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Air Quality Improvements as Co-benefit for Urban Climate Politics – A qualitative analysis of Cologne

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submitted by

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List of Abbreviations

ACF	Advocacy Coalition Framework
CC	Climate Change
GHG	Greenhouse gas
IMT	Individual motorised transport
IPCC	Intergovernmental Panel Climate Change
MT	Main theme
NDC	Nationally determined contributions
NGOs	Non-governmental organisations
NRW	North Rhine-Westphalia
RE	Renewable energy
ST	Sub-theme
SCC	SmartCityCologne
TA	Thematic analysis
TMNs	Transnational municipal networks

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Abstract

All around the world cities are working against the effects of climate change by setting their own climate action targets. Integrating co-benefits into local climate policy provides a pathway to make climate measures more tangible for citizens and stakeholders, as they can foster public support for climate action, improve cooperation, offer economic and social benefits, and justify promotion of climate measures in urban areas. Yet, the advocacy potential of co-benefits to advance climate efforts is often not fully realised. Since many studies about this subject focus on analysing written sources that often lack nuanced insights, this thesis takes a qualitative case study approach by conducting expert interviews with relevant stakeholders from Cologne to fill the potential knowledge gap. The collected data was processed utilising an inductive thematic analysis that generated six main themes. The themes related to the fundamental aspects of co-benefits' advocacy potential, such as economic incentives, cooperation and collaboration, and the ability of co-benefits to make the abstract nature of GHG neutrality more tangible by offering immediate, localised impacts. Results indicate that stakeholders in Cologne are aware of co-benefits, and confirm their advocacy potential, as many report using them as arguments for climate action measures, while crediting them even as irreplaceable factors for effective climate governance. Common barriers include the lack of proper co-benefit evaluation and monitoring methods and interdepartmental cooperation hurdles. Although in general, intersectoral collaboration among actors is perceived positively for the Cologne case. Opportunities to enhance the potential of co-benefits include further developing assessment methods to better quantify their impacts and to consider reframing GHG reduction as a co-benefit of locally impactful measures. Both researchers and policymakers should make advancements in these areas.

1 Introduction

1.1 Background

It has long been recognized that climate change (CC) due to human-inflicted global warming is going to bring and already brought life-altering and even life-threatening implications to our societies, ecosystems, and environments. It is one of the greatest, if not the single greatest challenge humanity has ever faced. According to the latest AR6 Synthesis Report of the Intergovernmental Panel on Climate Change (IPCC) global greenhouse gas (GHG) emissions projected for 2030, based on nationally determined contributions (NDCs), make it highly likely that global warming will exceed the 1.5 °C threshold in the 21st century and will make restricting warming below 2 °C even more difficult. The report warns that the gaps between projected emissions from current mitigation policies and those from NDCs are insufficient to meet climate targets across all sectors and regions (IPCC, 2023). The effects of climate change are felt to varying degrees across different regions of the world (Samson et al., 2011). Yet, it is a global responsibility to work collectively on CC mitigation and adaptation. International treaties such as the Paris Agreement have brought countries together to pursue this common goal. Next to international cooperation between states, cities play a crucial role in achieving climate mitigation targets.

The relevance of urban environments regarding climate change comes down to a few factors. As of 2023, about 56 % of the world's population (4.4 billion inhabitants) live in cities. By 2050, urban populations are expected to more than double its current size, which then, would equate to nearly 70 % of the global population. Not only is the world's city-dwelling population is increasing size, but urban areas are also growing physically. The expansion of urban land consumption is outpacing population growth by up to 50 %, with an anticipated addition of 1.2 million km² of new urban built-up area globally by 2030 (World Bank, 2023). This type of sprawl places strain on land and natural resources, leading to negative consequences; cities are responsible for significant GHG emissions, especially from transportation and stationary energy use (Wei et al., 2021). Furthermore, they are responsible for around two-thirds of global energy consumption and more than 70 % of greenhouse gas emissions (World Bank, 2023).

In response, many cities have created mitigation action plans and established ambitious emission reduction targets (Rivas et al., 2021). Next to reducing emissions, these mitigation action plans come with additional local benefits. As stated in chapter eight of the IPCC AR6 Synthesis report, these so-called co-benefits are "the positive effects that a policy or measure aimed at one objective might have on other objectives, thereby increasing the total benefits to the society or environment" (IPCC, 2018a). In the context of urban climate action, co-benefits can range from improved air quality to increased energy security, and generally higher quality of life due to better public transportation or improved walkability, just to name a few. They can provide local governments with a compelling rationale for climate action (Roggero et al., 2023a). When framing these efforts as collective action from the local government's point of view, co-benefits can be seen as private goods, whereas climate mitigation is typically regarded as a public good (Brody et al., 2008). Consequently, a significant body of literature argues in favour of local government actions to mitigate climate change based solely on the pursuit of local co-benefits. At city level citizens can experience the results of policy actions first hand, which gives co-benefits a high potential in urban areas (Floater et al., 2016). For example, studies have demonstrated that low-carbon urban transport policies can enhance physical activity and improve air quality, leading to reduced morbidity and mortality (Wolkinger et al., 2018). Highlighting these co-benefits can foster public support for climate action and justify further promotion of adaptation measures in urban areas (Floater et al., 2016; Sharifi et al., 2021). This 'advocacy potential' of co-benefits is a strong argument for implementing these additional local benefits into urban climate policy and using it as a rationale for climate action.

1.2 Research Objective

In spite of their advocacy potential in addressing climate change, co-benefits are rarely included in climate policy assessments, resulting in biased decision-making and less effective policies (Karlsson et al., 2020; Nemet et al., 2010). Fully incorporating air quality co-benefits into policy frameworks could impact the ideal level of policy stringency, reduce overall costs, and strengthen incentives for international collaboration (Nemet et al., 2010). Academic literature on policy recommendations for integrating co-benefits into decision-making processes successfully, indicates that an integrated, multidisciplinary approach is necessary (Jiang et al., 2013; Mendez, 2015;

Zusman et al., 2013). Such an approach requires collaboration and cooperation between a multitude of different stakeholders, ranging from government and public sector officials, researchers and scientists, private sector and industry representatives, to non-governmental organizations and community groups. A systematic review of barriers and enablers for public health co-benefits integration in urban climate policy found systems thinking and knowledge co-production are potential ways to overcome common barriers for successful integration such as the need for improved evidence and greater political will (Negev et al., 2022). Systems thinking is a holistic approach to analysing factors and interactions that influence potential outcomes. It is more of a mindset than a strict methodology, and provides an understanding of how individuals can collaborate within various team dynamics (Morganelli, 2024). Knowledge co-production is an approach to contemporary sustainability challenges that favours more interactive arrangements between academic and non-academic actors (Norström et al., 2020). Both principles relate to the need for cooperation between a variety of actors to properly integrate co-benefits in urban climate action.

A study examining the link between the co-benefit improved air quality and emission reductions, found that this link appears to be more complex heterogeneous across the cities Paris, Montreal, and Moscow than expected. Air quality improvements played a different role in each of the three cases, ranging from a main driver of mitigation to a liability for local climate action (Roggero et al., 2023a) Other research employing computational techniques to systematically gather and analyse policy documents from the city of Cologne also highlights the complexity and heterogeneity of how various co-benefits play out in different policy sectors (Goymann, 2024). Among others, both studies mention the lack of interviews as limitations of their work. Their inclusion would have provided access to insights and perspectives that are not captured in written sources. Generally speaking, qualitative interviews focus on exploring the experiences and perspectives of participants to gain a deeper understanding of social reality (Edwards & Holland, 2013; Flick, 2018). Interviews, more specifically expert interviews, provide a method of gaining information about or exploring a certain field of action (Döringer, 2021).

Therefore, the general research objective of this thesis is to gain key insights from relevant experts about the overarching topic of co-benefits of urban climate politics in Cologne. Urban climate governance and the integration of co-benefits into climate

policy are highly complex and multifaceted areas of research. They depend on the collaboration of many distinct actors. Thus, interviewing some of these key stakeholders may provide missing information that previous studies focusing on analysing academic literature and official policy documents simply could not find. Expert interviews can fill research gaps by providing valuable perspectives backed by practical experience and knowledge in the field and offering potential solutions to the problem (Pfadenhauer, 2009). Expert selection is a key aspect of the preparation process of insightful interviews. Since co-benefits of urban climate action as an area of research can be observed in many cities around the world, a case study approach is suitable. For this work the city of Cologne in Germany was selected. The more detailed reasoning behind this choice can be found in section 4. In short, Cologne lends itself well for this kind of investigation on the one hand due to having a substantial and well-documented history of climate action (Goymann, 2024) and on the other hand due to its alignment with key attributes of urban climate action. These include a strong focus on research and innovation, its membership in a transnational municipal network, significant autonomy, and a collaborative civic and institutional framework (Roggero et al., 2023a).

The more specific objectives of this research are: i) discover co-benefits advocacy potential in the context of Cologne; ii) explore arguments for co-benefit integration; iii) identify barriers and opportunities of the co-benefit approach; and iv) provide outlook and policy recommendations accordingly.

These research objectives have led to the overarching research question of this thesis, which is the following:

How do key stakeholders in Cologne perceive and utilize the advocacy potential of co-benefits in driving climate action?

To answer the research question, a literature review was conducted to establish a baseline for the expert interview. The interview partners were selected by creating a list of suitable stakeholder groups that were then categorized into stakeholder types using Mitchell's stakeholder identification method (Mitchell et al., 1997). More on interview partner selection and categorization in Section 3.1. After conducting all expert interviews, a thematic analysis (TA) was performed. TA is a suitable method for qualitative data analysis due to its accessibility and flexibility (Braun & Clarke, 2006). By applying this method, this thesis intends to provide insights on the state of co-benefit

integration into Cologne's climate politics from the perspective of key actors, their advocacy potential, and outlooks on the future of sustainable urban climate governance in the city.

Thus, the following more specific sub-research questions can be outlined:

1. Are there significant barriers that hinder the advocacy potential of co-benefits for successful climate policy integration in Cologne?
    - If yes, what are those barriers?
2. Can co-benefits provide opportunities to advance climate action in Cologne?
    - If yes, what are those opportunities?

In summary, the overarching goal of this study is to explore the topic co-benefits of urban climate policy by analysing expert perspectives on their advocacy potential, as well as existing barriers and opportunities for achieving an integrated approach. In line with arguments for the advocacy potential of climate policy co-benefits found in the literature, three hypotheses can be formulated:

H1: Economic potential is not being realised in Cologne due to a lack of standardised terms and evaluation methods.

H2: Barriers such as lacking intersectoral collaboration hinder cooperation among stakeholders in Cologne.

H3: Recognition of co-benefits ability to make climate action more tangible needs to be increased in Cologne.

The subsequent literature review section provides the rationale behind these hypotheses in detail, delving into the economic argument, the collaboration and cooperation argument, the temporal and spatial argument, and lastly, common barriers and challenges for co-benefits (see section 2.2.3 to 2.2.6). At this point it should be noted that during the research process, the focus of this thesis shifted from specifically examining air quality improvements to a broader exploration of the advocacy potential of all co-benefits associated with Cologne's climate efforts. This adjustment was made to capture a more comprehensive understanding of how diverse co-benefits contribute to advancing climate action in the city, while still acknowledging the relevance of air quality improvements as part of this spectrum.

2. Literature Review

This section provides a brief overview of the overarching field of interest of this thesis – urban climate governance, including a sub-section on climate mitigation and adaptation. Next, it defines co-benefits and emphasises relevant characteristics of the co-benefits approach such as its advocacy potential as well as the economic, the cooperative, and the temporal and spatial argument that provide reasoning for integrating co-benefits into urban climate policies. Afterwards, a sub-section for common barriers and challenges to the approach follows. The literature review is concluded with a section on methodological literature about the chosen research method and analysis method. It aims to justify why expert interviews followed by a thematic analysis is a suitable approach to achieve the research goals of this work.

2.1 Urban Climate Governance

As established in the introduction of this work, cities play a pivotal role in global climate governance. They are regarded as both major contributors to emissions and places that are highly vulnerable to the consequences of climate change (van der Heijden, 2019a). Yet, cities are also widely seen as prime locations for implementing and scaling up behavioural, economic, and technological interventions for climate change adaptation and mitigation (IPCC, 2018b). They serve as catalysts for change and hubs for innovative climate policies (van der Heijden et al., 2019b). Being aware of this role, after the IPPC Special Report on Global Warming of 1.5°C in 2018, a large number of cities have established long-term targets for decarbonisation and reaching net-zero emissions (Sachdeva et al., 2022).

A paper analysing the mitigation targets of 327 European cities suggests their average reduction goals of 47 % are insufficient to meet Paris Agreement objectives. The authors indicate that larger cities tend to be more ambitious in their climate plans, while smaller cities face resource constraints (Salvia et al., 2021). Setting ambitious targets is one thing, accomplishing them is another. More recently a study found that large, affluent cities often achieve emission reductions regardless of ambitious targets, but for large cities without favourable national conditions, ambitious targets are necessary to drive local action. On the contrary, small cities tend to reduce emissions through

pragmatic, less ambitious approaches, often relying on collaboration with external stakeholders (Roggero et al., 2023b). It is important to keep in mind that emission reductions are only one of urban climate governance's main strategies to deal with climate change. Those measures fall under the category of climate mitigation. The other strategy is adapting to the effects of CC to increase resilience, better known as climate adaptation. The following sub-section briefly dives into these terms, defining them and giving context regarding their viability for urban climate governance.

2.1.1 Climate Mitigation vs. Adaptation

Mitigation refers to either preventing the emission of greenhouse gases into the atmosphere entirely or to reducing them significantly to make the impacts of climate change less severe. This can be accomplished by reducing the sources of these gases – for example by increasing the share of renewable energies (RE), or implementing cleaner means of transportation. Another mitigation method is improving the storage of GHGs, for instance by increasing the size of forests or urban measures like green roofs (EEA, 2024).

Adaptation involves anticipating the negative impacts of climate change and taking proactive steps to prevent or minimize damage or capitalize on potential opportunities. Measures can range from large-scale infrastructure changes, like constructing barriers to counter sea-level rise, to behavioural changes, such as reducing individuals exposure to extreme heat and supporting vulnerable community members during heatwaves (EEA, 2024).

Both strategies are intended to address global warming, with recent research showing a positive correlation between the two approaches. Cities with established mitigation policies and monitoring systems are more likely to adopt adaptation strategies, suggesting a synergistic relationship (Lee et al., 2020). In the past these approaches have often been treated separately in policy, however, there is growing interest in integrating them in combined strategies. Locatelli et al. (2015) have identified three conceptualisations of the adaptation-mitigation relationship: joint outcomes, unintended side effects, and joint objectives (Figure 1). Joint outcomes are measures with non-climatic main objectives that deliver joint adaptation and mitigation outcomes. Unintended side effects are measures meant to either achieve adaptation or mitigation objectives, yet they deliver outcomes for the other objectives as well. And lastly, joint

objectives associate both adaptation and mitigation objectives, which leads to interactions that can strengthen or weaken outcomes (Locatelli et al., 2015).

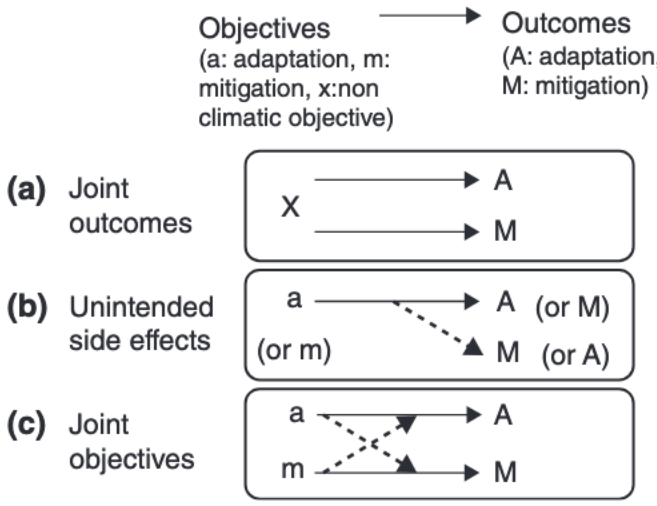

Figure 1: *Three main conceptualisations of the relationships between adaptation & mitigation (copied from Locatelli et al. 2015)*

The discussion section of this thesis will explore the relationships between mitigation and adaptation measures in the context of the chosen case study, the city of Cologne, and how they correspond with their associated co-benefits. Mitigation and adaptation measures for climate change can yield substantial co-benefits and synergies in urban environments mitigation and adaptation can offer co-benefits (Sharifi, 2021). Cities are increasingly incorporating both approaches into their plans, with strategies like green infrastructure, urban mobility initiatives, and sustainable building design proving especially effective in providing co-benefits (Boyd et al., 2022; Sharifi, 2021).

2.2 Co-benefits

This section aims to offer a better understanding of the term co-benefits by defining it according to literature. Next, it goes into the different arguments for co-benefits that were explored during the interviews. These are: the advocacy potential of co-benefits, the economic argument, the collaboration and cooperation argument, as well as the temporal and spatial gap argument. Lastly, it highlights common barriers and perspectives from critics.

2.2.1 Definitions

As stated in the IPPC's latest Assessment Report, local governments that adapt to climate impacts and reduce emissions experience a wider array of additional local benefits. These local benefits have a variety of names in politics and academia. Secondary benefits, synergies, ancillary benefits, or trade-offs related to climate action (Floater et al., 2016; Roggero et al., 2023a). However, they are most commonly referred to as co-benefits (Boyd et al., 2022; Floater et al., 2016; Mayrhofer & Gupta, 2016; Scovronick et al., 2021; Ürge-Vorsatz et al., 2014). Co-benefits can be further defined as a 'win-win' strategy through which at least more than one objective is achieved through a single policy (Mayrhofer & Gupta, 2016). In context of climate politics the term can describe synergies between climate change mitigation and/or adaptation and other goals and their positive effects beyond their primary objectives, such as emission reductions resulting from adaptation strategies like ecosystem-based measures (Boyd et al., 2022; Mayrhofer & Gupta, 2016). The literature further highlights the diverse intentionality, scope, and scale of co-benefits, including health, economic, and environmental improvements alongside climate objectives, such as air quality improvements or job creation. They also note that co-benefits can make climate actions more politically and economically appealing (Floater et al., 2016; Ürge-Vorsatz et al., 2014). This economic and political appeal is what can also be referred to as the advocacy potential of co-benefits, which sub-section 2.2.2 explains in more detail.

