-makers who require economic data<br>• Difficult to integrate within existing systems that prioritise quantifiable economic outcomes<br>• Resource-intensive implementation, especially at the regional level<br>• Primarily effective at the local level, may not address broader regional or societal health impacts<br>• May struggle to gain political and administrative support without economic data | • Health impacts are often captured indirectly and not explicitly prioritised<br>• Reduces social and environmental components to numerical scores, oversimplifying complex health issues<br>• Focus on economic outcomes can overwrite potential direct health benefits, equalisation of benefits<br>• Reduced focus or impact on community engagement and inclusion in the analysis<br>• Health benefits are communicated in a non-localised way<br>• Adaptation to existing systems may reinforcing the status quo rather than promoting innovative changes |

### 6.2.1 General roles of the respective planning practices

To answer the question of how the respective practices can complement each other to contribute to public health improvements in cities, we need to understand their roles. These roles in planning processes need to first be reiterated.

#### Underlying processes of translation

Both practices involve a translation process that makes health, typically a peripheral topic in mobility planning, more tangible. This process converts health factors into material relevant to mobility planning. However, there are important differences between the two planning practices.

The Healthy Streets approach integrates local social factors, like the number of seating areas and pedestrian crossings, with ecological and environmental factors, such as air quality. These elements are translated into the Healthy Street score, a metric that primarily reflects social value in the output. Economical values, on the other hand, are not of primary concern in the practice. (See Fig. 32)

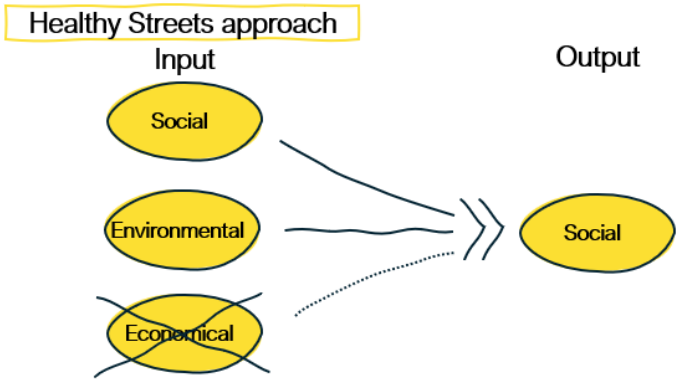


*Figure 32: Translation process from input to output in the Healthy Streets practice*

In contrast, the socio-economic analysis considers environmental factors, such as emissions and noise, along with related social factors like increased health risks and impacts on the healthcare system, including sick leaves and insurance costs. The analysis also includes economic factors, such as investment and maintenance costs. These environmental, social and economic factors (input) are quantified in terms of unit prices per transport kilometre. Ultimately, these factors are combined and translated into an economic score - the return of investment (output) - rather than a social score. (See Fig. 33)

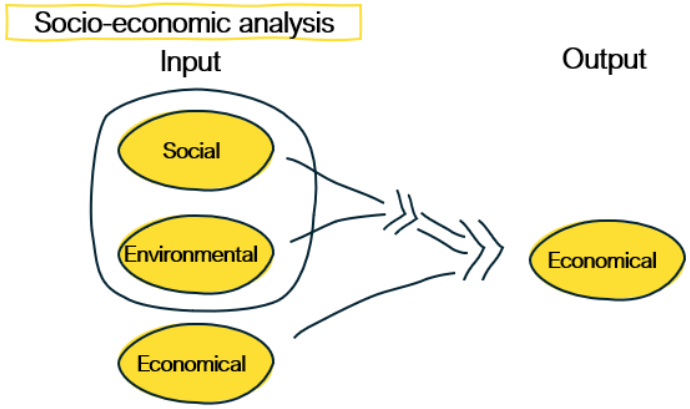


*Figure 33: Translation process from input to output in the socio-economic analysis*

This translation effort impacts how health is reflected in planning, raising the possibility of translation losses. Both practices reduce health to simplified metrics, like the Healthy Streets score or return of investment, potentially excluding aspects. The Healthy Streets approach, for instance, omits financial factors relevant to planning decisions, such as investment and maintenance costs. (See Fig. 32)

Additionally, it is worth noting that excluding economic factors does not mean that, in turn, the Healthy Streets approach automatically accounts for all socially significant impacts of street design. For example, the interests of residents and local businesses, such as the need for car parking spaces or increased traffic volumes to support trade, may not be taken into account as part of the Healthy Streets concept. This indicates that Healthy Streets is not a one-size-fits-all solution but is specifically tailored to enhance the health of pedestrians and cyclists. While it offers significant benefits for these groups, it may overlook other community needs and economic considerations.

On the other hand, socio-economic analysis considers social, ecological and economic factors, all of which can be quantified in monetary terms. However, the results are primarily presented from an economic perspective and in an economic language. This means greater translation efforts are needed for social and ecological factors, while the economic perspective is inherent to the system, as illustrated in Fig. 33. Consequently, the socio-economic analysis may implicitly prioritise economic factors over social and ecological ones. (See Fig. 33)

### Tools for quantification and advocacy

Both the Healthy Streets approach and socio-economic analysis use quantification tools in their planning practices. The HSCD measures health at the street level, while socio-economic analysis and its economic models measure socio-economic return. Both tools can produce numerical outputs that project a sense of objectivity. Healthy Streets is often described as an evidence-based approach. Interviewees, including Sidsel Birk Hjuler (2024) and Tim Judd (2024), have noted that these numerical outputs are convincing factors in decision-making processes.

Both planning practices are driven by a strong commitment to promoting cycling infrastructure, healthy street design and active transportation. All stakeholders interviewed appeared convinced of the benefits of these principles in urban design and mobility planning. Interviews revealed this conviction, which appeared somewhat independent of the results from the application tools and assessments. This raises questions about the role of these tools. If it is decision-makers rather than planners who need to know whether a proposed infrastructure project has social value in terms of health improvements or socio-economic profitability, then the tools' primary function might shift from measurement to argumentation. In this context, the tools' function may not only consist in the quantification of health benefits or socio-economic profitability but also in supporting preexisting interests in implementing health-oriented planning approaches. These reflections suggest that preconceived notions stemming from academia, cultural conditions or personal values are integrated into the planning tools and outputs (Fig. 34). It is essential to analyse these preconceptions to understand how different tools influence discourses and decisions.