2.2.2 Advocacy Potential

The introduction section of this thesis briefly touches on the concept of co-benefits of climate policy having an advocacy potential. Since the term is not commonly defined, this sub-section goes into detail of what is meant by advocacy potential. First, it provides a general explanation, and then explores its relevance in relation to the co-benefits in climate policy.

According to Oxford Languages (2024) the term advocacy refers to "public support for or recommendation of a particular cause or policy". In academic literature, advocacy is broadly defined as the act of supporting, recommending, or pleading for a cause or the interests of another person or group (Beardsley & Brazeau, 2003; Panitch, 1974; Sorensen & Black, 2001). Therefore, advocacy potential refers to the capacity or ability of an individual, group, or organisation to influence policy decisions, public opinion, or

social change through advocacy efforts. It encompasses factors that determine how effectively an entity can advocate for a cause or policy, including resources, networks and alliances, reputation and credibility, strategic positioning, public support, and messaging and communication, while also being enhanced by organizational capacity and the ability to navigate complex policy environments (Albert et al., 2022; Cullerton et al., 2018; Mosley, 2010). In essence, it's about how well-positioned an advocate is to effect change, considering both their internal capabilities and external environment.

The aforementioned definition of advocacy potential refers to entities such as individuals, groups, or organisations. However, the interest of this research lies in exploring advocacy potential that co-benefits of climate politics inherent. A definition of the advocacy potential of co-benefits is required. While many studies indirectly mention the concept, academic literature does not provide a clear and concise definition. However, there are some articles that explicitly refer to the term.

In their work on co-benefits in climate policy, Mayrhofer and Gupta (2016) state that the successful adoption of the co-benefits approach can be attributed to its strong advocacy potential in addressing climate change. They highlight that a major challenge of climate change policy is that it is a 'wicked' problem: the benefits of climate action are often delayed, difficult to directly link to the policies, and may be more evident in different regions of the world, while the costs are immediate, substantial, and borne by specific groups. The concept of co-benefits holds advocacy potential because it helps bridge the temporal and spatial gap between the costs and benefits of climate policy. By offering additional benefits that are typically local, immediate, and easier to measure, a co-benefits strategy makes climate policy more politically feasible (Mayrhofer & Gupta, 2016). Roggero et al. (2023a) states, that the interest in co-benefits is linked to their advocacy potential, as they offer a strong rationale for climate action, presenting a captivating argument for local governments to enhance the acceptance of climate initiatives among local constituencies.

There are two advocacy-related concepts that do not mention 'advocacy potential' nor 'co-benefits' directly, yet still can be applied to the topic at hand. The first is the Advocacy Coalition Framework (ACF), which is a theoretical model of the policy process that analyses how groups, known as coalitions, form based on shared belief systems and how they engage with both supportive and opposing coalitions to shape

public policy. It defines so-called ‘advocacy coalitions’ as coalitions formed by policy actors who join with other actors that share similar beliefs. These advocacy coalitions translate their beliefs into policies and programs to influence a subsystem[1] (Gabehart & Weible, 2023). In a scenario where a group supports policies because of a co-benefit, such as improved air quality or heat reduction, the co-benefit can be seen as a shared belief. The second concept also relates to cooperation of individuals or groups to combat climate change. Boulanger & Massari (2022) examine initiatives that boost cities’ actions toward CC mitigation and adaptation, in particular, transnational municipal networks (TMNs) and non-institutional, grassroots movements for climate actions. These ‘advocacy actions’ call for strengthening socio-ecological resilience by engaging stakeholders, gathering feedback, and testing solutions. These collaborative networks often advocate for climate action by supporting initiatives that come with co-benefits. Both concepts include an important point. In order to successfully boost urban climate action and bring political change, cooperating with peers as well as other stakeholders is essential.

From this, a definition for the advocacy potential of climate policy co-benefits can be derived: The advocacy potential of co-benefits in the context of climate policy refers to the ability of co-benefits to serve as a persuasive tool that enhances the political feasibility and public acceptance of climate policies. Co-benefits can bridge the gap between the immediate costs and the often delayed or geographically dispersed benefits of climate action. By highlighting these immediate, localised, and tangible benefits, co-benefits can effectively mobilise support from various stakeholders, overcome resistance, and facilitate the adoption and implementation of climate policies.

There are a variety of barriers that hinder implementation of effective climate policy. Among them are high costs and the issue of their effects often not being immediate and therefore less tangible. Further, there is a lack of communication and coordination between different expert communities. This is where co-benefits such as improved air quality provide valid arguments due to their advocacy potential. The following sub-sections look at how these arguments derived from literature.

[1] A policy subsystem encompasses the policy topic, geographic area of focus, and the individuals involved in their policy issues (Gabehart & Weible 2023).

2.2.3 Economic Argument

From an economic standpoint, systematic assessments of climate change suggest that the advantages of taking early action outweigh the costs associated with delaying such measures (Garnaut, 2012; Stern, 2007). Co-benefits can be used as a compelling argument for early climate action, as they span across multiple domains, including health, energy security, as well as economic, social, and environmental domains. Economic co-benefits are the most common, with air quality improvements being the most frequently cited individual co-benefit (Finn & Brockway, 2023), as research indicates that air quality improvements resulting from climate policies can generate significant economic benefits, often comparable to or even surpassing the costs of mitigation (Karlsson et al., 2020; Williams, 2014). The offsetting of mitigation costs can be achieved through avoided deaths, reduced respiratory diseases, and improved agricultural productivity (Kitous et al., 2017).

For example, a study from the United States revealed that substantial health co-benefits can be achieved by reducing emissions from power plants, with net benefits estimated at $12 billion (Buonocore et al., 2016). Furthermore, a new projection tool indicates that by 2050 in the U.S., every dollar saved on electricity in buildings generates an additional $0.02 to $0.81 in health and climate co-benefits (Salimifard et al., 2023). Similar calculations have been done in other parts of the world. Xie et al. (2018) found that by 2050, air pollution reduction through climate mitigation measures could result in savings in life value[2] of approximately 2.8 trillion USD in Asian countries, far exceeding mitigation costs.

Air quality improvements may be the most prevalent co-benefit, but far from the only one that is economically relevant. Climate change mitigation and energy efficiency policies also bear substantial cost-saving potential through co-benefits. For instance, increasing residential insulation in the U.S. could lead to significant CO^2 reductions and prevent premature deaths, with monetized health and climate co-benefits of $49 per ton of CO^2 on average (Levy et al., 2016). Moreover, a global synthesis on incentivizing energy efficiency measures through co-benefits found that energy savings and energy security in Europe and South Asia are crucial, with the magnitude of quantifying co-

[2] Refers to the value of statistical life (VSL) which quantifies the economic benefits of reduced mortality in policy areas like air quality, traffic safety, and health OECD (2024).

benefits amounting to billions of USD (Chatterjee et al., 2022). Despite that, quantifying co-benefits remains challenging, highlighting the need for standardised terms and methodologies to enhance policymaking (Bisello et al., 2016; Finn & Brockway, 2023).

2.2.4 Collaboration and Cooperation Argument

Policymaking and the implementation of policy measures are complex processes that require multiple actors working together. Some scholars argue that co-benefits are able to improve cooperation among stakeholders and even help form collaborative networks. The findings from an early study on benefits of climate mitigation highlight the need for increased opportunities for interagency coordination, methods for prioritising funding streams, and the development of partnerships with community-based organisations for linking climate planning with co-benefits (Jochem & Madlener, 2004). According to empirical evidence by Birchall (2014), a local government climate program in New Zealand managed to achieve significant emission reductions as well as foster inter-council collaboration, awareness, and learning.

Next to collaboration within municipal departments, other research notes the importance of cooperation of relevant stakeholders across the different levels of the urban climate policy landscape. For example, Mitchell and Graham (2020) argue that municipal practitioners will struggle to adopt evidence-based advocacy planning without support from credible boundary organizations, higher government levels, and academic and industry associations. Further studies underline the significance national and international cooperation. Nemet et al. (2010) state that a full integration of air quality co-benefits into policy considerations could influence optimal policy stringency, […], and international cooperation incentives. Additionally, advocacy actions such as transnational municipal networks (TMNs) and non-institutional, grassroots movements (e.g. NGOs) for climate actions boost cities' efforts toward CC mitigation and adaptation by calling for strengthening socio-ecological resilience, engaging stakeholders, gathering feedback, and testing solutions (Boulanger & Massari, 2022).

2.2.5 Temporal and Spatial Gap Argument

The final argument for why co-benefits possess advocacy potential is the temporal and spatial gap argument. As mentioned in sub-section 2.2.2, the effects of climate

mitigation such as CO^2 reductions can't be felt or seen immediately and their positive impact for the climate lies in the future. Tebaldi and Friedlingstein (2013) estimate that mitigation effects on global mean surface temperature may take 25 to 30 years to become detectable, with regional effects taking even longer. Because of this, climate change policy is often described as a 'wicked' problem, characterized by delayed benefits that are difficult to directly link to policies and frequently manifest in different regions, while the costs are immediate, substantial, and concentrated. This temporal and geographic mismatch between costs and benefits presents a significant challenge for policymaking (Jenkins, 2014; Mayrhofer & Gupta, 2016). Furthermore, this delay creates a reversed intergenerational equity problem, as current generations face immediate costs for benefits that will materialize in the future (Davies, 2020), which in turn, also poses a substantial challenge for policymakers, as convincing people to accept short-term sacrifices for long-term gains is politically difficult.

Nonetheless, another study argues that immediate action is the most effective strategy in addressing uncertain climate change, especially under the possibility of recurring events. They found that "wait and see" behaviour is only successful when the timing of necessary contributions is known, and risks can be fully mitigated. Otherwise, quick action is more effective, even in scenarios involving wealth inequality and heterogeneous risks immediate action is the best strategy when facing uncertain climate change (Abou Chakra et al., 2018). The concept of co-benefits represents a strong argument for such immediate action. Particularly health co-benefits, holds strong advocacy potential by bridging this gap, as it offers local, immediate, and measurable advantages that enhance the political feasibility of climate policies. (Jenkins, 2014; Mayrhofer & Gupta, 2016). Additionally, Karlsson et al. (2020) argue that identifying co-benefits offers policymakers a more holistic understanding of the stakes involved and introduces a near-term, positive framing of policies, as co-benefits are relatively close in time and space. This enhances the opportunities for science-based decision-making and the development of socio-economically beneficial policies, helping to address the 'wicked' nature of the climate change challenge.

2.2.6 Common Barriers and Challenges

One might assume that these arguments for integrating co-benefits into policy making would result in widespread adoption of co-benefits as a rationale for climate action in

urban politics. However, this does not necessarily appear to be the case. According to literature, the co-benefits concept comes with a number of barriers that hinder its integration. According to Negev et al. (2022), scholars widely agree that a lack of political will and commitment represents one of the most fundamental barriers to effective action. Co-benefits can be utilised as a compelling argument for climate action, however, there are challenges in effectively communicating their value to stakeholders (Floater et al., 2016) as well as a lack of awareness amongst policymakers at the local level, which can act as a barrier to the co-benefit approach (Rahman & Mori, 2020).

From a financial perspective, some researchers argue that there is a risk that co-benefits such as air quality improvements may be perceived as incidental instead of as primary drivers of strong climate policy. This is due to the climate policy discourse remaining to be framed around cost minimisation until climate mitigation benefits can be estimated with greater reliability (Nemet et al., 2010). The need for greater reliability corresponds with findings from other authors as one commonly cited barrier is insufficient data and capacity to measure and analyse co-benefits and therefore a lack of understanding of their potential. This, as well as the absence of robust methodologies and standardised tools for assessing co-benefits, leads to undervaluation (Floater et al., 2016; Ürge-Vorsatz et al., 2014). Standardised data capturing methods and analysation tools allow for more accurate estimation of monetary aspects of co-benefits.

However, next to economic barriers, academic literature also identifies crucial hurdles in regard to cooperation and collaboration of the relevant actors of urban climate policy. For example, Jiang et al. (2013) warn that the co-benefits approach may face obstacles due to limited coordination and collaboration among government bodies and divisions, hindering the development and implementation of integrated co-benefit policies. The key step to effective policy implementation that can realise co-benefits' potential is shared problem solving and intersectoral collaboration (Stead & Meijers, 2009). However, fostering such collaboration remains a significant challenge in public policy across many countries, as aligning actions across sectors with differing priorities can be rather difficult. Decision-making still often takes place in silos, with individual ministries or committees concentrating on their primary mandates while often neglecting other important dimensions, including co-benefits in other domains (Karlsson et al., 2020; Ürge-Vorsatz et al., 2014). Another barrier to intersectoral

collaboration stems from the lack of policy-orientated scientific evidence, hindering the recognition of potential co-benefits as incentives for local climate policy. At the municipal level, formal collaborations may include intersectoral institutions, programs, and working groups that unite the relevant departments within the local government (Negev et al., 2022). A lack of coordination of responsibilities and interaction between departments can also act as a barrier to the co-benefit approach, when a city implements both mitigation and adaption strategies (Laukkonen et al., 2009).

Which of these barriers stakeholders in Cologne perceive to be present, remains to be an important question to answer, since it could provide valuable insights for developing an integrated co-benefit approach.

2.3 Methodological Literature

The aim of this sub-section is to provide some rationale for the chosen research method of this thesis. It explains the value of expert interviews and why they are fitting for accomplishing the research goals. Afterwards, the chosen method for data analysis is justified based on current literature.

2.3.1 Expert Interviews

In general, interviews are a versatile qualitative data collection method utilised by researchers across the social sciences. They enable individuals to articulate their understanding and interpretation of the world in their own words (Knott et al., 2022) and are designed to gather a richer source of information from a small number of people about their attributes, behaviour, feelings, preferences, attitudes, knowledge and opinions (Virginia Tech, 2024). For the research topic at hand, the knowledge of the interview partners as well as their opinion on the matter are the most relevant information types.

The expert interview as a method lends itself perfectly for this use case, as it is based on a topical guide that is focused on the knowledge of experts, which is commonly defined as specific knowledge in a certain field of action (Meuser & Nagel, 2009). Döringer (2021) characterise expert interviews as a widely employed qualitative method designed to gather information or explore specific areas of expertise and action. An expert can be

classified as any person that has specialised information on a subject or who has been involved in the political or social process of interest (Dexter, 2006). Depending on the research interest, experts can be found in a variety of fields and may include individuals such as practitioners, managers, academics, politicians, or others with specialised experience or knowledge (Maestas, 2018). Leveraging their insights addresses the fundamental challenge that many topics of interest in political science, and more broadly, the social sciences, are not directly observable, documented, or transparent (Soest, 2023).

Based on existing literature, Soest (2023) differentiates four main applications of qualitative expert interviews: i) assessment; ii) aggregation; iii) anticipation; and iv) affirmation. Firstly, *assessment*, which is the most relevant application. It entails experts sharing their judgement on political and social processes in an analytical, reconstructive way. Secondly, the next related function is *aggregation*, where experts excel in simplifying real-world complexities and synthesising multifaceted phenomena. Like the assessment function, aggregation often involves reconstructing events and providing information as well, but in a more descriptive manner. Thirdly, experts can draw on their research or personal experience for *anticipation* and prediction of events, of actors' behaviour, or of long-term developments. Lastly, expert interviews may be used as a method of *affirmation*, allowing for the confirmation, or disproving of previous research findings, information from other sources, or anecdotal evidence. Applied to the research topic of co-benefits in urban climate politics, the conducted expert interviews are expected to deliver results that include all four applications, at least to some extent. The experts are expected to share their judgement on the integration of co-benefits in Cologne's climate politics as well as the value and shortcomings of these benefits (assessment). They are also expected to describe events such as the creation of local climate strategies and summarising complex processes involving many stakeholders (aggregation). Furthermore, they may provide future outlooks on local climate action in Cologne (anticipation) and confirm or deny whether co-benefits play the important role that literature credits them to inherit (affirmation). Therefore, conducting expert interviews is a well-fitting method for the research goals of this study, as it is able to provide valuable insights from local actors that directly or indirectly involved in Cologne's climate action that other sources such as document analysis methods may not provide.

2.3.2 Thematic Analysis

Thematic analysis is a widely used method for analysing qualitative interview data in various research contexts. It is a popular method due to its accessibility and flexibility and it can be used to systematically identify, organise, and provide insight into patterns of meaning or themes within a dataset (Braun et al., 2015), with the aim of uncovering commonalities and interpreting their meaning in relation to the research question. TA lends itself well for the analysis of written sources such as policy documents, electoral programs, plans, communication media like news articles or social media posts, or fieldwork material such as field notes, speeches or – like for this study – interview transcripts.

The method can be applied using inductive, deductive, or hybrid approaches. An inductive approach involves allowing the data to determine the codes and/or themes, while a deductive approach involves analysing the data with preconceived themes based on theory that are expected to be found within the dataset (Fereday & Muir-Cochrane, 2006). Furthermore, thematic analysis is informed by various philosophical perspectives, including positivism, interpretivism, and critical realism. Positivism means the knowledge is already in the available data, the methods help to extract said knowledge, and subjectivity must be avoided as much as possible. In contrast, within the concept of interpretivism subjectivity is a resource since knowledge is obtained by subjectively interpreting the data. The critical realism approach to TA aims to produce causal explanations (Fryer, 2022).

A fundamental part of this method is the process of coding, which involves assigning attributes to texts. Codes are interesting "features of the data" that are utilised to construct more abstract themes, which are defined as "patterns of shared meaning underpinned by a central organizing concept" (Braun & Clarke, 2006). In addition to code generation and theme searching, the process typically includes data familiarisation, reviewing, and description (Salleh et al., 2017). This approach was developed by Braun and Clarke (Braun & Clarke, 2006; 2006), who came up with a six-step framework for conducting a thematic analysis. Step one is *familiarisation* with the data. In the context of analysing interviews, this involves transcribing audio recordings, reading through the text and taking initial notes. Step two is the previously mentioned process of *coding,* which refers to highlighting sections of text – usually phrases or sentences – and

developing short labels or codes to describe their content. From there, step three of *generating themes* follows. Patterns among the codes are identified, from which themes are developed. Themes are broader than codes and are usually made up of multiple codes. At this stage, less frequent codes might need to be discarded, due to being less relevant. Step four involves *reviewing themes* to ensure the themes are useful and representative of the dataset. Step five is *defining and naming themes.* The previously edited list of themes needs final refinement, with goal of capturing the essence of what each theme is about. Naming involves formulating concise and easily understandable names for each theme. Finally, step six is *writing up,* which is simply putting the results of TA in text form (Braun & Clarke, 2006). In the case of this thesis, section 5 serves this function.

3. Methodology

The core research method of this thesis is conducting and analysing expert interviews with key stakeholders in the city of Cologne. This section goes into detail of the research design, including stakeholder categorisation, interview structure, and interview partner sampling techniques. Further, it delves into data collection and data analysis processes.

3.1 Research Design

The research design is based on a literature review of the advocacy of potential urban climate policy co-benefits (see section 2), which serves as a foundation for expert interviews with relevant actors within the socio-political landscape of Cologne. The reasoning for why expert interviews, followed by a thematic analysis, are a suitable method can be found in section 2.3.1 and section 2.3.2 respectively. To successfully conduct expert interviews, relevant stakeholders must be identified and selected, an interview structure must be developed, and suitable sampling techniques must be chosen. The next sub-sections go into the details of these steps and are then followed by sections of the data collection process and data analysis.

3.1.1 Stakeholder Categorisation

A crucial step of any qualitative research interview process is the selection of interview partners. For this study, experts regarding the topic of co-benefits of urban climate action needed to be identified. As previously mentioned, experts are individuals recognised for their specialised knowledge of a certain subject, community position, or status (Kaiser, 2021) and are defined as those possessing specialised information or direct involvement in the political process of interest (Dexter, 2006). Experts can be differentiated into inside and outside experts. Internal experts are decision-makers directly involved in shaping the political or social process of interest, while external experts are individuals outside the process who acquire their expertise through research, experience, or engagement with the policymakers and officials responsible for the decisions. Soest (2023) recommends including both kinds of experts as respondents.

Keeping this suggestion in mind, a list of potential stakeholder categories was developed through a brainstorming process. The list consisted of stakeholders or actors including politicians and municipal authorities, scientists and researchers, urban planners, industry associates, non-governmental organisations (NGOs), and international organisations as well as others (refer to Table 1). The terms ‘stakeholders’ and ‘actors’ are used interchangeably throughout this work. Both refer to people who are either directly involved in the development of Cologne’s climate action, are directly or indirectly involved in the implementation of it, or are simply knowledgeable about the subject through work or study experience. After consultation with the supervisor of this study, two stakeholder categories and a few sub-categories were entirely disregarded (crossed out in Table 1). Category 6 which includes transnational municipal networks and intergovernmental organisations were deemed too broad considering the local focus on the city of Cologne. Category 7, comprising media and communication experts, initially appeared to offer the potential for valuable perspectives from individuals reporting on the topic. However, their status as experts remains questionable, as journalists often cover a wide range of topics and, unlike researchers or scientists who also serve as external experts, do not typically play a consulting role, or provide scientific evidence that can directly inform decision-making.

Table 1: *Initial draft of stakeholder categories and sub-categories. Crossed out categories were disregarded due to concerns about expertism and to narrow down potential participants.*

Stakeholder Category	**Sub-categories**
1. Government and Public Sector Officials	• Local and Municipal Governments • National and Regional Government Agencies • Legislators and Policy-Makers
2. Academic and Research Institutions	• Climate Scientists and Environmental Researchers • Social Scientists and Economists • ~~Policy Analysts and Think Tanks~~
3. NGOs and Advocacy Groups	• Environmental NGOs • Public Health Organizations • ~~Social Justice and Equity Advocates~~
4. Private Sector and Industry Representatives	• Renewable Energy and Green Technology Firms • Construction and Urban Development Companies • Industry Associations
5. Community and Grassroots Organisations	• Local Community Groups • ~~Grassroots Climate Movements~~
~~6. International Organisations and Networks~~	• ~~Transnational Municipal Networks (TMNs)~~ • ~~Intergovernmental Organizations~~
~~7. Media and Communication Experts~~	• ~~Journalists and Media Outlets~~ • ~~Public Relations and Communication Specialists~~

The other categories were kept going into the next step, which involved identifying stakeholder types according to Mitchell's stakeholder identification and salience model (1997), illustrated in Figure 2. This categorisation concept is based on three key attributes that can be used to identify and prioritise stakeholder groups. The first key attribute is *power,* meaning the stakeholder is in a position to carry out actions despite facing resistance. The second key attribute is *legitimacy,* which is a generalised perception that a stakeholder's action is desirable, proper, and appropriate. The third key attribute is *urgency*, which is defined as the degree to which stakeholder claims call for immediate action, either caused by time sensitivity or the critical nature of the problem.

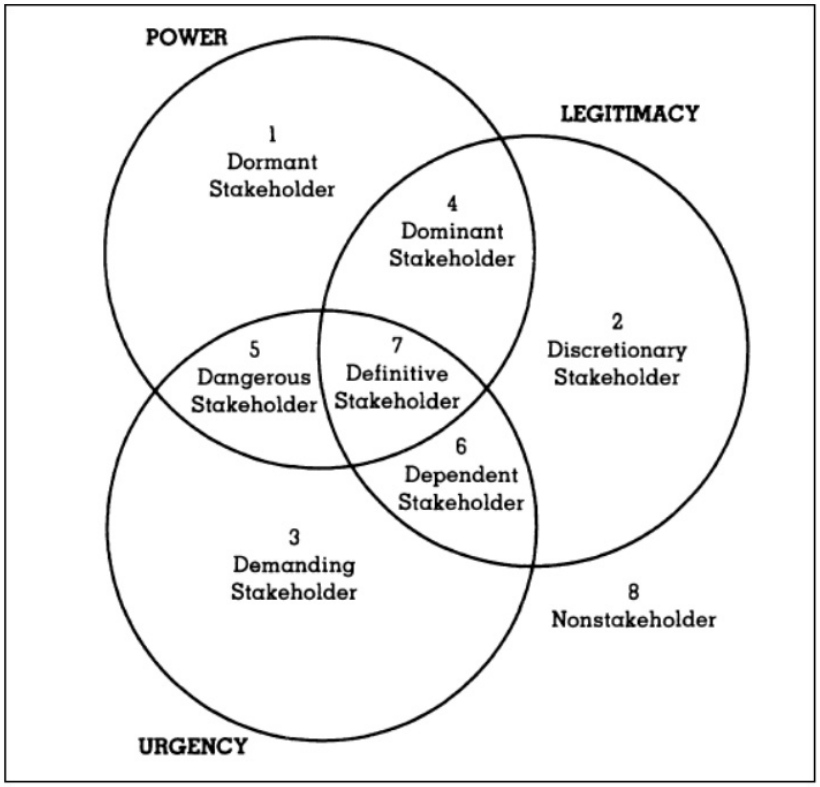

Figure 2: *Mitchell's (1997) stakeholder typology. Figure copied from Şener et al. (2016).*

These attributes can be assigned to three overarching stakeholder categories. These are latent stakeholders, expectant stakeholders, and definitive stakeholders. Latent stakeholders possess only one of the key attributes and do not have strong influence on decision-making processes. This category can be divided into three stakeholder types: 1.) dormant stakeholders; 2.) discretionary stakeholders; and 3.) demanding stakeholders. Expectant stakeholders possess two of the three key attributes and can be generally seen as more influential. They are also made up of three stakeholder types which are: 4.) dominant stakeholders; 5.) dangerous stakeholders; and 6.) dependent stakeholders. The last distinction is 7.) definitive stakeholders which are a type and category unto themselves and possess all three attributes. They represent the most influential type of stakeholder and should be prioritized when determining potential interviewees (Mitchell et al., 1997). Details on what attributes the stakeholder types possess and a description of what they are can be found in Table 2.

Table 2: *Stakeholder types with their attributes and a description (Mitchell et al., 1997).*

Stakeholder Type	Attributes	Description
1. Dormant Stakeholder	Power	Stakeholder has power but lacks legitimacy and urgency; potential to influence if activated.
2. Discretionary Stakeholder	Legitimacy	Stakeholder has a legitimate relationship but lacks power and urgency; involvement is optional.
3. Demanding Stakeholder	Urgency	Stakeholder has urgent claims but lacks power and legitimacy; demands may be seen as nuisance.
4. Dominant Stakeholder	Power, Legitimacy	Stakeholder has both power and legitimacy, providing strong influence over decisions.
5. Dependent Stakeholder	Legitimacy, Urgency	Stakeholder relies on others for power but has legitimate and urgent claims needing advocacy.
6. Dangerous Stakeholder	Power, Urgency	Stakeholder has power and urgency but lacks legitimacy; poses a potential threat if mishandled.
7. Definitive Stakeholder	Power, Legitimacy, Urgency	Stakeholder has all three attributes and requires immediate attention and engagement.

This stakeholder typology concept was then applied to the previously developed stakeholder categories (see Table 1). The goal of this process was to find a ranking method for the stakeholder categories to justify which kind of potential interview partners should be prioritised. It provided additional confirmation to the purposive sampling method discussed in section 3.1.3; however, a 'good' ranking did not automatically mean a certain stakeholder category should be prioritised over others based solely on its ranking. The results of this process are displayed in Table 3.

***Table 3**: Mitchell's stakeholder typology applied to stakeholder sub-categories with their attributes and rationale. The degree of shading represents the stakeholders potential influence based on how many of the three key attributes they possess (darker = more influence, lighter = less influence).*

Stakeholder Sub-Categories	**Mitchell's Typology**	**Attributes**	**Rationale**
1. Local and Municipal Governments	Dominant Stakeholders	Power, Legitimacy	Significant power in policy implementation and recognized as legitimate authorities.
1. National and Regional Government Agencies	Definitive Stakeholders	Power, Legitimacy, Urgency	Hold power, legitimacy, and often face urgent climate pressures, making them crucial actors.
1. Legislators and Policy-Makers	Dominant or Definitive Stakeholders	Power, Legitimacy (and Urgency if pressured)	Authority to enact laws and allocate resources, with urgency under electoral/societal pressure.
2. Climate Scientists and Environmental Researchers	Discretionary or Dependent Stakeholders	Legitimacy (and possibly Urgency)	Legitimate due to expertise but lack direct power but potentially urgent if addressing immediate policy challenges.
2. Social Scientists and Economists	Discretionary Stakeholders	Legitimacy	Legitimate actors whose influence depends on the application of their insights in policy.
2. Policy Analysts and Think Tanks	Discretionary or Dependent Stakeholders	Legitimacy (and possibly Urgency)	Legitimate sources of analysis, potentially urgent if addressing immediate policy challenges.
3. Environmental NGOs	Dependent Stakeholders	Legitimacy, Urgency	Legitimate and advocate for urgent issues but depend on others for power to enact change.
3. Public Health Organizations	Dependent Stakeholders	Legitimacy, Urgency	Legitimate actors focused on urgent health issues, relying on others' power for policy impact.
3. Social Justice and Equity Advocates	Dependent or Dangerous Stakeholders	Legitimacy, Urgency (and Power if mobilized)	Advocate for equity with legitimacy and urgency, potentially "dangerous" if challenging the status quo.
4. Renewable Energy and Green Technology Firms	Dominant Stakeholders	Power, Legitimacy	Significant economic power and legitimacy in promoting green technologies.

4. Construction and Urban Development Companies	Dominant Stakeholders	Power, Legitimacy	Powerful in shaping urban planning and legitimate stakeholders in urban development.
4. Industry Associations	Dominant or Definitive Stakeholders	Power, Legitimacy (and Urgency in some cases)	Represent collective industry interests with significant power and legitimacy, urgency if policies affect members.
5. Local Community Groups	Dependent or Demanding Stakeholders	Legitimacy (and Urgency if mobilized)	Legitimate as community representatives, with urgency if mobilizing around a crisis.
5. Grassroots Climate Movements	Dependent or Dangerous Stakeholders	Legitimacy, Urgency (and Power if mobilized)	Legitimate and urgent in climate advocacy, potentially "dangerous" if challenging power structures.

For example, national and regional government are definitive stakeholders because they have power, legitimacy, and are often tasked with handling urgent climate pressures. Yet with the regional focus of this study, national government officials were deemed unfitting as potential interview partners, due their distance to the specific case of Cologne as well as it being more difficult to establish contact with them. The stakeholder categories policy analysist and think tanks, social justice and equity advocates, and grassroots climate movements are left unshaded in Table 3 due to being regarded as low priority interviewees. This judgement is based on concerns about their knowledge in this particular research field and is supported by them being categorised as latent or at most expectant stakeholders.

In addition to the stakeholder categorisation and typology, the aforementioned regional focus of the study served as another criterion for narrowing down potential interview partners. While they do not need to be residents of Cologne, their work should either currently be based in or have been conducted within the Cologne metropolitan region in the recent past. With this in mind, a baseline contact list was created by researching online for fitting interview participants. More information about this process is provided in section 3.2 on data collection.

3.1.2 Interview Structure

In general, the most appropriate format for expert interviews is a semi-structured approach with defined topics and preformulated questions (Tansey, 2007). This allows them to be guided by defined themes, keywords, and established questions, while also leaving room for follow-up enquiries and exploratory probes. Semi-structured interviews offer a valuable balance between structure and flexibility, enabling both comparability and sensitivity to context (Soest, 2023).

Naturally, the topic of climate action co-benefits in Cologne is reflected in the themes behind the interview questions that were developed. The ultimate goal of these questions is to contribute to answering the overarching research question. Thus, themes such as the co-benefit's advocacy potential, economic and financial aspects, along with cooperative and collaborative aspects were present in all interview guides. On a first level, the interview guides were tailored to align with the stakeholder categories. On a second level, the specific questions were adjusted and personalised to the individual (selection of interview guide examples in Appendix A).

The general structure of all interview guides was relatively the same. All interviews started with a short introduction phase which consisted of a few words about the topic, research goal, the term co-benefits, and in some cases, Cologne's climate neutrality goals. The permission to record the interview for later transcription purposes was also received here. Afterwards, recording started and the first set of questions allowed the interviewee to introduce themselves. They were designed to establish their knowledge on Cologne's climate goals as well as how much they were affected by respective measure in their job. Next were questions that were designed to find out how the respondent perceives co-benefits advocacy potential. They were followed by one set of questions regarding economic aspects of co-benefits and another regarding cooperation and collaboration. Some interviews had a question asking the respondent's outlook on Cologne's urban climate action future. The interview concluded with an open-ended question, allowing the interviewee to address any points they felt were missing, along with a query about potential additional contacts for further interviews.

When developing the questions, the overall aim was to keep them open-ended and avoid simple 'yes' or 'no' questions. Questions that could be answered in that manner had a follow-up question asking for further explanation. They were also designed to be as

neutral and non-leading as possible to avoid implying a ‘correct’ answer. Further, they were designed to be specific enough to guide towards the research topic but remain flexible enough to allow the conversation to flow naturally. In some instances, spontaneous follow-up questions were asked when the respondent brought up an interesting new point.

3.1.3 Sampling Techniques

Purposive Sampling

Careful selection of participants is essential to ensure interviews yield meaningful and valuable research insights. Qualitative expert interviews are well-suited to purposeful, non-probability sampling (Goldstein, 2002; Tansey, 2007) because expert judgments are inherently subjective and not always representative or reproducible. A common non-probability technique is purposive sampling, used in qualitative research to select knowledgeable informants for studying specific domains (Tongco, 2008). This sampling method involves the intentional selection of participants based on their characteristics, knowledge, experience, or other criteria (NCSC, 2024). It is not intended to provide a representative sample but rather to hone in on particular phenomena and/or process (Robinson, 2014). The characteristics of the participants for the research case of this thesis are described in the previous sub-section 3.1.1 about stakeholder categorisation. This sampling technique resulted 37 potential participants out which 18 were contacted (more details in section 3.2). Out of these 18 interview requests eight resulted in interviews, two were declined and eight remained unanswered.

Snowball Sampling

To complement the purposive sampling technique, a second method to find additional interview partners was employed. As mentioned in sub-section 3.1.2, at the end of each interview, respondents were asked if they knew of any other potential interview partners. Snowball sampling is a purposeful method of data collection, which utilizes referrals from initial participants to identify additional subjects (Etikan, 2016a; Goldstein, 2002; Naderifar et al., 2017). This technique resulted in three additional interviews.

3.2 Data Collection

Contacting process

After an initial list of potential interview participants was created, they were contacted via email. The email was standardised, but some parts were tailored to the individual. It included a link to Calendly, which is a web-based scheduling solution that allowed respondents to book timeslots at their own convenience. This approach proved to be very time efficient and straightforward as it helped to avoid a back and forth of exchanging emails to find a suitable date and time. Two respondents called to ask a few questions and scheduling details before the actual interview, but apart from that contacting largely remained a text-based process. Unanswered emails were followed up around one week after the initial email which led to a few interviews that otherwise might not have happened. The first interview participant was contacted on the 25th of October 2024 and the last interview was held on the 18th of December 2024. All other interviews were conducted in the period in-between with the majority (nine out of eleven) being conducted in November 2024.

Online interviews

Interviews were exclusively conducted online. Despite there being some merit to doing the interviews in-person, as they allow for establishing rapport with the participant, noticing cues, and record additional non-verbal meta data, digital research methods have emerged as a viable alternative to face-to-face meetings. This is especially true for synchronous online interviewing via video-conferencing tools such as Zoom or Microsoft Teams (Soest, 2023). Some research found statistical equivalence in outcomes between online and in-person interviews (Peasgood et al., 2023). Moreover, conducting interviews online has advantages like increased convenience and in some cases the potential for even stronger rapport-building (Peasgood et al., 2023; Shapka et al., 2016). For this study the two main factors for online interviews were comparability and convenience for both interviewer and interviewees. Interviews could be easily processed in the same manner when it came to recording method and analysis because they were all conducted in a near identical way. Due to the physical distance between Berlin and Cologne and other factors such as finding a suitable interview space (quiet enough, yet not too private), meeting at said location, etc., online interviews were easier

to schedule and more convenient for all parties involved. Another factor was cost that would accumulate due to travel expenses or potentially needing to rent a suitable interview space.

Most interviews (nine out of eleven) were conducted using the videotelephony software Zoom Workplace. One interview was held using the virtual classroom software BigBlueButton, and one was conducted via Apple's FaceTime due technical difficulties with Zoom. Additional alternatives offered to participants were Microsoft Teams as well as a traditional phone call. Interviews took anywhere from 45 minutes to 77 minutes to complete, with an average interview length of around 55 minutes.