On the other hand, new knowledge produced from tool applications can inform tool improvements, such as adapting the Healthy Streets approach to different countries or cities or developing socio-economic analysis methods (Judd, 2024; Incentive, 2024). In conclusion, the tools used in planning not only measure health benefits but also play a crucial role in shaping the discourse and supporting the implementation of health-oriented planning approaches. (See Fig. 34)

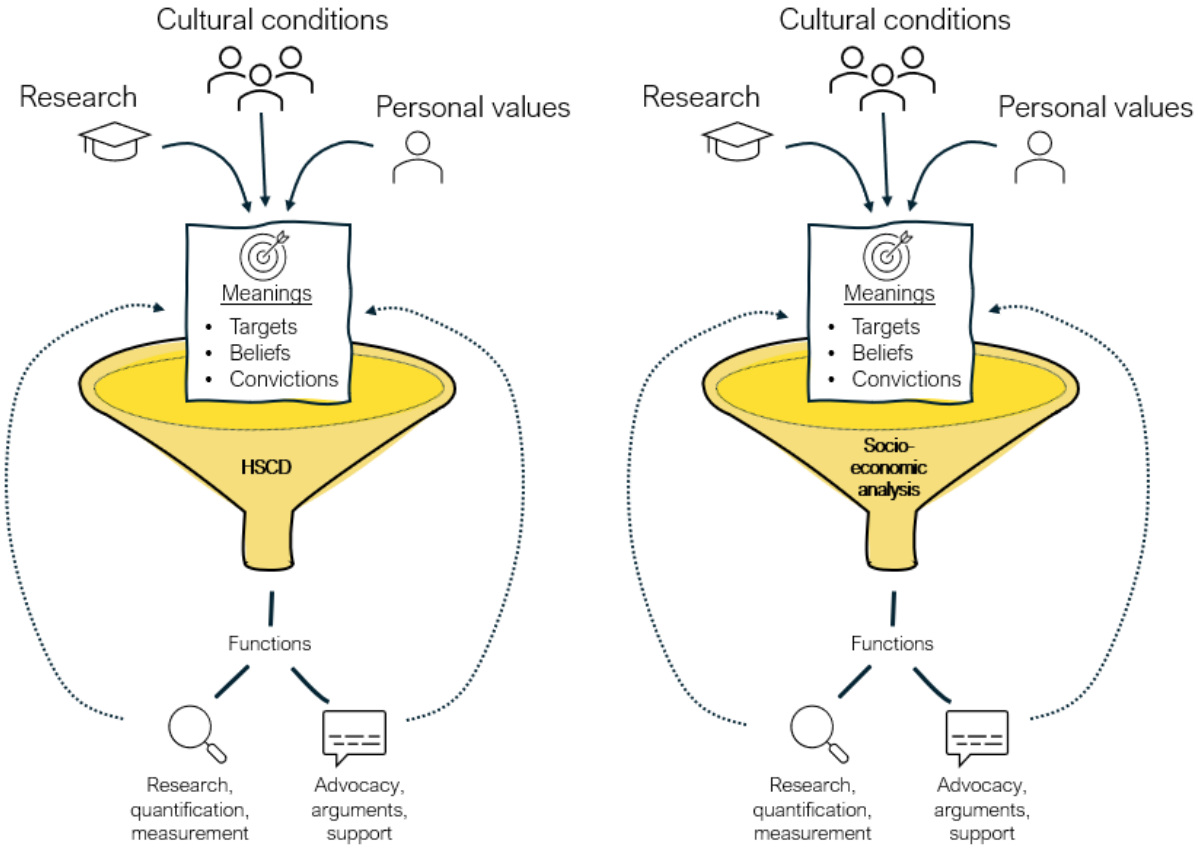


*Figure 34: Circulation of meanings in the practices*

### Differentiation of planning stages

Healthy Streets is an approach adapted to early-stage design and project scoping that comes with strengths in visualising health impacts and engaging communities. Our research underlines that the approach is tailored to local-level applications and can be applied by multiple stakeholders. In our interviews, those stakeholders ranged from professionals in urban planning and design, transport consultants working for independent firms, a civil engineer, as well as a public official, each showing an interest in the approach and highlighting different use cases. Most predominant appears to be the application of the approach, including the HSCD, in early project stages, scoping what a potential infrastructural improvement or street improvement in a particular neighbourhood could look like. These applications are often commissioned by a public authority and feed into a proposal, offering an assessment of different health characteristics as well as suggestions for improvements. Decision-makers and the public have an interest in such proposals, providing

clear, hands-on guidance for the further development of a project and a tangible local vision for healthy urban design.

The socio-economic analysis used by the Cycle Superhighway Secretariat addresses a different stage and a different kind of project planning. The research suggests that the infrastructure in question must already be outlined in its basic features, but not necessarily in its local design, so that it can be included as a scenario in the analysis. The analysis itself is hardly about local implementation, but rather about the general effects on a transport system and its potential to achieve socially added value, including health benefits, though the Cycle Superhighway Secretariat supports the local design process (Helledi, 2024). The socio-economic return in the case of the Cycle Superhighway project is calculated with a cross-regional scope. Its function is not so much concerned with the measurement of health factors on a street level. Rather, the health factors are generalised health impacts associated with different modes of transportation that can be fed into a transport-economic model to produce an estimation of socio-economic benefits. Compared to the results of the HSCD, this information is informative to a different audience and on a different scale.

### 6.2.2 Strengths and challenges of the planning practices

Both approaches have been shown to entail strengths in promoting and improving public health through mobility planning, as clearly expressed by our interviewees and experienced through our experimental application of the HSCD in Tingbjerg, Copenhagen. The following discussion of strengths and challenges should not indicate an *either or*, as the outlined planning approaches are far from being alternatives to one another. Each approach comes with its own abilities to address unique challenges.