All interviews were conducted in German, as the participants were native German speakers. This approach minimised the risk of missing relevant information due to language barriers. The subsequent analysis was carried out in English using the original German transcripts of the interviews.

Recording Method, Note-taking, and Transcription Process

At the beginning of every interview permission to record the conversation for later transcribing was obtained. Recording was usually done with Zoom's build in recording function. For the two interviews held using other platforms, the audio recording function of MacOS' build-in application QuickTime Player was used. In addition to the recording, manual notes of the participants answers were taken in a text document. To convert the audio recording into text form, the web-based transcription tool TurboScribe was used. This tool utilises OpenAI's Whisper to automatically transcribe video or audio files. This method resulted in downloadable transcripts needed for the analysis of the interviews.

3.3 Data Analysis

The approach to data analysis for this thesis is an inductive thematic analysis. This approach to TA was chosen because it is grounded in the qualitative data itself and enables the identification of patterns from which key themes and interesting insights can be derived without the constraints of preconceived theoretic categories or constructs (Fereday & Muir-Cochrane, 2006). However, while the analysis was not based on a

preconceived theoretic framework, it should be noted that the research design, and therefore the interview questions and themes found during analysis, are based on existing literature about the overarching topic of co-benefits (refer to sub-sections 2.2.2 to 2.2.6).

The process of conducting the thematic analysis was based on Braun and Clarke's (2006) six-step framework. Figure 3 provides an overview of that approach.

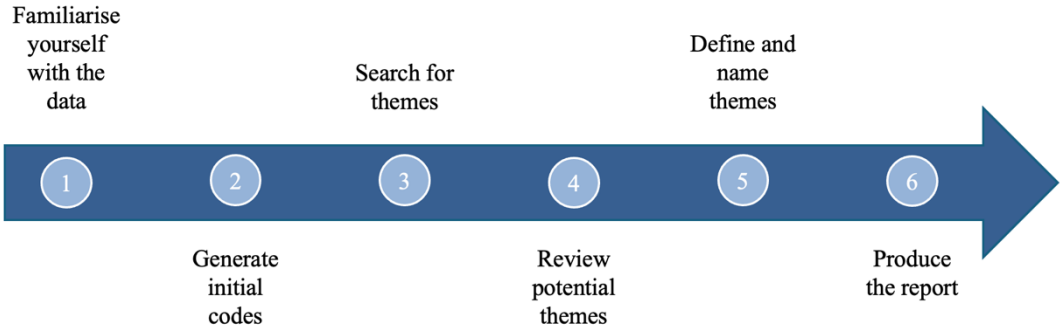

Figure 3: *Six-step framework for thematic analysis process (adapted from Braun & Clarke, 2006, 2012).*

Step 1: Familiarisation

The analysis process began with data familiarisation. This entailed thoroughly reading through all interview transcripts and notes taken during the individual interviews. Due to the relatively short period of time between data collection and data analysis, the content of the interviews was immediately familiar, and it did not require multiple iterations of this first step.

Step 2: Coding

Coding was exclusively done using version 24.7.0 of MAXQDA, a software specifically designed for qualitative data analysis. As mentioned in the introduction of this section, coding was done utilising an inductive (data-driven) approach. This meant while reading through the transcripts, participant answers that seemed relevant to answer the research questions, were identified and labelled with a suitable code. An example of this process is illustrated in Table 4 below.

***Table 4**: Initial coding process example. Code was applied to the highlighted part of the data segment (original German version).*

Data Segment	**Code applied**
"[…] Da sehe ich eine riesige Chance darin, auf einer räumlich lokalen Ebene zu argumentieren. Dafür sind diese Co-Benefits wirklich super. Das ist einer, also Umkehrung der Wertschöpfung. Der andere ist, es gibt wieder eine Verbindung, das kann man auch erleben, dass sich die Menschen, wenn sie darüber entscheiden können, also nicht Mieter sind, wieder an ihre eigene Energieversorgung, wie soll ich das sagen, emotionale heranrücken." (P1).	• Co-benefits as value creation reversal

Step 3: Generating Themes

After the previous coding phase, initial themes were generated. This involved grouping codes into potential themes by searching for patterns of shared meaning among the codes. For example, every code for data segments that included perspectives on financial advantages of co-benefits was organised under the theme 'Economic opportunities through co-benefits'. Themes such as this one, were then grouped with similar themes, like 'Economic barrier' and 'Cost distribution', making them sub-themes of more overarching main themes, in this case, 'Economic Considerations'. Table 5 showcases this process on a few examples.

***Table 5**: Theme generating process examples.*

Initial Code →	**Sub-Theme** →	**Main Theme**
Co-benefits as value creation reversal	Economic Opportunities through Co-Benefits	Economic Considerations
Socially equitable expansion of renewable energy	Economic Opportunities through Co-Benefits	Economic Considerations
Vulnerable groups would benefit	Cost Distribution	Economic Considerations
Successful alignment of interest groups	Co-Benefits improve Cooperation	Cooperation and Collaboration

Step 4: Reviewing Themes

The next step involved refining the themes by ensuring they were distinct and coherent. To illustrate, during the previous phase the theme of 'Co-Benefits of Climate Mitigation and Adaptation' emerged. Yet it did not warrant being its own main theme, hence, it was grouped as a sub-theme under the main theme 'Making Climate Action Tangible'. All existing themes were cross-checked against the entire dataset to confirm their relevance. A complete overview of all themes, sub-themes, and codes can be found in Appendix C.

Step 5: Defining and Naming Themes

In step five, the scope of all themes was defined, and the names of some themes were adjusted to be descriptive and concise. For example, the theme 'Economic Aspects of Co-Benefits' was changed to 'Economic Considerations'. The descriptions of each main theme can be found in the corresponding section of the results.

Step 6: Writing Up

The identified themes are presented in the results found in section 5. It includes each main theme's sub-themes, along with supporting evidence from the interview transcripts as indirect and literal quotations. Additionally, for every main theme the presence of each sub-theme among the dataset is displayed in a bar chart, which was created using Excel.

4. Case Description – City of Cologne

The chosen case study for this master's thesis is the city of Cologne. As established in the introduction, cities play a key role in achieving climate mitigation and adaptation targets. The following section provides an overview of the city's urban characteristics, its climate and environment, urban development and infrastructure, organisational structure, and finally, it gives insights into Cologne's urban climate politics.

4.1 Characteristics, Urban Development, and Infrastructure

Cologne is the fourth largest city in Germany and the largest city in the state of North Rhine-Westphalia (NRW). It is located along the River Rhine and hosts one of Europe's major inland ports, underscoring its historic role as a key commercial hub (Kohl & Stehkämper, 2024). The city has a population of around 1.1 million inhabitants and stretches over an area of 404.89 km^2 (Schimohr & Scheiner, 2021). Cologne's urban structure reflects clear socio-spatial differences, with varying population densities, unemployment rates, and purchasing power indices. The city consists of a dense core, inner and outer suburbs, and rural outskirts. The central areas combine high population density with economic and cultural functions, while suburbs range from affluent neighbourhoods in the southwest to socially disadvantaged areas in the northwest and east, characterised by higher unemployment and foreign resident shares (Diercke & Michael, 2015). Cologne's economy is diverse, with key industries including banking, automotive manufacturing, insurance, media, engineering, chemicals, and pharmaceuticals. The city also hosts major trade fairs, prominent economic organisations, and research institutes (Kohl & Stehkämper, 2024).

Cologne fulfils important economic and administrative function for the entire region, as well as being a popular destination for tourists. Because of its central functions and location on major routes, the city represents a transport hub which accommodates both urban and inter-urban traffic. Approximately 270,000 people commute into Cologne daily, while around 121,000 residents commute to surrounding cities (Schimohr & Scheiner, 2021). The most popular mode of transport is the car, also known as individual motorised transport (IMT). From 2010 to 2020 the number of privately registered vehicles saw an increase of 13.6 % to almost 487,000. Around 60 % of the local transport sectors CO^2 emissions come from IMT. As a result, it becomes difficult for individuals to adopt alternative modes of transportation, such as cycling and walking, while also hindering the efficient functioning of public transport systems (Stadt Köln et al., 2022)

The provision of basic utilities such as electricity, heat, natural gas, water, and other energy services in Cologne lies within the responsibility of RheinEnergie AG, which is the largest municipal utility in NRW. The municipal company is currently owned by two shareholders: 75.8 % of the shares are held by GEW Köln AG, a holding company that

is directly and indirectly 100 % owned by the City of Cologne. The remaining 24.2 % of the shares are owned by Westenergie AG (RheinEnergie AG, 2025). Next to being an energy producer and supplier, RheinEnergie also partakes in projects such as SmartCityCologne (SCC) which is a collaboration with the city of Cologne. This strategic partnership is an important component of the city's 'Integrated Climate Protection Concept' which is embedded across various municipal departments. The SCCs aim is to drive the energy transition and be a solution for the multifaceted issues and challenges Colognes urban development is facing due to climate change (Follmann et al., 2021).

4.2 Climate and Environment

According to a guide about de-paving and greening of private areas published by the city, the climate conditions in Cologne differ significantly from those in the surrounding areas. Building facades and streets absorb incoming solar radiation and store it as heat energy. Heating systems, vehicles, and industries release additional heat, further warming the city. Simultaneously, Cologne has fewer green spaces and bodies of water compared to its surroundings, which reduces cooling processes through evaporation. Additionally, the inflow of cooler air from the surrounding areas is often disrupted or limited to a few ventilation corridors, such as large streets. As a result, Cologne forms a heat island compared to its surrounding areas. On some days, the temperature difference between the city and the countryside exceeds 10° C. Within the city, this effect varies in intensity. Particularly overheated are densely built-up areas, where night-time cooling is significantly delayed due to heat storage in buildings and streets. In contrast, areas with green spaces experience less heat stress thanks to the vegetation. Furthermore, Cologne's average temperature has risen significantly in recent decades, a trend expected to continue due to climate change. By mid-century, summer days (over 30 °C) may increase by 30 to 70 %, and extremely hot days by 60 to 150 %. Frequent, prolonged heatwaves, like in 2018, will heighten heat stress, hinder night-time cooling, and pose health risks, especially for vulnerable groups, while also reducing residents' comfort and productivity (Stadt Köln & StEB Köln, 2018).

4.3 Administrative Structure

Cologne serves as the administrative centre of one of five primary administrative districts of NRW. The city is governed by elected council led by the chief mayor[3] (Kohl & Stehkämper, 2024). The foundation of all activities by the council and administration is municipal self-governance, which grants the city the right to independently manage local community matters in accordance with laws and regulations. It plays a crucial role in enabling city bodies and committees to develop citizen-friendly solutions (Stadt Köln, 2022).

The council is the central governing body of the city and is generally responsible for all municipal administration matters. On September 13, 2020, the Cologne City Council was elected for the next five years. It can delegate decisions to committees unless they involve significant matters, such as the election of department heads, changes to municipal boundaries, or the adoption of the municipal budget. The primary purpose of forming committees is to facilitate the council's work. Issues that the council must decide on itself are usually discussed in advance in the committees, enabling the council to make decisions more efficiently based on the committee's recommendations. Another responsibility of the council and the mayor is to collaboratively define the responsibilities and scope of the city departments (Stadt Köln, 2022).

Although many of the city's departments fulfil relevant roles regarding urban climate governance, one department, in particular, is a key actor in this aspect. The department for 'Climate, Environment, Green Spaces and Real Estate'[4] which includes the Environmental and Consumer Protection Office'[5] and the 'Climate Protection Coordination Office'[6]. The office for 'Environmental and Consumer Protection' is responsible for air pollution control, water and waste management, soil protection, nature conservation, food safety, animal protection, and veterinary supervision. It also focuses on biodiversity and environmental education. The 'Climate Protection

[3] Oberbürgermeisterin Henriette Reker

[4] Dezernat VIII – Klima, Umwelt, Grün und Liegenschaften

[5] Umwelt- und Verbraucherschutzamt

[6] Koordinationsstelle Klimaschutz

Coordination Office' is tasked with coordinating the strategic direction of the city's climate protection efforts. It acts as the central point of contact for the administration, politics, investors, and businesses in Cologne, initiating and overseeing projects while ensuring effective coordination among the involved stakeholders (Stadt Köln, 2024a).

4.4 Urban Climate Policy

The city of Cologne is aware of its role in the tension between local and global responsibility and has been actively engaged in climate protection for years. The city is a member of the EU Covenant of Mayors, committing to a 20 % reduction in CO2 emissions by 2020 (based on 1990 levels), supported by expanding renewable energy use and enhancing energy efficiency. Similarly, Cologne joined the Climate Alliance of European Cities, pledging to cut CO^2 emissions by 50 % by 2030 and further reduce them to 2.5 tons per capita (a 75 % reduction from 1990 levels). Internationally, the city is part of European and global city networks and on a local level supports educational climate protection initiatives[7] (Celsius, Smart Cities, 2024) and shareholder-driven climate action efforts such as the 'Climate Council Cologne'[8]. This council is an advisory expert body comprising representatives from academia, business, housing, civil society, and administration. It provides a platform for open and trusted exchange among its members on climate protection issues in Cologne. With the adoption of the report 'Cologne Climate Neutral 2035', the work of the Climate Council has transitioned from the strategy phase to the implementation phase (Stadt Köln, 2024b).

To reach climate neutrality by 2035 is the overarching goal of Cologne's climate change efforts. This was approved by the council in June 2021 (Stadt Köln et al., 2022). In order to achieve the 2035 target, the 'Climate Protection Coordination Office' worked with contractors for the preparation of the report on how to achieve climate neutrality. The contractors were a professional-scientific consortium consisting of an engineering company, an urban planning and engineering company, and two specialised research

[7] Klimaschutz-Bildungskonzept Köln

[8] Klimarat Köln

institutes as subcontractors[9] (Stadt Köln, 2023a). Cooperation with key partners and various stakeholders is viewed as the most important tool to drive key projects forward and ensure that the entire city community embarks on the journey to achieve the goal of climate neutrality together (Stadt Köln, 2023b). The strategy aims to achieve climate neutrality in five areas of action: i) buildings and neighbourhoods; ii) energy sector; iii) work and economy; iv) mobility and logistics; and finally, v) promotion of climate neutral lifestyle and education. The primary goal of the climate neutrality plan is clear: achieve greenhouse gas neutrality by 2035 with Cologne's entire urban area. GHG neutrality is achieved when the amount of GHGs emitted within the city is no greater than the amount that can be naturally or artificially absorbed – resulting in a net balance of zero GHG emissions. Moreover, the climate neutrality plan mentions co-benefits, albeit not literally (Stadt Köln et al., 2022). These two excerpts are taken directly from the document and are translated to English:

"Against the backdrop of the already evident conflicts of interest, such as balancing environmental protection, landscape conservation, climate protection, and the requirements of energy security, it will be crucial to clearly demonstrate the ***tangible benefits*** *that extend beyond the abstract value of greenhouse gas reduction. […] For instance, these can include the* ***following supplementary evaluation criteria****: impact on process and organizational quality in Cologne, including aspects of participation quality; effects on living standards, design and open space quality, mobility quality; impact on people and health; energy supply quality, with considerations of access and supply security, and risk minimization."* (Stadt Köln, 2022, p. 161).

"The detailed cost-benefit analysis, which compared CO^2 *abatement costs with avoided environmental costs and regional value-added effects (e.g., additional profits for businesses, increased municipal revenues, and higher net income), clearly demonstrated that investing in ambitious climate protection measures is economical across all fields of action, provided the* ***broader societal effects*** *are taken into account."* (Stadt Köln, 2022, p. 197).

[9] The contractors were: Gertec GmbH Ingenieurgesellschaft; Jung Stadtkonzepte Stadtplaner & Ingenieure Partnerschaftsgesellschaft; Wuppertal Institut für Klima, Umwelt, Energie gGmbH; ifeu - Institut für Energie- und Umweltforschung Heidelberg gGmbH

These two examples demonstrate that Cologne's administration should not only be aware of its responsibility to act against climate change by reducing GHG emissions, but also, of the additional positive effects of urban climate action. These *tangible benefits* improve the quality of life for Cologne's citizens and the *broader societal effects* provide justification for investing in climate mitigation and adaptation measures in all areas of action. However, while identifying co-benefits in official policy documents is one step, uncovering tangible real-world evidence is another. The expert interviews conducted aim to bridge this gap.

5. Results

This section presents the results from the conducted expert interviews and from the thematic analysis. The first sub-section provides an overview of the experts that were interviewed and other details of the qualitative process. The second sub-section explores the themes and sub-themes derived from coding the interview transcripts by defining them and showcasing supporting evidence through excerpts and quotes from the interview material. The main themes (MT) are: MT1 Advocacy Potential of Co-Benefits; MT2 Economic Considerations; MT3 Cooperation and Collaboration; MT4 Co-Benefit and Climate Action Barriers; MT5 Co-Benefit Opportunities; and MT6 Making Climate Action Tangible.

5.1 Expert Interviews Results

The selection process of searching and contacting experts as potential interview partners resulted in eleven interviews with participants representing a variety of the previously established stakeholder categories. More details about the selection process and stakeholder categories can be found in section 3.1, showcasing the research design.

A total of five interview participants are from category *1. Government and Public Sector Officials,* ranging from local government members to representatives of municipal administration offices that are relevant for the research topic at hand. However, one interview (participant ID: P3) was conducted simultaneously with two members of Cologne's Environmental and Consumer Protection Office but is counted as

one interview. Therefore, only four participant IDs fall into the first stakeholder category. Another interview was conducted with a member from the same office (P10), one with a member of the Climate Coordination Office (P2), and one with one of Cologne's mayors (P6). Regarding Mitchell's (1997) stakeholder typology, experts from the first category were defined as *Dominant Stakeholders,* due to having significant power and being recognised as legitimate authorities.

Four interviews were conducted with experts from category *4. Private Sector and Industry Representatives.* One participant is a local architect (P11), one a climate adaptation expert for a Cologne based urban planning office (P5), another a member of the industry association IHK Cologne (P9), and the last was the project lead of the engineering company Gertec (P1), which took a leading role in the devolvement of measures for Cologne's climate neutrality plan 2035. The participants of this category fall into the stakeholder types of *Dominant, Dominant or Definitive, and Dependent Stakeholders.* The sub-category *Construction and Urban Development Companies* is powerful in shaping urban planning and they are legitimate stakeholders in urban planning, making them *Dominant Stakeholders.* The urban planner and the project lead of Gertec fit into this description, yet the architect, while fitting into the same sub-category was classified as *Dependent Stakeholder* due to having urgent claims and legitimate views but relying on other stakeholders because of a lack of power. The architect working for a large architectural firm is not in a position of direct power. Arguably, the same classification could be made for the urban planner but since they actively work with the city of Cologne on creating a climate adaptation plan, they were classified as a *Dominant Stakeholder*. The industry association member can be classified as a *Dominant* or even *Definitive Stakeholder,* as they represent industry interests with significant power and legitimacy, and in some cases, also with urgency when policies affect their members.