#### Strengths and challenges of Healthy Streets

One of the core principles of the Healthy Streets approach is to use clear and inclusive language to improve public health literacy and stakeholder engagement. This human-centred perspective counters car-centric planning by considering the well-being of people near and on the street. The approach addresses the externalities of car driving, such as air and noise pollution and advocates for urban environment improvements, especially in disadvantaged neighbourhoods. The Healthy Streets approach identifies hotspots at street and neighbourhood levels, guiding interventions and visualises healthier street designs with tangible evidence for advocacy. It enables testing different street design options and their health impacts through small-scale interventions that require minimal resources. The associated assessment tool can further capture local health inequities and the character of neighbourhoods, addressing both physical and mental health aspects. A mobility planning practice supported by the Healthy Streets approach comprises various elements integral to the process. Central to this approach is the human-centred perspective, which communicates how streets can become healthier, especially with citizen involvement. Citizen and political support

are crucial for the acceptance of proposed measures and the process should be led by trained professionals to ensure high-quality outcomes.

Applying the Healthy Streets approach requires specific skills and knowledge, such as preparation, data collection, quality assessment and proficiency in using the tool. The technical metrics of HSCD and knowledge of planning for prioritising cyclists and pedestrians are part of the practical skills required, especially in developing proposals for a street's health improvements. Interpreting HSCD results and implementing them demands communication skills and the ability to engage with the community, as community support is vital for successful implementation. Materials are linked to various elements of meanings and competencies. Input data, such as vehicle measurements, design regulations or neighbourhood characteristics, form the basis for the tool's functionality. The research, analytical framework and assessment model are essential for applying the Healthy Streets approach.

However, the Healthy Streets approach has limitations. It makes limited economic considerations, which can be less convincing for decision-makers who prioritise economic data. Integrating this approach within systems that focus on quantifiable economic outcomes is challenging and resource-intensive, particularly at the regional level. While effective locally, it may not address broader regional or societal health impacts and may struggle to gain political and administrative support without economic data. Therefore, storytelling and framing become all the more important to persuading stakeholders when economic data is lacking, ultimately enhancing public health quality. While the Healthy Streets approach provides a valuable human-centred perspective and addresses various health aspects, its limitations in economic considerations and resource demands must be acknowledged.

### Strengths and challenges of the Cycle Superhighway Collaboration's approach

The socio-economic analysis approach in mobility planning incorporates additional factors to emphasise public health. It is well adapted to existing administrative systems and funding mechanisms, providing measurable and comparable outcomes. This approach has proven effective for cycling infrastructure, fostering a supportive environment by integrating mobility into broader public health considerations and enhancing decision-making. At its core, the planning practice of the Cycle Superhighway Collaboration is driven by a vision of cycling as a viable long-distance transportation mode, challenging the traditional view of cycling as a short-distance leisure activity. By utilising socio-economic analysis, the collaboration quantifies health benefits, advocates for cycling's viability and demonstrates a substantial return of investment. This practice expands health-centric planning and promotes cycling as a long-distance transport mode. By incorporating health into the socio-economic assessment, the Collaboration makes an economic case for cycling infrastructure, raising awareness and emphasising the importance of health in transportation.

The socio-economic analysis relies on established systems and quantification, enhancing decision-making and promoting intersectoral governance for *health in all policies*. It highlights the broader economic impacts of health investments, supports regional arguments and provides economic justification for health initiatives. This facilitates funding and political support, translating environmental and social factors into economic scores to aid decision-makers.

However, the socio-economic analysis approach also has its challenges. It can appear detached from direct community interests and does not always ensure that the community recognises the value of economic return of investment. Health impacts are captured on a broader societal level, rather indirectly, through indicators like reduced sick days. Reducing social and environmental components to numerical scores can oversimplify complex health issues. The focus on economic outcomes can overshadow direct health benefits, which may be less appealing to community members. Additionally, being well adapted to existing systems, it tends to reinforce the status quo rather than promote innovative changes.

### 6.2.3 Integration of the assessed mobility planning practices

By combining the strengths of both approaches, urban planners can create a more inclusive, health-focused and economically viable mobility planning practice that addresses both immediate community needs and long-term systemic public health improvements. Healthy Streets serves as an early-stage design tool, helpful in project scoping phases, providing initial insights into health impacts, while socio-economic analysis can validate these health impacts on a broader scale, offering economic justification for proposed interventions.

The Healthy Streets approach makes complex health issues understandable for the public, including local communities, thereby improving health literacy and fostering community engagement. This aspect is crucial for gaining public support and ensuring that health considerations are integrated into urban planning. Meanwhile, the socio-economic analysis translates these health benefits into economic terms that decision-makers can use to facilitate funding and support. This dual translation ensures that health impacts are communicated effectively to both the public and policymakers.

Furthermore, Healthy Streets offers a human-centred, qualitative perspective on health and mobility, addressing local health inequities and neighbourhood character. This perspective can be complemented by the quantitative economic evaluations provided by socio-economic analysis, which strengthens regional-level arguments for health-focused infrastructure projects. This ensures that both local and regional health challenges are addressed comprehensively. Healthy Streets also uncovers new mobility interventions and may highlight mental health aspects that traditional socio-economic analyses might overlook. By incorporating these insights into broader planning, socio-economic analysis can support innovative health-focused transport strategies.

This integration fosters intersectoral governance and promotes evidence-based approaches, ensuring that health considerations are central to urban planning and policy development.

Integrating the two practices demonstrates how introducing new perspectives can change the discourse. For example, explicitly considering the harmful externalities of car-centric street design on surrounding users or including negative unit prices for health costs associated with increased car traffic could address the impact of sedentary lifestyles and encourage more active transportation modes. Additionally, transferring new materials, such as data from one practice to another or skills learned from using one tool to another practice, has the potential to expand the scope of the practice.

To develop an effective mobility planning strategy that synthesises the strengths of the Healthy Streets approach and health-adjusted socio-economic analysis, to support sustainable transitions and healthier urban conditions, we can consider how these practices align with the six transformations by Sachs et al. (2019). Out of these, Transformations 1, 2, 5, and 6 are particularly relevant because they are addressing areas more directly related to public health and urban liveability.