Two interviews were held with experts from category *2. Academic and Research Institutions,* both of which falling in the sub-category *Climate Scientists and Environmental Researchers.* Both participants work at the Wuppertal Institute for Climate, Environment and Energy (P4; P8). They were also involved in the development of measures for Cologne's climate neutrality plan. Within Mitchell's stakeholder typology they are classified as *Discretionary or Dependent Stakeholders* since they have legitimacy due to their expertise but lack direct power. However, they

can potentially possess urgency as well if they address immediate policy challenges. With their work on the cities climate neutrality strategy, the Wuppertal Institute directly helped to address policy challenges. Hence, they are classified as *Dependent Stakeholders* for this analysis.

Lastly, one interview participant is from category *5. Community and Grassroots Organisations* and sub-category *Local Community Groups.* It was challenging to classify this respondent because of some unique characteristics granting them their expert role. Their main profession as a scientist working for the private sector is research focused, yet not in the climate and environmental nor in the social science or economic field. However, they have expertise in this area due to their role as a member of Cologne's climate council, being a co-founder of the international environmental initiative Scientists for Future (S4F), and their Cologne specific initiative 'Climate Declaration Cologne'[10]. As a climate council member, they have an advisory role on climate policy matters for the city (P5). According to the stakeholder typology experts from this sub-category are classified as *Dependent or Demanding Stakeholders,* as they have legitimacy as community representatives, with urgency if mobilised around a crisis. Since this participant is actively working to find solutions for climate change – which is a global crisis – they are classified as *Dependent Stakeholder,* possessing both legitimacy and urgency. An overview of all eleven participants is displayed in Table 6 below. The full version of this table with additional information about interview length, communication channel used, and date of the respective interview can be found in Appendix B.

[10] Klimaerklärung Köln

***Table 6**: Anonymised interview participant overview. Includes Participant IDs, their role, stakeholder category, stakeholder typology, and their expertise or area of focus. The degree of shading represents the stakeholders potential influence based on how many of the three key attributes they possess (darker = more influence, lighter = less influence).*

Participant ID	Role/Job	Stakeholder Category	Mitchell's Typology	Expertise / Area of focus
P1	Project lead Gertec	4. Private Sector & Industry Representatives: Construction & Urban Development Companies	Dominant Stakeholder	Urban & spatial planning, municipal climate protection, measure development for climate neutrality plan
P2	Member of Climate Protection Coordination Office	1. Government and Public Sector Officials: Local & municipals governments	Dominant Stakeholder	Monitoring & controlling, climate neutrality plan with impact measurements
P3	Two members of Environmental and Consumer Protection Office	1. Government and Public Sector Officials: Local & municipals governments	Dominant Stakeholder	Climate adaptation management, heat protection measures, air pollution control, noise reduction
P4	Researcher Wuppertal Institute	2. Academic and Research Institutions: Climate scientists & Environmental Researchers	Dependent Stakeholder	Research Unit Sustainable Mobility and Transport Policy, development of measures, implementation concepts, impact assessments (climate neutrality plan)
P5	Urban planner in Cologne	4. Private Sector & Industry Representatives: Construction & Urban Development Companies	Dominant Stakeholder	Spatial planner with focus on urban climate & air pollution control, creating climate adaptation concepts for municipalities
P6	Mayor city of Cologne, deputy chief mayor	1. Government and Public Sector Officials: Local & municipals governments	Dominant Stakeholder	Chairman of the Climate Alliance, council member responsible for climate protection (control function)

P7	Climate council member, scientist	5. Community & Grassroot Organizations: Local Community Groups	Dependent or Demanding Stakeholder	Co-founder Scientists4Future, Climate Council member, advising the city on climate policy, initiative Klimaerklärung Köln
P8	Project lead & researcher Wuppertal Institute	2. Academic and Research Institutions: Climate scientists & Environmental Researchers	Dependent Stakeholder	Head of Urban Change Research Unit, project manager climate neutrality plan, responsible for mobility and economy
P9	Member of IHK Köln	4. Private Sector & Industry Representatives: Industry Associations	Dominant or Definitive Stakeholder	Chamber of Industry and Commerce, exchange between companies & the city, mobility sector (Sustainable Urban Mobility Plan)
P10	Member of Environmental and Consumer Protection Office	1. Government and Public Sector Officials: Local & municipals governments	Dominant Stakeholder	Responsible for air quality planning, environmental protection, impact compensation planning & urban land-use planning
P11	Local architect	4. Private Sector & Industry Representatives: Construction & Urban Development Companies	Dependent Stakeholder	Architect in Cologne area, privately engaged in politics & environmental concerns

5.2 Thematic Analysis Results

The thematic analysis generated a total of six overarching themes, each having two to five sub-themes respectively. The following sub-section explores each main theme (MT), its sub-themes (ST) and compares how many experts provided statements on the specific theme or sub-theme. The percentages displayed in the following bar charts are not meant to suggest that sub-themes with higher percentages are inherently more

important than those with lower percentages. Instead, they provide an indication of relevancy and potential consensus among the experts. Furthermore, relevant quotes from the interviews are showcased and a brief section on additional insights that did not fit into any theme concludes the results section. A complete table with all main themes, sub-themes, and codes can be found in Appendix C.

Main Theme 1: Advocacy Potential of Co-Benefits

The first main theme (MT1) stems directly from responses to questions designed to answer the overarching research question of this thesis. Out of 271 codes applied to sections of the eleven interview transcripts, the theme 'Advocacy Potential of Co-Benefits' had the most sections coded with a total of 81 codes. This is unsurprising since the interview questions were specially intended to generate responses that address this topic. The theme highlights how co-benefits are utilised to promote climate action by bridging the gap between abstract goals and tangible impacts. It is made up of a total of five sub-themes which are:

- ST1.1: 'Co-Benefit used as Argument for Local Climate Action'
- ST1.2: 'Climate Policy or Climate Change Acceptance'
- ST1.3: 'Confirmation of Advocacy Potential'
- ST1.4: 'Importance of Co-Benefits'
- ST1.5: 'Acknowledgement of Co-Benefits in Cologne Policy'

All of these sub-themes represent statements where the experts spoke about how co-benefits enhanced the political feasibility and/or public acceptance of climate policies. The number and percentage of how present they are among the total number of interviews can be seen in Figure 4 below. An example for ST1.1 as well as ST1.3 is the following quote from participant 1 (P1): *"[…] It is incredibly important to highlight that these climate neutrality strategies are closely linked to sustainable urban development and the additional effects associated with it."*. For further emphasis, P4 said: *"[Co-benefits are] definitely a very effective tool for advancing climate policy."*. ST1.2 focuses specifically on whether the acceptance of co-benefits by the public or stakeholders represents a significant hurdle and includes instances where participants stated that co-benefits improve acceptance. 45.45 % of respondents stated that in general, acceptance of climate policy measures is not the issue, while 63.64 %

confirmed that co-benefits have a positive effect on general acceptance of climate policies. For instance, P8 argued: *"Focusing on co-benefits or synergies between climate protection, adaptation, social issues, and economic concerns makes a lot of sense because it quickly highlights measures that are well-received and eliminates the need for lengthy persuasion or debates about who will bear the costs."*.

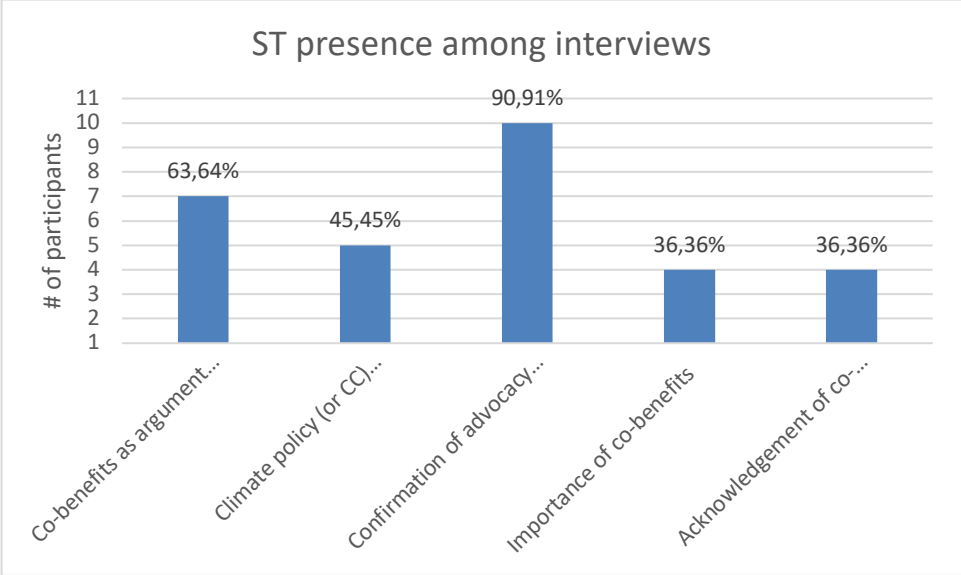

Figure 4: Sub-theme presence among interviews for main theme 1.

ST1.3 was found in almost every interview. Ten respondents, representing 90.91 %, confirmed the advocacy potential of co-benefits. For example, P4 stated: *"We also always try to increase the likelihood of implementation through these additional effects."* ST1.4 consists of statements that simply reflect the important role that co-benefits play, as they enhance urban climate and air quality (P10), address diverse needs of young and old citizens when it comes to heat reduction (P8), or that they can be leveraged for urban marketing by cities to advertise their high quality of life (P4). When asked if they think co-benefits are a good argument for mobilising support for climate policies, P7 argued that they are irreplaceable for effective climate action: *"I would go even further. It's simply not possible without them, because to be honest, CO^2 reduction doesn't have any immediate benefit."*. Lastly, ST1.5 reflects answers where respondents confirmed the acknowledgement of co-benefits in Cologne's administration or in official policy documents. During the development of Cologne's climate neutrality 2035 strategy, contractors responsible for measure development tried to qualitatively address these additional effects (co-benefits) in each measure's profile, wherever it made sense (P1). A member of the Environment and Consumer Protection Office explained that

during the process of drafting proposals for the city council, co-benefits are used as part of the argumentation (P10). As defined in the literature review's sub-section 2.2, the advocacy potential of co-benefits not only stems from their ability improve acceptance or to facilitate the adoption and implementation of climate policies, but also because by highlighting these immediate, localised, and tangible benefits, they can effectively mobilise support from various stakeholders, and overcome resistance. The following main themes address these aspects as well as other relevant factors.

Main Theme 2: Economic Considerations

The second main theme (MT2) includes all statements where the interview participants made remarks on economic aspects of co-benefits, such as their cost saving and value creation potential, presence or absence of financial hurdles, as well as cost-benefit distribution considerations, both on an economic and social level. Out of all 271 codes applied to the transcripts, 42 fell into MT2. This theme directly corresponds with the research design, since all interviews included a section of questions dedicated to economic aspects of co-benefits. It consists of three sub-themes which are:

- ST2.1: 'Economic Barriers for Co-Benefits'
- ST2.2: 'Economic Opportunities through Co-Benefits'
- ST2.3: 'Cost Distribution Aspects'

Figure 5 displays the presence of each MT2 sub-theme within the dataset. Eight participants, or 72.73 % spoke of barriers regarding co-benefit implementation. ST2.1 includes statements about experiences some experts made, when municipalities, companies, or citizens had the perception that implementing measures would entail high financial burdens for them (P5; P8; P10). Further, P11 noted that in the construction and building sector, environmentally friendly building techniques such as using mainly timber for constructing new buildings is too expensive for most projects. Consequently, the method is rarely employed for multi-apartment housing construction. A barrier mentioned by four experts can be summarized as the difficulty to convince true critics or opponents of the benefits of a particular measure (P2; P3; P6; P11). For example, when asked whether they thought co-benefits have the potential to convince critics, P2 answered: *"The critics who hold a fundamental conviction on the matter are unlikely to be swayed by this."*.

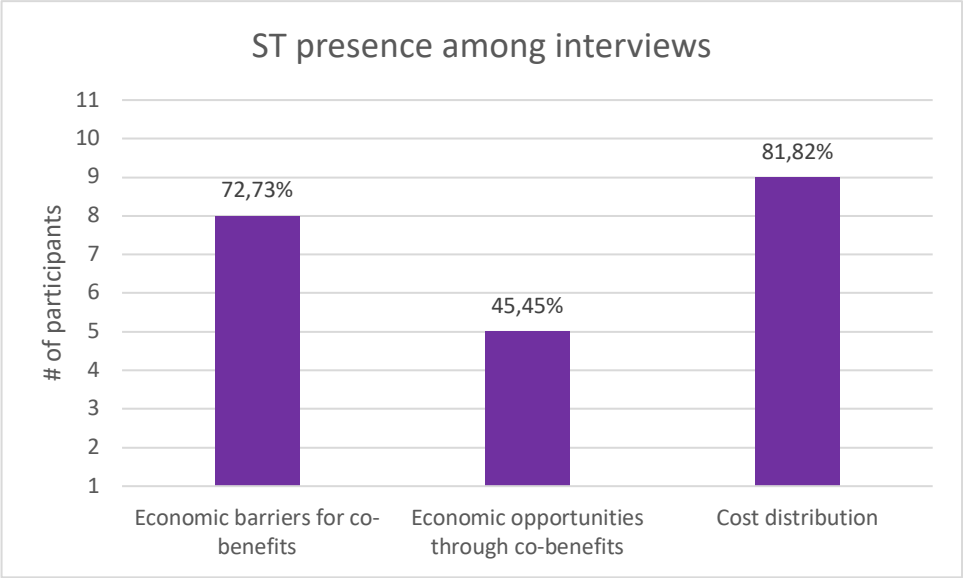

Figure 5: Sub-theme presence among interviews for main theme 2.

Even though ST2.2 was only talked about by five experts (45.45 %), they brought up many valid points, reenforcing the potential of co-benefits to deliver economic opportunities. In contrast to financial barriers from ST2.2, three experts explicitly stated that high costs are not a valid argument against climate action and therefore not a barrier. They refer to trillions of Euros in German savings accounts, sufficient budgets for municipal climate protection departments, and the allocation of large budgets to other infrastructure projects such as highway construction (P1; P6; P8). Another opportunity can be illustrated by the example of reducing internal combustion engine vehicle use with the main goal of reducing GHG emissions. One of the co-benefits of transitioning to other means of transportation such as walking, bicycles, and public transport is simultaneously an economic opportunity: the money a driver spends at a gas station leaves the region, which in turn weakens regional value creation. Local economic retention would be enhanced by reduced car dependency since that money previously spent on imported fuel can now be spend on the local economy (P4). P1 raised a similar point, talking about using imported natural gas vs. an air heat pump for heating: *"I see this as a huge opportunity to argue on a local level. These co-benefits are really great for that. That's one example — the reversal of value creation."*.

The third and final sub-theme of MT2 was mentioned by 81.82 % of experts, partly due to the questions directed towards this topic, and partly due to the important role the distribution of costs plays in political decision-making processes. Five respondents highlighted that especially vulnerable groups would benefit from co-benefit

implementation (P1; P2; P3; P6; P8). For instance, four experts mentioned lower income groups living next to high traffic roads, unable to afford rent in other parts of the city, benefiting from improved air quality and noise reduction (P1; P2; P6; P8). Another key aspect of ST2.3 was the challenge of achieving equitable cost-benefit distribution in practical contexts, highlighting the complexities and misalignments that often arise between theoretical frameworks and real-world implementation. For example, in the context of solar panel implementation in rental housing, P7 noted that when landlords are required to invest in energy-efficient upgrades, the associated costs are often passed on to tenants. Tenants, however, may not see immediate or tangible benefits, as they continue to pay for electricity without directly experiencing cost savings. This creates a misalignment of incentives, requiring idealism or a system where cost advantages are realized immediately. Two experts brought up the issue of costs and benefits being misaligned when trees are planted to mitigate heat-related deaths or health issues. This benefits the health sector but doesn't positively impact the budget of the parks department, which only has the costs of planting trees. This disconnect makes it challenging to fully capture the broader societal value of such measures, even though they provide significant benefits for both the healthcare system and individuals (P5; P8). Lastly, three respondents addressed the distribution of costs for co-benefits between the city and companies or citizens in a broader sense. All three, stated that there are both costs for city administration and private entities, the magnitude of which, is however highly case dependent (P2; P8; P10).

Main Theme 3: Cooperation and Collaboration

The third main theme (MT3) represents expert insights that either reveal information on how co-benefits improve cooperation among different actors or remarks on common barriers regarding stakeholder collaboration. In addition, it includes responses where participants highlighted the significance of cooperation. Just like the second main theme, MT3 is made up of 42 coded sections. Despite this being a coincidence, it conveniently reflects the research design of having three sets of main questions: advocacy potential, economic aspects, and cooperative and collaborative aspects. The theme includes three sub-themes, which are the following:

- ST3.1: ‘Barriers for Cooperation and Collaboration’
- ST3.2: ‘Co-Benefits improve Cooperation’

- ST3.3: ‘Importance of Cooperation’

Figure 6 showcases the presence of each MT3 sub-theme among interview transcripts. ST3.1 and ST3.2 were addressed equally by the experts, as both were brought up by 9 participants, or 81.82 %. The first MT3 sub-theme encapsulates all instances when experts mentioned any particular challenge or barrier that can arise when cooperation with multiple actors is required. The most frequently mentioned barrier can be summarised as the challenge that complexity of many different actors brings. Four experts talked up this barrier, three internal experts working for one of Cologne’s administrative departments (P2; P3; P10) and one external expert (P8), who collaborated with the city when developing their climate neutrality 2035 strategy, said: *“The topics of climate protection, adaptation, and health are still far from being considered together on the scale I envision, both at the scientific and political levels. In my mind, they fit together perfectly. However, I often notice that in political settings, city administrations, or initiatives, not everyone is fully aware of one another.”*. Similarly, the same three internal experts spoke about situation where subpar cooperation between departments lead to problems (P2; P3; P10). A respondent from the private sector mentioned bureaucratic hurdles by the city administration as a barrier during construction projects (P11). Other barriers include the reluctance of key actors to engage in urban planning projects, in turn slowing them down (P5), or the conflict of political opposition, where some policy decisions are simply not made because opposing parties cannot support it publicly due to political reasons, even though they may privately endorse the idea (P4). Additional challenging factors mentioned are conflicting agendas and lack of compromise (P8), a collaboration barrier stemming from networking events being less common in climate communities compared to e.g. tech circles (P7), and the general issue of directly telling someone to stop certain behaviours, like flying, often leads to resistance and is counterproductive, as people generally dislike being told what to do (P1).