### Transformation 1: Education, Gender and Inequality

This transformation indirectly supports the integration of health into mobility planning through its emphasis on education and reducing inequalities. The Healthy Streets approach promotes health literacy by making health benefits understandable and engaging the community. It advocates for equitable access to healthy environments, addressing health disparities and promoting inclusivity. Socio-economic analysis provides a zoomed-out perspective by highlighting the economic value of health investments, which can help to address funding inequalities. Together, these practices can support educational initiatives that raise awareness about the importance of healthy mobility and foster inclusive urban environments that benefit all citizens, particularly vulnerable groups.

### Transformation 2: Health, well-being and demography

This transformation is central to integrating mobility planning with sustainability and human rights. The Healthy Streets approach prioritises public health by making complex health issues understandable and fostering community engagement. It identifies health hotspots and guides targeted interventions, addressing both physical and mental health. By identifying evidence-based health benefits of street designs, it promotes healthier urban environments. Meanwhile, the socio-economic analysis could quantify these health benefits in economic terms, facilitating funding and policy support. Together, these practices can ensure that mobility planning directly contributes to improved public health, reduced air pollution and increased physical activity, aligning closely with the goals of this transformation.

### Transformation 5: Sustainable cities and communities

Sustainable mobility is a cornerstone of this transformation, which aims to create resilient and inclusive urban environments. The Healthy Streets approach enhances community inclusion by considering the well-being of residents and promoting human-centred urban design. It advocates for improved urban environments and identifies hotspots in cities and neighbourhoods for targeted interventions. The socio-economic analysis supports this by providing economic justifications for health-focused infrastructure in cities, helping to secure funding and political backing. This combined approach may ensure that mobility planning contributes to creating health-promoting urban spaces, reducing reliance on private vehicles and enhancing public health.

### Transformation 6: Digital revolution for sustainable development

Digital tools are integral to both planning practices. The Healthy Streets approach uses tools like the HSCD to measure health impacts at the street level, providing visual and tangible evidence for advocacy and community engagement. The socio-economic analysis employs economic models to quantify socio-economic returns, translating health benefits into monetary terms. Integrating these digital tools can enhance the planning process by combining detailed, localised health data with broader economic analyses, enabling more informed decision-making. This can lead to planning solutions that are both health-focused and economically viable.

### Proposed mobility planning approach

By synthesising the strengths of the Healthy Streets approach and health-adjusted socio-economic analysis, urban planners can create a mobility planning strategy that is both inclusive and economically justified. This integrated approach would involve:

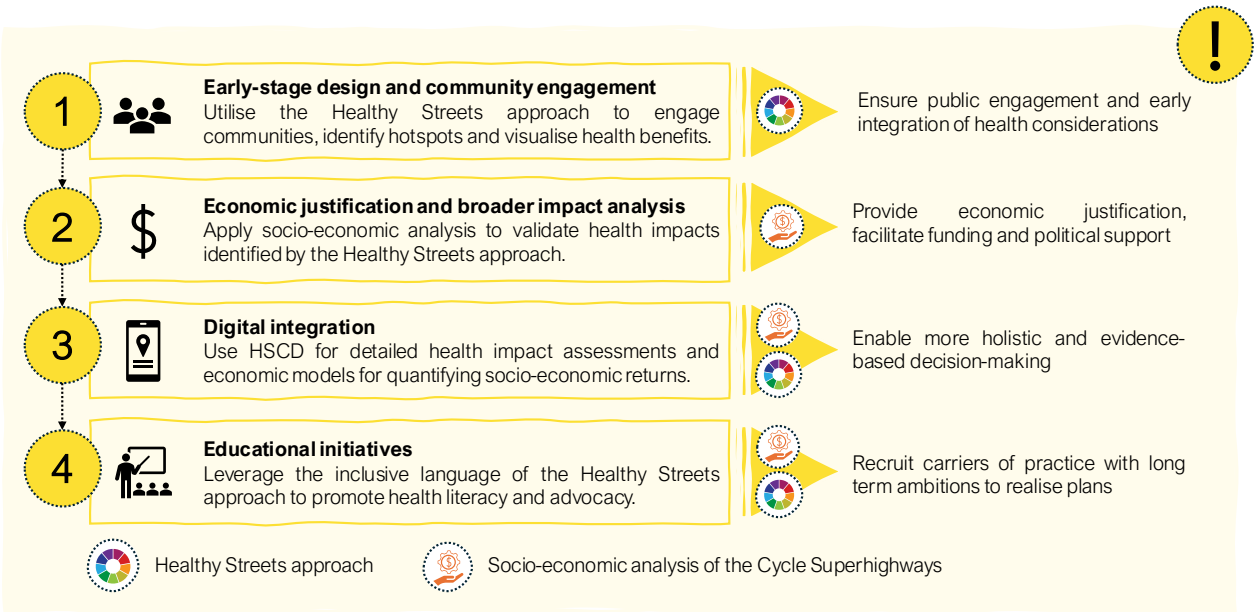


*Figure 35: Proposed mobility planning approach with matching practice*

# 7. Conclusion

The thesis explored the Healthy Streets approach and the Cycle Superhighway Collaboration, including its use of health-adjusted socio-economic analysis, through the lens of practice theory. The objective was to understand how these two practices can complement each other to enhance public health outcomes and promote sustainability in urban settings.

The human-centred approach of Healthy Streets reimagines streets as habitats and inclusive spaces that prioritise pedestrians and cyclists over motorised traffic. By addressing local health risks and promoting sustainable mobility, this approach fosters healthier local urban environments, enabling evidence-based assessments with accessible language and tangible indicators of a street's health performance. With these qualities, the approach and its adjacent assessment and visualisation tools can, in many circumstances, be an effective method to enhance urban health locally. The Healthy Streets approach has also shown particular strengths engaging communities and policymakers alike. However, its focus on local-level applications indicates potential challenges in scalability and integration with broader economic planning frameworks.

Conversely, the socio-economic analysis of the Cycle Superhighways reflects a more established approach for evaluating the economic, social and environmental effects of cycling infrastructure on socio-economic well-being. This approach can help make economic decisions on a limited budget in favour of public health, demonstrating the socio-economic value of cycling infrastructure. The adjusted socio-economic analysis includes health aspects alongside traditional factors like time savings, noise and climate impacts. The Cycle Superhighway Collaboration leverages this approach and uses its results in its advocacy for infrastructures that enable and incentivise longer-distance cycling. This practice lends itself to intersectoral governance and may support *health in all* policies by quantifying the economic benefits of health. By translating health benefits into monetary terms, such benefits become topics that can be more effectively discussed and negotiated across various domains of urban life. In other words, expressing social benefits in economic terms makes them comparable, negotiable and manageable in other contexts. Nonetheless, this reliance on economic metrics could also obscure local community benefits. The consideration of health through an economic lens also means that health does not receive special treatment within decision-making or funding allocation processes but is subordinated to an economic logic.

The two practices can be effectively applied at different stages of a project. Our research indicates that the Healthy Streets approach is well-suited for the early stages of planning. This includes scoping, testing ideas and collaborating with the community to gain a deeper understanding of the local environment. In contrast, the socio-economic analysis appears more appropriate for later project planning stages, where it addresses the economic viability of a proposal and emphasises the importance of health as a beneficial socio-economic consideration.

While the socio-economic analysis addresses the effects that may be achieved by the expansion of cycling infrastructure, forecasting expected changes in transport behaviours, it does not necessarily tackle *how* of these changes are implemented. Specifically, the socio-economic analysis overlooks how the regional infrastructural vision is realised and designed at the local level. Consequently, the two approaches also differ in their data usage. The Healthy Streets approach focuses on local streets or neighbourhoods, using site-specific data from observations and empirical assessments. In contrast, the socio-economic analysis operates on a regional scale, spanning across municipalities and utilising generalised data, unit prices and mathematical modelling.

The synthesis of these approaches offers a promising path forward. Together, both approaches may form a more holistic and inclusive sustainable mobility planning practice that significantly enhances public health, aligns with WHO Europe's Essential Public Health Measures (EPHOs) and, importantly, serves the broader objective of a sustainable transition in cities in line with the Sustainable Development Goals. As previously discussed, four out of six transformations of sustainability are especially relevant here: health, well-being and demography; sustainable cities and communities; the digital revolution for sustainable development and education; gender and inequality (Sachs et al., 2019). By leveraging the Healthy Streets approach in the early stages of project planning, urban planners can engage communities, identify health hotspots and visualise potential health benefits. This groundwork could be validated through the socio-economic analysis, which provides the economic justification needed to secure funding and political support. We expect that together, these approaches will create a comprehensive, health-focused mobility planning practice that addresses both immediate local needs and broader systemic impacts.

The application of practice theory, while useful in breaking down complex planning processes into simpler elements, carries the risk of losing critical information. During our clustering process, identifying key insights from extensive interview content proved challenging. Information that was reoccurring throughout the data was considered especially important, yet the applied analysis and coding process is inherently subjective. We expect that both interviewee and researcher perspectives significantly shaped the assessment outcomes. Our research was primarily conducted from an academic vantage point and was aimed at the views of stakeholders involved in planning processes. However, perspectives i.e. from developers, local citizens or commuters, could yield different insights. In addition to adding new perspectives to the analysis, it would be valuable for future research to explore the introduction, removal or arrangement of elements within the planning practice to observe the effects of such changes. Furthermore, investigating the actual application of the Healthy Streets approach by trained professionals in Copenhagen would provide valuable insights, as our study was limited by the lack of local practitioners experienced with this approach.

In studying mobility planning practices that account for health, it became clear that streets are more than just conduits for transportation and can, in planning practice, also be treated as more than that. Socio-economic considerations as well as local-level assessments of a street's health performance both recognise streets as vital spaces that reflect priorities, social structures and values and have the power to shape health and well-being. The integration of health into mobility planning, as seen through the Cycle Superhighway Collaboration and Healthy Streets approach, underscores the important role that well-designed streets play in fostering sustainable, liveable cities.

The pressing challenges of modern urban life – i.e., air pollution, noise pollution and the spatial demands of motorised traffic – along with public health concerns linked to climate change and sedentary lifestyles, such as non-communicable diseases and mental health issues, call for innovative mobility planning practices that prioritise human health and well-being. By examining the socio-economic rationale behind Copenhagen's cycling infrastructure and the practical application of the Healthy Streets approach, we have highlighted the potential for these methods to address these challenges. Both approaches can be effective individually, but their strengths may be significantly enhanced by finding ways for them to complement each other.

# 8. Bibliography


Acheson, D. (1988) 'Public health in England. The report of the committee of inquiry into the future development of the public health function'. London: HMSO.

Alcantara, M.N. (2023) 'Scrutinizing sustainable mobility strategies in integrated urban development: Perspectives from Copenhagen and Curitiba'. Resilient and Sustainable Cities. pp. 263–291. doi:10.1016/b978-0-323-91718-6.00023-2.

[APHA] American Public Health Organization (2024) 'What is public health?'. Available at: https://www.apha.org/what-is-public-health (Accessed: 24 May 2024).

Azari, R. and Borisch, B. (2023) 'What is public health? A scoping review'. Archives of Public Health. 81(1). doi:10.1186/s13690-023-01091-6.

Bentley, R., Blakely, T., Kavanagh, A., Aitken, Z., King, T., McElwee, P. and Turrell, G. (2018) 'A longitudinal study examining changes in street connectivity, land use, and density of dwellings and walking for transport in Brisbane, Australia'. Environmental Health Perspectives. 126(5). doi:10.1289/ehp2080.

Birk Hjuler, S. (2024) 'Interview with Sidsel Birk Hjuler from 22 March 2024'.

Birk, H., Vrangbæk, K., Rudkjøbing, A., Krasnik, A., Eriksen, A., Richardson, E. and Smith Jervelund, S. (2024) 'Denmark: Health system review 2024'. Health Systems in Transition. 26(1). pp. i–152.

Birtchnell, T. (2012). 'Elites, elements and events: Practice theory and scale'. Journal of Transport Geography. 24. pp. 497–502. doi:10.1016/j.jtrangeo.2012.01.020.