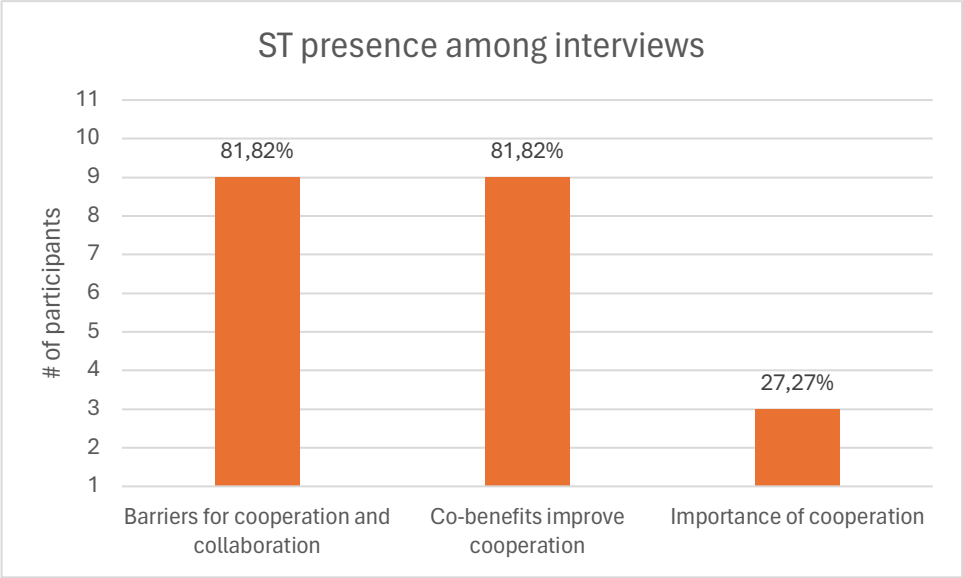

Figure 6: Sub-theme presence among interviews for main theme 3.

In contrast to ST3.1 the second MT3 sub-theme describes ways in which co-benefits have positive impacts on stakeholder cooperation. Despite the criticism from some member of Cologne's administration mentioned above, five experts conveyed the impression that overall, cooperation among stakeholders goes well in Cologne. Two directly working for the city as Environment and Consumer Protection office member and mayor, respectively (P3; P6), and the others being personally involved in city matters, either as collaborators in Cologne projects (P8; P9), or as advisor for the climate council (P7). Some examples of how co-benefits improve cooperation are their ability to offer an easier entry point for productive dialogue (P1), their potential to aid alignment of already existing projects with climate goals (P1), as well as their role in successfully aligning interest groups (P6). Additionally, co-benefits can lead to mutual support through interconnected goals (P1; P5). For instance, P5 stated: *"I believe [co-benefits] can be beneficial, […], when citizen initiatives form that share the same goal, but each have a different reason for pursuing it. In the area of climate adaptation, one person might support planting trees because it makes the street more attractive, another because it provides habitat for animals, and a third because it improves air quality. Yet, it is all achieved through the same measure."*. When asked whether they believe that co-benefits can promote collaboration between different interest groups, three experts simply confirmed this notion (P3; P4; P10).

The last MT3 sub-theme, albeit small – with only three interview participants (27.27 %) mentioning the subject – carries merit nonetheless. P8 and P11 emphasized that early

and continued communication is essential for successful cooperation. P10 described the need for the commissioners for environment and properties, for urban planning and for mobility to cooperate effectively, and added: *"[…] when they work together, co-benefits can succeed."*.

Main Theme 4: Co-Benefit and Climate Action Barriers

The fourth main theme (MT4) addresses any barriers to co-benefits or climate action mentioned by participants that are not directly related to cooperative or economic matters but may still influence these alongside other aspects. Unlike the previous three main themes, MT4 is made up of fewer coded sections, with 22 out of 271. This is also coherent with the research design as aspects that fall under this theme are results from questions aimed at the three previous main themes. MT4 has only two sub-themes, labelled:

- ST4.1: 'Barriers for Co-Benefits'
- ST4.2: 'Barriers for Climate Action'

Figure 7 displays the presence of both MT4 sub-themes within the dataset. The first sub-theme of MT4 captures additional challenges for co-benefit integration not addressed in MT2 or MT3 and was mentioned by seven respondents (63.64 %) in total. The most commonly pointed out barrier is the need for appropriate monitoring of co-benefits in order to quantify them, which was mentioned by four experts (P3; P4; P9; P10). Industry associate P9 stated: *"We really need to clearly identify these co-benefits once again."*, and shortly after reinforced: *"Co-benefits are not quantified. Co-benefits are not articulated, nor are they formulated as objectives where we could also provide support in achieving them."*. Working for the city of Cologne, P10 remarked that co-benefits are recognised as an argument, but the lack of data and manpower to calculate and track them limits their potential. Another city official points out that the added value of co-benefits is unclear, and there's uncertainty about supporting an initiative due to the extra work required to analyse and calculate potential impacts and savings on a per measure basis (P2). The local urban planner explained the issue of two sustainability goals blocking each other. For instance, more trees in a street can have the co-benefits of improved cooling on hot days while at the same time reducing air flow, which in turn leads to a higher air pollution concentration in that area. They also highlight the common not-in-my-backyard problem, with the example of experiencing strong

resistance when parking spaces are removed, regardless of rational arguments or benefits, such as flood prevention. People remain fixed in their opposition, and additional positive side effects rarely change their stance (P5).

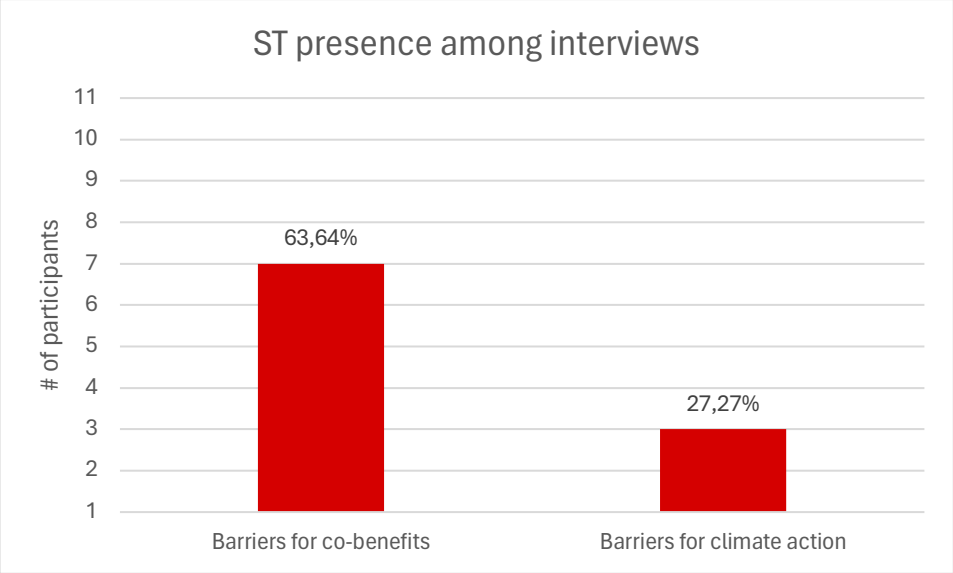

Figure 7: Sub-theme presence among interviews for main theme 4.

ST4.2 includes statements from respondents about barriers that hinder urban climate action in general. This sub-theme was only addressed by three experts, yet the points raised are still noteworthy. In years of experience working with municipalities, P8 observed barriers for climate measure within the complex and fragmented process of urban planning, where plans are reviewed by numerous city departments. They underline this point by reporting a general process inefficiency problem (P8). Member of Cologne's Climate Protection Coordination Office P2 remarks that a city's area of influence is limited. For instance, a city can substitute photovoltaic panels for citizens but only has direct influence on implementing such measures on municipal buildings. P1 share their impression of a misaligned economic development in the German energy sector, as within the last decades there was too much emphasis on importing energy sources rather than ensuring regional production. Further, they point out competing financial priorities for many municipalities, as climate neutrality measures may be a beneficial economic investment in theory, the immediate concern on the local level is the lack of funding, as high investments are also needed for projects such as school renovations.

Main Theme 5: Co-Benefit Opportunities

In contrast to MT4, the fifth main theme (MT5) focuses on expert statements regarding the potential opportunities inherent in co-benefits, which in some cases still need to be fully realised. Similar to the previous main theme, MT5 consists of 24 coded sections, which as mentioned before, aligns well with the research design. The theme has three sub-themes which are listed below:

- ST5.1: 'Unrealised Co-Benefit Potential'
- ST5.2: 'Enhancing Co-Benefit Effectiveness'
- ST5.3: 'Co-Benefits Importance on Local Level'

The presence of each MT5 sub-theme among all interview transcripts is displayed in Figure 8 below. ST5.1 includes only two statements by two experts (18.18 %) who both worked on climate action projects with the city of Cologne. Both think there is unrealised potential in the co-benefits approach. P8 emphasizes the importance of not only incorporating climate protection but also various aspects, such as adaptation, and social considerations, into urban development projects. They advocate for a comprehensive approach to sustainability by considering these dimensions early in the planning process, regardless of the type of project. P9 answered a question about the potential of co-benefits to enhance cooperation among different stakeholders by emphasising the urgent need to make co-benefits more visible and explicitly defined for Cologne.

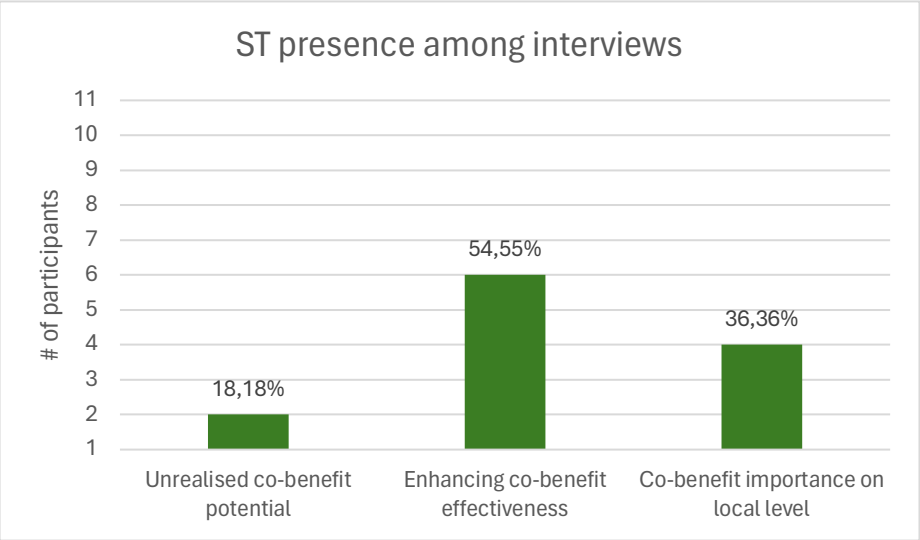

Figure 8: Sub-theme presence among interviews for main theme 5.

The second MT5 sub-theme is somewhat similar to ST5.1 which focused on opportunities that have not yet been fully implemented in Cologne climate policy, while ST5.2 emphasises optimising existing co-benefits to make them more impactful and includes examples of solutions brought up by respondents. For instance, two experts advocate for simplified and localised assessment methods (P1; P9) and the need for clear metrics for visual presentation for the co-benefit approach (P1). Internal expert P2 explained that they are working on the implementation of a climate neutrality monitoring platform for Cologne, that in the future will also include co-benefits of certain measures. P7 observed the effectiveness of employer-financed e-bikes changing the commuting behaviour of many people, which has positive impacts for health and environment. P8 indicated that improving co-benefit recognition and employing outcome-oriented municipal budgeting would enhance co-benefits effectiveness. Another opportunity are participation events that involve citizens. These are informative events where stakeholders and citizens can exchange information and express ideas and needs (P4).

ST5.3 consists of statements from participants that emphasised the significance co-benefits have in a local climate politics context, which was mentioned by four experts (P1; P3; P4; P7). For example, P7 noted: *"And that's why it's so important, in this social climate, to manage creating policies that primarily address short-term aspects but are designed in a way that also protects the climate."*. In addition, P4 described how important factors such as job opportunities, strong companies, clean air, and safe, convenient, and healthy mobility are crucial arguments, particularly at the local and regional levels. When asked whether they see co-benefits as an argument to mobilise support for climate policy measures, P1 answered: *"[...] At the municipal level, it is certainly wiser to emphasise all these positive side effects, because the goal of climate neutrality is too abstract and too distant for many decision-makers."*. The last part of that statement is a convenient segue to the last main theme.

Main Theme 6: Making Climate Action Tangible

The sixth and final main theme (MT6) includes statements where respondents provide arguments about co-benefits potential to promote climate action by bridging the gap between abstract goals of climate neutrality and tangible impacts, such as improved air quality, heat reduction, or cost savings. Like the two previous themes, MT6 consists of

fewer coded sections (23) than the first three main themes. This can be linked to a lack of questions directly addressing the sub-themes with this main theme. The sub-themes are:

- ST6.1: 'Abstractness of CO^2 Reduction and GHG Neutrality'
- ST6.2: 'Temporal and Spatial Argument'
- ST6.3: 'Co-Benefits are Tangible for Quality of Life'
- ST6.4: 'Reconceptualising CO^2 Reduction as the Co-Benefit'
- ST6.5: 'Co-Benefits of Climate Mitigation vs Adaptation'

Figure 9 displays the presence of each MT6 sub-theme among the dataset. ST6.1 includes – as its title suggests – instances when participants argued that the goal of reducing GHG emissions and reaching climate neutrality is abstract and difficult to promote in the current political climate. Three external experts (P1; P4; P8) highlighted this issue as well as one internal expert (P6). To illustrate, Cologne's mayor said: *"I actually believe that you can reach people better with co-benefits than with CO^2 kilogram figures."*. In relation to this issue, one expert mentioned the temporal and spatial argument (see section 2.2.6) explaining there is no direct link between an individual reducing CO^2 and any immediate benefit, making it a detached process. It can only work if co-benefits are created alongside the reduction efforts (P7).

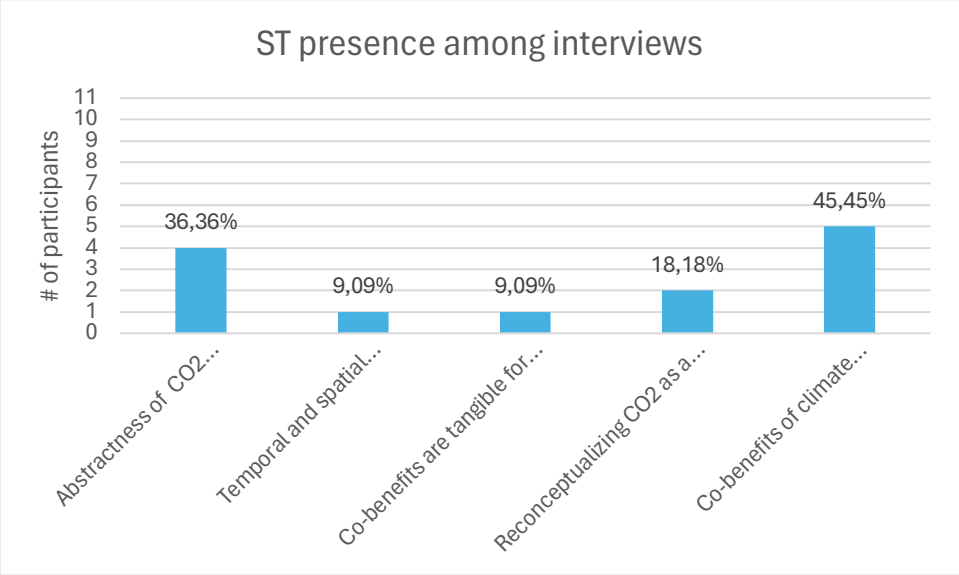

Figure 9: Sub-theme presence among interviews for main theme 6.

On the contrary to ST6.1, one expert (9.09 %) argued that co-benefits are tangible for the perceived quality of life by citizens (P4). ST6.4 is connected to this, as two other experts, or 18.18 % of respondents brought up the idea to reconceptualise CO^2 reduction as the co-benefit of other climate action measure (P1; P7). Participant 7 suggested: *"[...] there is no immediate incentive to reduce CO^2. This means it can only work if you manage to turn the concept around. So, you must [...] make CO^2 reduction the co-benefit. The actual benefits have to be something else, otherwise nothing will happen."*.

Finally, ST6.5 highlights statements where experts spoke about climate mitigation or adaptation measures that lead to co-benefits respectively. On the climate mitigation side, P6 mentioned when Cologne introduced electric buses with emission reduction as the main goal, it also made transportation quieter and more pleasant for passengers, leading to complaints when older diesel buses had to be used temporarily. On the climate adaptation side, P3 and P5 spoke about urban greening measures with the primary goals of water retention and heat reduction, but with the co-benefit of improved air quality. One respondent suggested that the concept of co-benefits is more applicable to climate adaptation measures because they have a more tangible character, making it easier to immediately consider how these measures directly impact people's lives (P7).

Additional Insights

This final part of the results section highlights two additional insights that, while important, did not align with any existing theme or justify their own main theme. A few interview questions were specifically about the most researched co-benefit of climate action – air quality improvements. As explained in the introduction, during the research process, there was a focal shift away from air quality improvements to a more general look on all co-benefits of Cologne's climate efforts. The interviewed experts made several remarks on air quality improvements, which can be attributed to the question design. For instance, an external expert reported that during the development of measures for climate neutral buildings for Cologne, each measure included a section on 'additional effects', addressing impacts such as economic benefits, social benefits, and ecological advantages like reducing air pollutants (P1). P4 made a similar statement, explaining co-benefits like air quality improvements are being considered during the conceptualisation of measures. Cologne's mayor mentioned that during the phaseout of coal plants, improved air quality was a welcome side effect (P6). For two experts from

the city's Environmental and Consumer Protection Office, air pollution control is or used to be main a responsibility of their work, however in their case, air quality improvements were the main goal, not a co-benefit (P3; P10). External expert P5 and internal expert P10 recognised air quality improvements as a co-benefit during urban greening projects yet made clear that it played a minor role.