Cities for Better Health (2024) 'Copenhagen'. Available at: https://www.citiesforbetterhealth.com/network/our-cities/copenhagen.html (Accessed: 24 May 2024).

City of Copenhagen (2015) 'Enjoy life, Copenhageners'. Available at: https://www.kk.dk/sites/default/files/2021-07/HEALTH%20POLICY%202015-2025.pdf (Accessed: 24 May 2024).

City of Copenhagen (2024a) 'Copenhagen - The Best Cycling City in the World | Urban Development'. Available at: https://urbandevelopmentcph.kk.dk/mobility-cycling/copenhagen-the-best-cycling-city-in-the-world (Accessed: 02 June 2024).

City of Copenhagen (2024b) 'Email conversation with Technical and Environmental Department of the City of Copenhagen'

City of Copenhagen Health and Care Administration (2022) '2022-2025. Action plan for diabetes and heart disease'. Available at: https://www.kk.dk/dagsordener-og-referater/Sundheds-%20og%20Omsorgsudvalget/m%C3%B8de-23062022/referat/punkt-3 (Accessed: 24 May 2024).

Danish Health Authority (2023) 'Physical activity for adults (18-64 years)'. Available at: https://www.sst.dk/en/english/publications/2023/Physical-activity-for-adults (Accessed: 24 May 2024).

Diabetes Foreningen (2022) 'Diabetes i region hovedstaden'. Available at: https://diabetes.dk/media/ct5dbmsb/diabetesrisiko-samlet-2022-hovedstaden.pdf (Accessed: 24 May 2024).

Ede, J. and Morley, A. (2020) 'Review of Transport for London's "healthy streets approach" and its potential contribution to biophilic cities'. Cities & Health. 7(2). pp. 193–200. doi:10.1080/23748834.2019.1698937.

[EUPHA] European Public Health Association (2024) 'Who we are'. Available at: https://eupha.org/who-we-are (Accessed: 03 June 2024).

Frank, L.D., Andresen, M.A. and Schmid, T.L. (2004) 'Obesity relationships with community design, physical activity, and time spent in cars'. American Journal of Preventive Medicine. 27(2). pp. 87–96. doi:10.1016/j.amepre.2004.04.011.

Giddens, A. (1984) The Constitution of society outline of the theory of structuration. Cambridge Cambridgeshire: Polity Press.

Glazener, A., Sanchez, K., Ramani, T., Zietsman, J., Nieuwenhuijsen, M. J., Mindell, J. S., Fox, M. and Khreis, H. (2021) 'Fourteen pathways between Urban Transportation and Health: A Conceptual Model and Literature Review'. Journal of Transport & Health. 21. p. 101070. doi:10.1016/j.jth.2021.101070.

Gössling, S. (2013) 'Urban Transport Transitions: Copenhagen, city of cyclists'. Journal of Transport Geography. 33. pp. 196–206. doi:10.1016/j.jtrangeo.2013.10.013.

Gössling, S. and Choi, A.S. (2015) 'Transport transitions in Copenhagen: Comparing the cost of cars and bicycles'. Ecological Economics. 113. pp. 106–113. doi:10.1016/j.ecolecon.2015.03.006.

Greater London Authority (2014) 'Transport and Health in London. The main impacts of London road transport on health'. Available at: https://www.london.gov.uk/sites/default/files/transport_and_health_in_london_march_2014.pdf (Accessed: 24 May 2024).

Greater London Authority (2023) 'Air Quality Positive (AQP) guidance'. Available at: https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance/air-quality-positive-aqp-guidance (Accessed: 24 May 2024).

Harders, A. K. B. (2015). 'Stædige infrastrukturer og genstridige praksisser: Et praksisteoretisk studie af byudviklingsprojekter mellem vision og realitet'. Institut for Planlægning, Aalborg Universitet.

Healthy Streets (2024a) 'What is Healthy Streets?'. Available at: https://www.healthystreets.com/what-is-healthy-streets#case-studies (Accessed: 23 May 2024).

Healthy Streets (2024b) 'About'. Available at: https://www.healthystreets.com/about (Accessed: 24 May 2024).

Healthy Streets (2024c) 'Europe'. Available at: https://www.healthystreets.com/europe (Accessed: 23 May 2024).

Healthy Streets (2024d) 'Training'. Available at: https://www.healthystreets.com/training (Accessed: 24 May 2024).

Helledi, S. (2024) 'Interview with Signe Helledi from 9 April 2024'.

Hoeben, A.D., Otto, I.M. and Chersich, M.F. (2022) 'Integrating Public Health in european climate change adaptation policy and planning'. Climate Policy. 23(5). pp. 609–622. doi:10.1080/14693062.2022.2143314.

[IEA] International Energy Agency (2023) 'Transport - Energy System'. Available at: https://www.iea.org/energy-system/transport (Accessed: 02 June 2024).

Incentive (2013) 'Samfundsøkonomiske analyser af cykelsuperstierne'. Available at: https://www.trafikdage.dk/td/papers/papers13/198_JonasHerby.pdf (Accessed: 03 June 2024).

Incentive (2018) 'Samfundsøkonomisk analyse af Supercykelstier'. Available at: https://www.incentive.dk/samfundsoekonomisk-analyse-af-supercykelstier/ (Accessed: 24 May 2024).

[IPCC] Intergovernmental Panel on Climate Change (2023) 'Climate change 2023: Synthesis report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the intergovernmental panel on climate change'. IPCC, Geneva, Switzerland. doi:10.59327/ipcc/ar6-9789291691647.

Judd, T. (2024) 'Interview with Tim Judd from 3 May 2024'.

Kent, J.L. (2022) 'The use of practice theory in transport research'. Transport Reviews. 42(2). pp. 222–244. doi:10.1080/01441647.2021.1961918.

Khreis, H., Warsow, K. M., Verlinghieri, E., Guzman, A., Pellecuer, L., Ferreira, A., Jones, I., Heinen, E., Rojas-Rueda, D., Mueller, N., Schepers, P., Lucas, K. and Nieuwenhuijsen, M. (2016) 'The health impacts of traffic-related exposures in urban areas: Understanding real effects, underlying driving forces and co-producing future directions'. Journal of Transport & Health. 3(3). pp. 249–267. doi:10.1016/j.jth.2016.07.002.

Københavns Kommune (2016) 'Socioøkonomisk Kort'. Available at: https://kbhkort.kk.dk/cbkort?&profile=sociokort (Accessed: 24 May 2024).

Københavns Kommune (2024) 'Københavner Kort'. Available at: Københavns Kommune (Accessed: 24 May 2024).

Langer, C. (2024) 'Tingbjerg Library and culture house'. Available at: https://dac.dk/en/knowledgebase/architecture/tingbjerg-library-and-culture-house/ (Accessed: 24 May 2024).

Lau, C., Eliasen, M., Grønkjær, M., Bekker-Jeppesen, M., Toxværd, C., Gøtzsche, N., Jacobsen, M. and Andreasen, A. (2021) ''Hvordan har du det?' Sundhedsprofil for Region Hovedstaden og kommuner 2021 – Sundhedsadfærd og risikofaktorer, , : 'Hvordan har du det?' Sundhedsprofil for Region Hovedstaden og kommuner 2021 – Sundhedsadfærd og risikofaktorer'. Available at: https://www.regionh.dk/til-fagfolk/Sundhed/Sundhedsprofilen/Resultater/Documents/Rapporter/Sundhedsprofil_2021_web.pdf (Accessed: 24 May 2024).

Lee, J., Kim, E., Lee, W.S., Chae, Y. and Kim, H. (2018) 'Projection of future mortality due to temperature and population changes under representative concentration pathways and shared socioeconomic pathways'. International Journal of Environmental Research and Public Health. 15(4). p. 822. doi:10.3390/ijerph15040822.

Lee, R.J. and Sener, I.N. (2016) 'Transportation Planning and quality of life: Where do they intersect?'. Transport Policy. 48. pp. 146–155. doi:10.1016/j.tranpol.2016.03.004.

Magaldi, D. and Berler, M. (2020) 'Semi-structured interviews'. Encyclopedia of Personality and Individual Differences. pp. 4825–4830. doi:10.1007/978-3-319-24612-3_857.

McIntosh, J., Marques, B., Smith, M., Rodgers, M. and Morgan, A. (2021) 'Healthy streets: Adopting international benchmarks in medium density cities'. Urban Policy and Research. 39(4). pp. 351–376. doi:10.1080/08111146.2021.1978969.

Meier, B.M., Bustreo, F. and Gostin, L.O. (2022) 'Climate change, public health and human rights'. International Journal of Environmental Research and Public Health. 19(21). p. 13744. doi:10.3390/ijerph192113744.

Ministry of Environment of Denmark (2024) 'Socio-economic analyses'. Available at: https://en.klimatilpasning.dk/knowledge/socio-economy/ (Accessed: 02 June 2024).

Murray, P. (2024) 'Interview with Pete Murray from 26 April 2024'.

Nabolagatlas (2024) 'Arbejde og indkomst'. Available at: https://www.nabolagsatlas.dk/dk/labour#pos=12.51/55.72021/12.47005&selected=cluster/101_798&year=2020&stat=unemp (Accessed: 24 May 2024).

Nicolini, D. (2012) 'Practice theory, work, and organization: An introduction'. Oxford: Oxford University Press.

Nieuwenhuijsen, M. J., Khreis, H., Verlinghieri, E. and Rojas-Rueda, D. (2016) 'Transport and health: A marriage of convenience or an absolute necessity'. Environment International. 88. pp. 150–152. doi:10.1016/j.envint.2015.12.030.

Nieuwenhuijsen, M.J. (2016) 'Urban and Transport Planning, environmental exposures and health-new concepts, methods and tools to improve health in cities'. Environmental Health. 15(S1). doi:10.1186/s12940-016-0108-1.

Nieuwenhuijsen, M.J. (2020) 'Urban and Transport Planning Pathways to Carbon Neutral, liveable and healthy cities; a review of the current evidence'. Environment International. 140. p. 105661. doi:10.1016/j.envint.2020.105661.

Noonan, C. (2024) 'Interview with Christina Noonan from 2 May 2024'.

Oakes, Alix. (2024) 'Interview with Alix Oakes from 2 May 2024'.

[OECD] Organisation for Economic Co-operation and Development and [EOHSP] European Observatory on Health Systems and Policies (2023) 'Denmark: Country Health Profile 2023. State of Health in the EU'. Brussels: OECD Publishing.

Official PTA WA. (2024) 'Interview with Official from Transport Authority of Western Australia from 30 April 2024'.

Pineda, A.F., Elle, M. and Iuel-Jensen, J. (2024) 'The role of design in sustainable transitions: The case of mobility in Greater Copenhagen'. Environmental Innovation and Societal Transitions. 50. p. 100807. doi:10.1016/j.eist.2023.100807.

Plowden, B. (2019) 'Creating healthy streets for sustainable cities – delivering public health benefits through redesigning London's streets'. Cities & Health. 4(2). pp. 156–161. doi:10.1080/23748834.2019.1685852.

Reckwitz, A. (2002) 'Toward a theory of social practices'. European Journal of Social Theory. 5(2). pp. 243–263. doi:10.1177/13684310222225432.

Riahi, K. et al. (2017) 'The shared socioeconomic pathways and their energy, land use, and greenhouse gas emissions implications: An overview'. Global Environmental Change. 42. pp. 153–168. doi:10.1016/j.gloenvcha.2016.05.009.

Rich, J., Jensen, A.F., Pilegaard, N. and Hallberg, M. (2021) 'Cost-benefit of bicycle infrastructure with e-bikes and Cycle Superhighways'. Case Studies on Transport Policy. 9(2). pp. 608–615. doi:10.1016/j.cstp.2021.02.015.

Robinson, K.M., Lykke, M., Hansen, B.H., Andreasen, A.H., Jeppesen, M., Buhelt, L.P., Lau, C.J. and Glümer, C. (2014) 'Sundhedsprofil for region og kommuner 2013'. Forskningscenter for Forebyggelse og Sundhed. Region Hovedstaden.