Lastly, five interview participants described co-benefits using different terminology (P1; P4; P5; P7; P8). These are the original German terms used by the experts, with English translation in parentheses: *"Weitere Wirkungen"* (further impacts); *"zusätzliche Effekte"* (additional effects); *"Synergieeffekte"* (synergy effects); *"Positive Zusatzeffekte"* (positive additional effects); and *"Positive Nebeneffekte"* (positive side effects). This observation as well as the other results of the analysis are interpreted and put into context with literature in the following section 6.

6. Discussion

The overarching aim of this thesis was to explore the topic co-benefits of urban climate politics by analysing expert perspectives on their advocacy potential. This involved identifying existing barrier and opportunities to achieve an integrated approach. First, this section summarises the findings, which are put in relation to each other, and the current research presented in the literature review. Subsequently, the established hypotheses are tested, and the research questions are answered. Next is a sub-section about implications for future research and for policymakers, and finally, limitations that might influence the validity and reliability of the results are addressed.

6.1 Summary of the Findings

In total, eleven interviews were conducted to collect the data for analysis. The inductive thematic analysis generated six overarching main themes, that each have two to five sub-themes. The six main themes are:

- MT1: Advocacy Potential of Co-Benefits
- MT2: Economic Considerations

- MT3: Cooperation and Collaboration
- MT4: Co-Benefit and Climate Action Barriers
- MT5: Co-Benefit Opportunities
- MT6: Making Climate Action Tangible

The first main theme (MT1) highlights how co-benefits are utilised to promote climate action in Cologne by making abstract goals such as GHG neutrality more tangible. It also represents statements from experts that describe how co-benefits improve political feasibility and public acceptance of the city's climate policies. As this main theme directly links to the overarching research question of this thesis 'How do key stakeholders in Cologne perceive and utilise the advocacy potential of co-benefits in driving climate action?', it already provides insights that answer that question. Despite that, a comprehensive answer to the research questions and hypotheses can be found towards the end of this sub-chapter. Overall, the expert statements included in MT1 showcase consensus among the study participants, that co-benefits definitely have advocacy potential to strengthen climate efforts in Cologne. 90.91 % of respondents made statements that confirmed co-benefit advocacy potential. Many experts spoke about instances where co-benefits were used as arguments for climate action (63.64 %) and five experts confirmed that they believe co-benefits improve acceptance of climate measures among the public and stakeholders (45.45 %). This indicates that the commonly named barrier to the co-benefit approach – a lack of awareness amongst policymakers at the local level – is apparently not present in Cologne. A member of the Environment and Consumer Protection Office (participant ID: P10) explained that during the process of drafting proposals for the city council, co-benefits are used as part of the argumentation, which aligns with Roggero et al. (2023a) stating co-benefits advocacy potential is linked to them offering a strong rationale for climate action due to providing a captivating argument for local governments to enhance the acceptance of climate initiatives among local constituencies. One respondent even argued that co-benefits are irreplaceable for effective climate action: *"I would go even further. It's simply not possible without them, because to be honest, CO^2 reduction doesn't have any immediate benefit."* (P7). The second part of their statement is an essential component of main theme 6, which will be addressed later in in this sub-section.

The advocacy potential of co-benefits can be further broken down into arguments how they offer incentive to cooperate and economic advantages. The second main theme (MT2) consists of statements where experts made remarks on economic aspects of co-benefits, such as their cost saving and value creation potential, presence or absence of financial barriers, as well as cost-benefit distribution considerations on an economic and social level. A majority of experts (72.73 %) brought up economic barriers for co-benefits. For example, three respondents shared experiences about situations when municipalities, companies, or citizens had the perception that implementing measures would entail high financial burdens for them (P5; P8; P10), which can be linked with issue of the climate policy discourse remaining to be framed around cost minimisation (Nemet et al., 2010).

On the contrary, some experts made clear that they believe that high costs are not a valid argument against climate action and therefore not a barrier, because of the availability of large budgets in both private and public sector (P1; P6; P8). Experts also mentioned economic opportunities that co-benefits can offer, such as the reversal of value creation in the context of switching to air heat pumps from imported natural gas, which creates value in the local economy instead of profiting foreign gas corporations (P1; P4). Lastly, 81.82 % of respondents provided their insight on cost distribution of co-benefits. For instance, five experts emphasised that vulnerable groups can benefits greatly from co-benefit integration (P1; P2; P3; P6; P8), which is in line with a study that found that climate mitigation co-benefits could result in savings of around 2.8 trillion USD in the value of statistical life in Asia (Xie et al., 2018). These savings refer to reduced mortality in policy areas like air quality, traffic safety, and health (OECD, 2024), which areas that affect the life of vulnerable groups in particular.

In addition, some interview participants voiced concerns about achieving equitable cost-benefit distribution in practical contexts, highlighting the complexities and misalignments that often arise between theoretical frameworks and real-world implementation. To illustrate, when landlords are required to invest in energy-efficient upgrades, the associated costs are often passed on to tenants. However, tenants may not see immediate or tangible benefits, as they continue to pay for electricity without directly experiencing cost savings, creating a misalignment of incentives (P7). These findings show, that while experts recognise the financial value of co-benefits, they also

underline that there are significant challenges to overcome, to fully realise their economic potential.

The next main theme (MT3) directly reflects the claim found within literature that co-benefits can positively influence the formation of coalitions and foster cooperation among stakeholders. MT3 includes expert insights that either reveal information on how co-benefits improve cooperation among different actors, remarks on common barriers regarding stakeholder collaboration, and responses that highlight the importance of cooperation. The results from the analysis reveal that overall, experts believe that co-benefits enhance cooperation, albeit being aware that there are hurdles that hinder optimal stakeholder cooperation that need to be addressed. Both of these sub-themes were mentioned by 81.82 % of participants. The most frequently highlighted barriers are the challenge of managing the complexity of many different actors and subpar cooperation between city departments resulting in issues that slow down or hinder policy implementation (P2; P3; P8; P10). These barriers correspond with findings from the literature, such as limited coordination and collaboration among government bodies and divisions, hindering the development and implementation of integrated co-benefit policies (Jiang et al., 2013). However, the results also indicate that the Cologne case is example for successful cooperation, both regarding cross-departmental and intersectoral collaboration. Five respondents, including internal and external experts, stated that generally, cooperation among relevant stakeholders goes well in the city (P3; P6; P8; P7; P9). This confirms the existence of one key requirement for effective policy implementation that can realise co-benefits potential, which is shared problem solving and intersectoral collaboration (Stead & Meijers, 2009).

The fourth main theme (MT4) is about any barriers to co-benefits or climate action mentioned by participants that are not directly linked to cooperative or economic matters. However, these barriers may still indirectly affect them. The most mentioned barrier is the need for appropriate monitoring of co-benefits to quantify them properly (P3; P4; P9; P10). An internal expert drew attention to the lack of data and manpower to calculate and track co-benefits, which limits their potential (P1). These insights can be aligned with findings from literature as insufficient data and capacity to measure and analyse co-benefits and therefore a lack of understanding of their potential, and the absence of robust methodologies and standardised tools for assessing co-benefits, leads to undervaluation (Floater et al., 2016; Ürge-Vorsatz et al., 2014). Another barrier for

co-benefits can be conflicts between two sustainability goals, such as trees providing cooling but reducing airflow, in turn increasing pollution. The not-in-my-backyard problem with the example of resistance to changes like removing parking spaces, with people often rejecting such measures despite rational arguments and multiple benefits like flood prevention, was also a mentioned hurdle (P5). Barriers that hinder urban climate action in general include a process inefficiency problem in municipal departments, and that direct influence of city is limited in regard to implementing measures themselves (P2; P8). Further, a concern about a misaligned economic development in the German energy sector, due to too much emphasis on importing energy sources rather than ensuring regional production within the last decades, was reported (P1). These results offer a valuable indication what challenges to be aware of when trying to take advantage of co-benefits integration.

Opposed to the previous theme, main theme five (MT5) focuses on expert statements regarding the potential opportunities inherent in co-benefits, which may still need to be fully realised in some instances. Here, results indicate that there is unrealised potential in the co-benefits approach, as it is important to not only incorporate climate protection but also various aspects, such as adaptation, and social considerations, into urban development projects (P8). These findings match the indication found in literature that an integrated, multidisciplinary approach is necessary to successfully incorporate co-benefits into decision-making processes (Jiang et al., 2013; Mendez, 2015; Zusman et al., 2013). Additionally, making co-benefits more visible and explicitly defined for Cologne (P9), could further enhance their potential, as backed by other research findings, that call for standardised terms and methodologies to enhance policymaking (Bisello et al. 2016; Finn & Brockway, 2023). In line with this, two interview participants also advocate for simplified and localised assessment methods (P1; P9) and the need for clear metrics for visual presentation for the co-benefit approach (P1). The city is currently implementing a climate neutrality monitoring platform, that could serve as a potential solution for these issues (P2). Another expert indicated that improving co-benefit recognition and employing outcome-oriented municipal budgeting would enhance co-benefits effectiveness (P8). Results further point toward the significance of co-benefits for local climate politics. One statement especially highlights this school of thought in regard to current political climate: *"And that's why it's so important, in this social climate, to manage to create policies that primarily address short-term aspects but are designed in a way that also protects the climate."* (P7). In summary, the

interviewed experts see great opportunities for the co-benefit approach, in particular on the local level.

Finally, the sixth main theme (MT6) consists of statements where respondents provide arguments about co-benefits potential to promote climate action by bridging the gap between abstract goals of climate neutrality and tangible impacts, such as improved air quality, heat reduction, or cost savings. The findings here reinforce the abstractness of reducing GHG emissions and reaching climate neutrality, as highlighted by 36.36 % of respondents. This notion is inherently routed in the temporal and spatial argument, which in literature, is often described as a 'wicked' problem, characterised by delayed benefits that are difficult to directly link to policies and frequently manifest in different regions, while the costs are immediate, substantial, and concentrated (Jenkins, 2014; Mayrhofer & Gupta, 2016). Two respondents offered an interesting solution to this problem (P1; P7). They suggested to reconceptualise CO^2 reductions as the co-benefit of other climate action measure, or in other words to bring tangible, local benefits to the forefront of climate policy and have GHG reduction as positive side effect, rather than the prominent 'advertised' goal. Lastly, MT6 includes statements where experts spoke about climate mitigation or adaptation measures that lead to co-benefits respectively. When applying Locatelli et al.'s (2015) conceptualisation of the relationships between adaptation and mitigation to Cologne's case, 'unintended side effects', or measures meant to either achieve adaptation or mitigation objectives, yet they deliver outcomes for the other objectives as well, were most common. For instance, when Cologne introduced electric buses with emission reduction as the main goal, it also made transportation quieter and more pleasant for passengers, leading to complaints when older diesel buses had to be used temporarily. According to one respondent, the concept of co-benefits is more applicable to climate adaptation measures because they have a more tangible character, making it easier to immediately consider how these measures directly impact people's lives (P7).

6.2 Hypothesis Testing and Answer to the Research Questions

Returning to the overarching research question of this thesis 'How do key stakeholders in Cologne perceive and utilise the advocacy potential of co-benefits in driving climate action?', the results from the thematic analysis suggest the following. Co-benefits are

generally recognised by all interview participants as important, and for some even essential drivers of regional climate action. The experts credit co-benefits to have advocacy potential, which is closely tied to how tangible climate goals are made through localised impacts. However, there is also consensus that acceptance of climate policies or specific measures is seldom the issue. At least in the case of Cologne, the support for climate action is generally there. Nonetheless, many respondents confirmed that co-benefits are frequently utilised as arguments for projects, both by internal and external experts. Furthermore, the results include evidence that confirms awareness among some experts of co-benefits ability to bridge the temporal and spatial gap that is associated with GHG reduction efforts. As the benefits of climate neutrality are abstract in nature and lie in the future, co-benefits are tangible since they are localised and immediate. According to the interview partners, this makes that highly valuable, and some suggest switching the concept of co-benefits of climate mitigation around and reconceptualise CO^2 as the co-benefit.

To address the hypothesis 1 (*H1: Economic potential is not being realised in Cologne due to a lack of standardised terms and evaluation methods*.) and hypothesis 2 (*H2: There are barriers such lacking intersectoral collaboration hinder cooperation among stakeholders in Cologne.*), the first sub-research question should be answered beforehand.

1) *Are there significant barriers that hinder the advocacy potential of co-benefits for successful climate policy integration in Cologne?*

    - *If yes, what are those barriers?*

The barrier of a lack of awareness among decision-makers could not be confirmed for the Cologne case, at least not within the dataset of this study. High costs were partly mentioned by respondents, but also dismissed as valid barriers for the approach. Another barrier found within the dataset is the difficulty to convince true critics or opponents of the benefits of a particular measure. This, however, is a problem that politics face in general, is not unique to urban climate action. The most frequently mentioned barrier for the co-benefits approach was the need for proper, localised quantification and monitoring methods. This aligns with barriers found in literature, as discussed in the sub-section above. While not mentioned specifically as barrier, the lack of standardised terms can also be partly confirmed by this study. As listed as an additional insight in the results section, expert used a total five different terms for co-

benefits. Whether this is actually a serious barrier for the approach, or merely a minor factor for unclarity is debatable. Nevertheless, the findings suggest that the economic potential of co-benefits is not being fully realised in Cologne due to a lack of standardised terms and evaluation methods (H1).

Other barriers found, are cooperation barriers such as the challenge that complexity of many different actors brings as wells as subpar cooperation between departments leading to problems. However, despite having room for improvement, the findings suggest that interdepartmental and intersectoral cooperation is generally perceived well in Cologne. Participants further reported many cases of collaboration between internal and external actors. Thus, the second hypothesis cannot be confirmed by the findings, as a significant lack of intersectoral collaboration or similar barriers do not hinder overall cooperation among stakeholders in Cologne (H2).

To address the third hypothesis (*H3: Recognition of co-benefits ability to make climate action more tangible needs to be increased in Cologne.*), it is best to answer the second sub-research question first:

2) *Can co-benefits provide opportunities to advance climate action in Cologne?*
    - *If yes, what are those opportunities?*

Among all the previously discussed opportunities mentioned by experts, a few key chances stand out. One opportunity relates to the common barrier of lacking quantification and monitoring methods to generate data that can be used as supporting evidence. Experts recommend the use of simplified and localised assessment methods and the need for clear metrics for visual presentation for the co-benefit approach. The city's own climate neutrality monitoring platform that is currently developed could serve that function. Secondly, participants also highlighted the significance of co-benefits for climate politics on a local level. Here they see the greatest chance for the approach to have an impact. This relates to hypothesis 3 because in regional setting, co-benefits have their strength of making climate action more tangible. Judging the level of recognition of co-benefits ability to make climate action more tangible, is not a simple endeavour. In spite of that, the fact that only one to four experts addressed the sub-themes found within main theme 6, give reason to believe that level recognition of said ability needs to be increased indeed.

6.3 Implications for Research and Policy

According to the results of this study, a few recommendations can be made for both further research and for policymakers and stakeholders alike. Regarding the research field of urban climate governance, the findings confirm the advocacy potential of co-benefits for local climate action. They also imply that there is an urgent need to develop standardised monitoring and assessment methods to quantify co-benefits more reliably. Study participants made it clear that the cost saving projections found in literature are good to know but only become truly valuable if calculated for the specific area of interest – in this case – Cologne. This would further assist in overcoming the challenge of effectively communicating their value to stakeholders. Here there are opportunities to advance research by developing better methods as well as applying existing methods to case studies such as the one presented here. Furthermore, it would be of value to investigate the proposition to reconceptualise CO^2 reduction as the co-benefit of other measure that have an immediate and tangible local impact.

This also provides a chance for municipal governments to frame climate mitigation in different way, that might receive better reception in the current political climate. The abstractness of GHG neutrality can be evaded, without sacrificing the significance of advancing measures that reduce emissions, which remains as critical as ever. More generally, policymakers need to be aware of the upsides of co-benefits integration, as they are compelling argument for climate action, that can also foster collaboration among all the different key actors of urban climate policy. The case study here revealed that stakeholder collaboration is already on the right path in Cologne, yet research findings show that there is always room for improvement. Shared problem solving and intersectoral cooperation are essential for effectively utilising the advantages of co-benefit integration in urban climate policy.

6.4 Limitations

Although the results of this study provide valuable new insights to the co-benefit approach in urban climate politics, there are a few research limitations that are noteworthy. The sample size of interviewed experts is relatively small with eleven study participants. The inclusion of a few more different stakeholders with relevant

backgrounds could have offered an even wider perspective on the subject. However, the time and effort required to interview more participants and later analyse the results would have exceeded the scope of this study. Moreover, the selection of eleven experts that covered four of the five stakeholder categories deemed relevant for this research – as well as the purposive sampling employed – already offer a satisfactory sample range. The data collection process heavily relied on self-reported data by the participants, which may be subjective, selective, or biased by memory. To counter this, the results were compared with the findings from related literature. Further, the questions were designed to be as neutral and open-ended as possible, to encourage honest, unbiased answers.

As for the data analysis, the process of identifying themes relies on the researcher's interpretation. For future studies on this topic, involving multiple coders and utilising inter-coder reliability checks should be considered. In addition, thematic analysis requires significant time for coding, theme development, and refinement of those themes. The time dedicated to this process was sufficient for the scope of this thesis, however, more time and further refinement could potentially lead to even more nuanced results. Lastly, it should be noted that the findings from qualitative data analysis have limited generalisability. Many of the results for the city of Cologne found here are context-specific and may not apply to other settings, populations, or regions. Therefore, it is advisable to perform similar studies for other cities or even entire regions. This would yield an even greater understanding of the subject matter at hand.