Sachs, J.D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N. and Rockström, J. (2019) 'Six transformations to achieve the Sustainable Development Goals'. Nature Sustainability. 2(9). pp. 805–814. doi:10.1038/s41893-019-0352-9.

Saunders, L. (2018) 'Healthy Streets'. Available at: https://londonlivingstreets.com/wp-content/uploads/2018/04/20180312-lucy-saunders-healthy-streets-check-feb-2018.pdf (Accessed: 24 May 2024).

Saunders, L., Green, J.M., Petticrew, M.P., Steinbach, R. and Roberts, H. (2013) 'What are the health benefits of active travel? A systematic review of Trials and Cohort Studies'. PLoS ONE. 8(8). doi:10.1371/journal.pone.0069912.

Schatzki, T.R. (1996) 'Social Practices. A wittgensteinian approach to human activity and the social'. New York: Cambridge University Press.

Schatzki, T.R. (2001) 'Introduction: Practice theory'. In Knorr-Cetina, K, Schatzki, T.R. & Savigny, E. von (Eds.) The practice turn in contemporary theory. New York: Routledge, pp. 10–23.

Schatzki, T.R. (2002) 'The site of the social: A philosophical account of the constitution of social life and change'. University Park, PA: The Pennsylvania State University Press.

Shove, E., Pantzar, M. and Watson, M. (2012) 'The dynamics of Social Practice: Everyday life and how it changes'. London: SAGE publications. doi:10.4135/9781446250655.

Social change (2024) 'An introductory guide to qualitative research analysis'. Available at: https://social-change.co.uk/files/Knowledge_Hub_-_qualitative_research_analysis.pdf (Accessed: 02 June 2024).

Supercykelstier (2017) 'Danmark får sit første net af Supercykelstier'. Available at: https://supercykelstier.dk/blog/2017/04/11/danmark-faar-sit-foerste-net-supercykelstier/ (Accessed: 02 June 2024).

Spurling, N. and McMeekin, A. (2014) 'Interventions in practices. Sustainable mobility policies in England'. In Strengers, Y.& Maller, C. (Eds.) Social Practices, Intervention and Sustainability. London: Routledge. pp. 78–94.

[TfL] Transport for London (2021) 'Healthy Streets Check for Designers'. Available at: https://tfl.gov.uk/corporate/about-tfl/how-we-work/planning-for-the-future/healthy-streets (Accessed: 24 May 2024).

[TfL] Transport for London (2024) 'Healthy streets'. Available at: https://tfl.gov.uk/corporate/about-tfl/how-we-work/planning-for-the-future/healthy-streets (Accessed: 24 May 2024).

[UNEP] United Nations Environment Programme (2020) 'Preventing the next pandemic - zoonotic diseases and how to break the chain of transmission'. Available at: https://www.unep.org/resources/report/preventing-future-zoonotic-disease-outbreaks-protecting-environment-animals-and?_ga=2.27072767.37586322.1716813728-1444691930.1716813727 (Accessed: 02 June 2024).

UN-Habitat (2013) 'Streets as public spaces and drivers of urban prosperity'. Available at: https://unhabitat.org/sites/default/files/2020/08/streets_as_public_spaces_and_drivers_of_urban_prosperity.pdf (Accessed: 02 June 2024).

Vicioso, M., Muller, N., Nieuwenhuijsen, M. and Rojas-Rueda, D. (2018) 'Urban transport and health indicators: a literature review'. Available at: https://www.isglobal.org/documents/10179/7115648/Horacio+Victioso+MFP/b67c331c-e1f4-464d-bc1d-775d6739f3af (Accessed: 24 May 2024).

Watson, M. (2012) 'How theories of practice can inform transition to a decarbonised transport system'. Journal of Transport Geography. 24. pp. 488–496. doi:10.1016/j.jtrangeo.2012.04.002.

[WHO] World Health Organisation (1946) 'Constitution of the World Health Organization'. Available at: https://www.who.int/about/accountability/governance/constitution (Accessed: 24 May 2024).

[WHO] World Health Organisation (2022a) 'Ambient (outdoor) Air Pollution'. Available at: https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health (Accessed: 02 June 2024).

[WHO] World Health Organisation (2022b) 'Cycling and walking can help reduce physical inactivity and air pollution, save lives and mitigate climate change'. Available at: https://www.who.int/europe/news/item/07-06-2022-cycling-and-walking-can-help-reduce-physical-inactivity-and-air-pollution--save-lives-and-mitigate-climate-change (Accessed: 02 June 2024).

[WHO] World Health Organisation (2023b) 'Non communicable diseases'. Available at: https://www.who.int/en/news-room/fact-sheets/detail/noncommunicable-diseases (Accessed: 24 May 2024).

[WHO] World Health Organisation (2024) 'Heat and health'. Available at: https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health (Accessed: 02 June 2024).

[WHO Europe] World Health Organisation Regional Office for Europe (2012a) 'Preliminary review of institutional models for delivering essential public health operations in Europe'. Available at: https://who-sandbox.squiz.cloud/__data/assets/pdf_file/0003/172731/Preliminary-review-of-institutional-models-for-delivering-essential-public-health-operations-in-Europe.pdf (Accessed: 02 June 2024).

[WHO Europe] World Health Organisation Regional Office for Europe (2012b) 'Strengthening public health services and capacity: an action plan for Europe'. Available at: https://iris.who.int/bitstream/handle/10665/340447/WHO-EURO-2012-2219-41974-57687-eng.pdf?sequence=1 (Accessed: 02 June 2024).

[WHO Europe] World Health Organisation Regional Office for Europe (2024) 'The 10 Essential Public Health Operations'. Available at: https://who-sandbox.squiz.cloud/en/health-topics/Health-systems/public-health-services/policy/the-10-essential-public-health-operations (Accessed: 02 June 2024).

Widener, M.J. and Hatzopoulou, M. (2016) 'Contextualizing Research on transportation and Health: A Systems Perspective'. Journal of Transport Health. 3(3). pp. 232–239. doi:10.1016/j.jth.2016.01.008.

Winslow, C.-E.A. (1920) 'The untilled fields of Public Health'. Science. 51(1306). pp. 23–33. doi:10.1126/science.51.1306.23.