7. Conclusion

At this point, the necessity to act against climate change should no longer be a topic of debate. Yet, achieving the targets set by the Paris Agreement to limit global warming seem more and more out of reach. Luckily, many cities around the world have set their own specific climate action targets, to not only mitigate the effects of climate change and adapt to its impacts, but also to create a higher quality of life environment for their inhabitants. In the context of urban climate governance, integrating co-benefits into local climate policy provides a pathway to make climate measures more tangible for citizens and stakeholders alike. Co-benefits are additional positive effects that a policy

or measure that targets one objective may have on other objectives, in turn enhancing the overall benefits for society and environment. For example, these can be improved air quality due to less GHG emissions from transport, increased energy security from switching to local renewable production, or improved health due to improving walking and cycling infrastructure. Scientific literature suggest that the co-benefit approach can foster public support for climate action, improve cooperation among actors, offer economic and social benefits, and justify further promotion of climate measures in urban areas. However, according to other research, the actual implementation of co-benefits in climate policy assessment is rarer that one might initially assume, leading to biased decision-making and less effective policies. Due to many studies focusing on analysing academic literature and official policy documents regarding co-benefits, this thesis takes a qualitative approach to the subject by conducting expert interviews followed by an inductive thematic analysis. The interview participants were selected with purposive sampling by first identifying relevant stakeholder categories and then contacting and interviewing a sample of suitable respondents. One of the limiting criteria of whom to interview, was the selection of a case study, which was the city of Cologne. Participants either actively work in relevant fields within in the Cologne region or have done so in recent years. The city lends itself well for this kind of investigation on the one hand due having a substantial history of climate action and having a strong focus on research and innovation, significant autonomy, and a collaborative civic and institutional framework.

The research main objective of this thesis was to assess how experts perceive and utilise the advocacy potential of co-benefits for Cologne's climate policies. For this, examining the fundamental aspects of said advocacy potential, such as economic incentives, cooperation and collaboration, and the ability of co-benefits to make the abstract nature of climate neutrality more tangible by offering immediate, localised impacts, was essential. Furthermore, the study aimed to identify common barriers and opportunities for co-benefits of climate action in Cologne. The interview process resulted in fruitful conversations with eleven experts, which were recorded and later transcribed for analysis. Conducting the thematic analysis generated a total of six main themes, that related to study objectives. These include a main theme on co-benefits advocacy potential, economic considerations, cooperation and collaboration, barriers, opportunities, and making climate action more tangible. The findings show that experts agree that co-benefits inherit advocacy potential. This is supported by reports of using

them as arguments for climate action measures, and crediting them as important and by one respondent even as essential factors for effective climate governance. The expert also emphasised the significance of co-benefits in a regional context, confirming their potential to make more abstract CO^2 reductions tangible by providing more immediate benefits that citizens can relate to. Two respondents even suggested switching the concept of co-benefits of climate mitigation around and reconceptualise CO^2 as the co-benefit. The most frequently mentioned barrier to the co-benefit approach by experts was the lack of appropriate data evaluation and monitoring tools that allow for co-benefit quantification. Financial hurdles were identified, although some expert clarified that at least in Germany, high costs should not be the argument for not implementing a climate measure. Barriers of lacking intersectoral and interdepartmental cooperation among relevant actors, was recognised by experts, yet overall, this does not seem to be a major hurdle for Cologne specifically, as general perception of this factor is positive. The opportunities relate to the common barrier of lacking quantification and monitoring methods. Respondents recommended the use of simplified and localised assessment methods and highlighted the need for clear metrics for visual presentation for the co-benefit approach. Cologne's own climate neutrality monitoring platform that is currently being developed has potential to fill that gap at least to some extent. Further, participants underlined the importance of co-benefits for climate politics on a local level. Here they see the greatest chance for the approach to have an impact. This sentiment comes back to argument of co-benefits making urban climate action more tangible compared to measure that presented with the main target of emission reductions.

With these findings in mind, future research could focus on refining existing co-benefit evaluation and monitoring methods or developing new approaches. Additionally, exploring the idea of reframing GHG reduction as a co-benefit of locally impactful measures is a valid option for both research and urban governments, as this method may resonate better in the current political climate. Policymakers need to consider integrating co-benefits into climate strategies, as they present compelling arguments for action and foster collaboration among diverse urban climate stakeholders. While stakeholder collaboration in Cologne is progressing, the findings suggest there is room for improvement in shared problem-solving and intersectoral cooperation. By leveraging co-benefit integration, municipal governments can promote climate mitigation effectively while addressing immediate local needs, ensuring progress toward

emission reductions remains a priority. The value of the co-benefit approach in advocating effective climate action seems to be obvious, whether more cities and municipalities take advantage of it, remains to be seen.

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Appendix

Appendix A: Interview Guidelines

Example Interview Guideline for Stakeholder Category 1

Introduction Questions:

- F1: Möchten Sie sich kurz vorstellen?
- F2: Das Fachgutachten Köln Klimaneutral 2035 bezieht sich auf verschiedene Handlungsfelder, darunter Gebäude, Energie, Wirtschaft, Verkehr. Welcher dieser Handlungsfelder liegen im Verantwortungsbereich des Umwelt- und Verbraucherschutzamtes?
- F3: Inwiefern sind Sie persönlich bei Ihrer Arbeit an der Umsetzung der Kölner Klimaschutzziele beteiligt?
- F4: Hat die Verbesserung der Luftqualität Relevanz in Ihrem Tätigkeitsbereich?

Perception of Advocacy Potentials:

- F5: Positive Nebeneffekte wie Luftqualitätsverbesserungen können laut akademischer Fachliteratur bei der Umsetzung und Akzeptanz von klimapolitischen Maßnahmen helfen. Was ist Ihre Meinung zu Co-benefits als Argument für Klimapolitik?
- F6: Glauben Sie Co-benefits erleichtern die politische Unterstützung oder Umsetzung?
    - Falls ja, warum?
    - Falls nein, warum nicht?
- F7: Wie könnte es aus Ihrer Sich besser bzw. effektiver genutzt werden?
- F8: Wie schätzen Sie das Potential dieser lokalen Vorteile ein, Kritiker zu überzeugen?
- F9: Welche Rolle spielt die Verbesserung der Luftqualität bei Projekten wie GRÜN hoch 3?
    - Wurden Luftqualitätsverbesserung zu Argumentation für das Projekt genutzt?

Stakeholder Cooperationt:

- F10: Mit welchen anderen Abteilungen der Kölner Stadtverwaltung arbeiten Sie in Bezug auf Klimapolitik zusammen?
    - Sehen Sie hier Möglichkeiten für verbesserte Kooperation?
- F11: Glauben Sie lokal messbare Vorteile, wie verbesserte Luftqualität, können die Zusammenarbeit verschiedener Interessengruppen fördern?

- F12: Arbeiten Sie mit anderen Interessengruppen in Köln, wie z.B. Unternehmen, NGOs oder Wissenschaftler, in Bezug auf Umsetzung von Klimapolitik zusammen?
    - Ist das Projekt iResilience ein Beispiel für ein solche Zusammenarbeit?
- F13: Gibt es besondere Herausforderungen bei der Zusammenarbeit?
- F14: Ein weiteres Projekt ist ÖKOPROFIT. Ist dies ebenfalls ein Beispiel für diese Kooperation?
    - Welche Herausforderungen gibt es dabei?

Economic Considerations:

- F15: Co-benefits, insbesondere verbesserste Luftqualität, wird ein hohes Potential für Kostenersparnisse zugesprochen. ($8-40/tCO2e) Diese könnten die Kosten von Klimaschutzmaßnahmen decken oder sogar übertreffen. Sind Sie mit solchen Berechnungen vertraut?
- F16: Welche finanziellen oder sozialen Vorteile sehen Sie durch Co-Benefits?
    - Wie werden diese zwischen den verschiedenen Bevölkerungsgruppen verteilt?

Example Interview Guideline for Stakeholder Category 2

Introduction Questions

- F1: Möchten Sie sich kurz vorstellen? Was gehört zu Ihren Aufgabenbereichen?
- F2: Könnten Sie mir zunächst einen kurzen Überblick über Ihre Rolle bei der Erstellung der Strategie „Köln Klimaneutral 2035“ geben?
    - Welche spezifischen Schwerpunkte verfolgten Sie und Ihr Team im Rahmen der wissenschaftlichen Begleitung?
- F3: Sind Ihnen die Kölner Klimaschutzziele bekannt?
    - Wenn ja, in welchem Umfang?
- F4: War die Erstellung bestimmter Maßnahmen Teil Ihrer Arbeit?
    - Wenn ja, welche sind dies?
- F5: Hat die Verbesserung der Luftqualität Relevanz in Ihrem Tätigkeitsbereich?

Perception of Advocacy Potential:

- F6: Co-Benefits, wie beispielsweise die Verbesserung der Luftqualität und die Förderung einer nachhaltigen Wirtschaft, haben laut akademischer Fachliteratur das Potenzial, Unterstützung und Akzeptanz für Klimaschutzmaßnahmen auf lokaler Ebene zu fördern. Inwiefern spielt das Potenzial solcher Co-Benefits eine Rolle bei der Entwicklung der Maßnahmen für Köln?

- F7: Werden diese Vorteile gezielt genutzt, um Unterstützung für Klimaschutzmaßnahmen zu gewinnen?
- F8: Sehen Sie Co-Benefits, wie z.B. die Verbesserung der Luftqualität und die Steigerung der Standortattraktivität, als ein Argument, um die Unterstützung für klimapolitische Maßnahmen zu mobilisieren?
    - Wie nutzten Sie diese Vorteile in ihrer Arbeit bei Ihrem Institut?
- F9: Gibt es aus Ihrer Sicht Potenzial, diese Co-Benefits stärker einzusetzen, um die Klimaziele der Stadt Köln zu fördern?
    - Wenn ja, auf welche Weise?
- F10: Glauben Sie, dass Co-Benefits im Diskurs über die Klimapolitik eine größere Rolle spielen sollten, um die Beteiligung und Unterstützung seitens der Öffentlichkeit und der Unternehmen zu stärken? Warum oder warum nicht?

<u>Economic Considerations:</u>

- F11: Co-benefits, insbesondere verbesserste Luftqualität, wird ein hohes Potential für Kostenersparnisse zugesprochen. ($8-40/tCO2e) Diese könnten die Kosten von Klimaschutzmaßnahmen decken oder sogar übertreffen. Sind Sie mit solchen Berechnungen vertraut?
- F12: Setzen Sie solche oder ähnliche Berechnungen bei Ihrer Arbeit ein, um positive Nebeneffekte von entwickelten Maßnahmen argumentativ zu unterstützen?
- F13: Welche finanziellen oder sozialen Vorteile sehen Sie durch Co-Benefits (Luftqualitätsverbesserungen)?
    - Wie werden diese zwischen den verschiedenen Bevölkerungsgruppen verteilt?

<u>Stakeholder Cooperation:</u>

- F14: Wie gestaltete sich die Zusammenarbeit mit der Kölner Stadtverwaltung und anderen Akteuren bei der Erstellung des Klimaneutralitätsplans?
- F15: Gab es Kooperation mit anderen Instituten, Unternehmen oder anderen Interessengruppen?
- F16: Co-benefits werden die Eigenschaft zugesprochen, Akteure aus verschiedenen Bereichen zu einen und Koalitionsbildung zu fördern. Glauben Sie lokal messbare Vorteile, wie verbesserte Luftqualität, können die Zusammenarbeit verschiedener Interessengruppen fördern?
- F17: Welche Herausforderungen oder Hürden gibt es aus Ihrer Sicht bei der Zusammenarbeit mit unterschiedlichen Akteuren und Ebenen?
- F18: Gibt es bereits erfolgreiche Koalitionen oder Partnerschaften, die als Modell dienen könnten?

Example Interview Guideline for Stakeholder Category 4

Introduction Questions:

- F1: Möchten Sie sich kurz vorstellen? Was ist Ihre Rolle bei Ihrem Job?
- F2: Inwiefern sind Sie persönlich bei der IHK an der Unterstützung der Stadt Köln im Bereich Klimapolitik beteiligt?
- F4: Sind Ihnen die Kölner Klimaschutzziele bekannt?
    - Wenn ja, in welchem Umfang?
- F5: Betreffen bestimmte Maßnahmen Ihre Arbeit?
    - Wenn ja, welche sind dies?
- F6: Hat die Verbesserung der Luftqualität Relevanz in Ihrem Tätigkeitsbereich?

Perception of Advocacy Potential:

- F7: Inwiefern sehen Sie positive Nebeneffekte, wie z.B. die Verbesserung der Luftqualität und die Steigerung der Standortattraktivität, als ein Argument, um die Unterstützung für Klimapolitiken zu mobilisieren?
    - Wie nutzt Sie diese Vorteile in ihrer Arbeit?
- F8: Gibt es aus Ihrer Sicht Potenzial, diese Co-Benefits stärker einzusetzen, um die Klimaziele und die langfristige Mobilitätsstrategie der Stadt Köln zu fördern?
    - Wenn ja, auf welche Weise?

Economic Considerations:

- F9: Klimapolitische Maßnahmen, die Co-Benefits bieten, können ökonomische Vorteile generieren. Wie bewerten Sie die finanziellen und ökonomischen Vorteile, die für lokale Unternehmen entstehen könnten, z.B. durch erhöhte Attraktivität des Standorts Köln und eine gesteigerte Lebensqualität?
- F10: Sehen Sie Herausforderungen bei der Verteilung der Kosten und Nutzen solcher Mobilitätsmaßnahmen auf verschiedene Wirtschaftsakteure und Bürger?
- F11: Wie können diese Herausforderungen aus Ihrer Sicht adressiert werden?
- F12: Co-benefits, insbesondere verbesserste Luftqualität, wird ein hohes Potential für Kostenersparnisse zugesprochen. ($8-40/tCO2e) Diese könnten die Kosten von Klimaschutzmaßnahmen decken oder sogar übertreffen. Sind Sie mit solchen Berechnungen vertraut?
- F13: Welche finanziellen oder sozialen Vorteile sehen Sie durch Co-Benefits?
    - Wie werden diese zwischen den verschiedenen Bevölkerungsgruppen verteilt?

Stakeholder Cooperation:

- F14: Wie gestalten Sie die Kooperation mit der Stadtverwaltung, Unternehmen und anderen Interessengruppen, um die Mobilitäts- und Klimaziele zu erreichen?
- F15: Glauben Sie lokal messbare Vorteile, wie verbesserte Luftqualität, können die Zusammenarbeit verschiedener Interessengruppen fördern?
- F16: Welche Herausforderungen oder Hürden gibt es aus Ihrer Sicht bei der Zusammenarbeit mit unterschiedlichen Akteuren und Ebenen?
- F17: Gibt es bereits erfolgreiche Koalitionen oder Partnerschaften, die als Modell dienen könnten?

Future Outlook:

- F18: Mit Blick auf die zukünftige Entwicklung: Welche weiteren Schritte oder Maßnahmen halten Sie für notwendig, um die Klimaziele zu erreichen und nachhaltige Mobilität langfristig in Köln zu fördern?

Example Interview Guideline for Stakeholder Category 5

Introduction Questions:

- F1: Möchten Sie sich kurz vorstellen? Was machen Sie hauptberuflich und was ist Ihre Rolle bei Ihren ehrenamtlichen Tätigkeiten?
- F2: Inwiefern sind Sie persönlich an der Unterstützung der Stadt Köln im Bereich Klimapolitik beteiligt?
- F3: Beinhaltet Ihre Arbeit auch die direkte Umsetzung der Kölner Klimaschutzziele?
    - Wenn ja, in welche Klimaschutzziele sind dies?
- F4: Können Sie mir Beispiele für konkrete Maßnahmen nennen?
- F5: Hat die Verbesserung der Luftqualität Relevanz in Ihrem Tätigkeitsbereich?

Perception of Advocacy Potentials:

- F6: Inwiefern sehen Sie positive Nebeneffekte, wie z.B. die Verbesserung der Luftqualität und die Steigerung der Standortattraktivität, als ein Argument, um die Unterstützung für Klimapolitiken zu mobilisieren?
- F7: Nutzen Sie diese Vorteile in ihrer Arbeit?
- F8: Gibt es aus Ihrer Sicht Potenzial, diese Co-Benefits stärker einzusetzen, um die Klimaziele und die langfristige Mobilitätsstrategie der Stadt Köln zu fördern?
    - Wenn ja, auf welche Weise?

Economic Considerations:

- F9: Co-Benefits, insbesondere verbesserste Luftqualität, wird ein hohes Potential für Kostenersparnisse zugesprochen. ($8-40/tCO2e) Diese könnten die Kosten von Klimaschutzmaßnahmen decken oder sogar übertreffen. Sind Sie mit solchen Berechnungen vertraut?
- F10: Klimapolitische Maßnahmen, die Co-Benefits bieten, können ökonomische Vorteile generieren, neben den zuvor genannten Kostenersparnissen aus dem Gesundheitssektor, z.B. durch erhöhte Attraktivität des Standorts Köln, wirtschaftliche Wertschöpfung und Arbeitsplätze sowie niedrigere Kosten für Energie und Heizen. Wie bewerteten Sie persönlich das Potential für solche finanziellen und ökonomischen Vorteile, die für lokale Unternehmen und Privatpersonen entstehen könnten?
- F11: Welche anderen finanziellen oder sozialen Vorteile sehen Sie durch Co-Benefits?
    - Wie werden diese zwischen den verschiedenen Bevölkerungsgruppen verteilt?
- F12: Sehen Sie Herausforderungen bei der Verteilung der Kosten und Nutzen von klimapolitischen Maßnahmen auf verschiedene Wirtschaftsakteure und Bürger?
    - Wie können diese Herausforderungen aus Ihrer Sicht adressiert werden?

Stakeholder Cooperation:

- F13: Für das Erreichen von Klimaschutzzielen ist gute Zusammenarbeit verschiedener Stakeholder essenziell. Wie gestaltet sich die Kooperation des Klimarats mit der Stadtverwaltung, Unternehmen und anderen Interessengruppen, Klimaziele zu erreichen?
- F14: Wie gestaltet sich dabei die Zusammenarbeit der verschiedenen Partner?
- F15: Welche Herausforderungen oder Hürden gibt es aus Ihrer Sicht bei der Zusammenarbeit mit unterschiedlichen Akteuren und Ebenen?
- F 16: Würden Sie sagen, S4F oder Klimaerklärung Köln, könnten als Modell für erfolgreiche Koalitionen oder Partnerschaften dienen?
- F17: Glauben Sie lokal messbare Vorteile, wie verbesserte Luftqualität, können die Zusammenarbeit verschiedener Interessengruppen fördern?

Future Outlook:

- F18: Mit Blick auf die zukünftige Entwicklung für den Klimaschutz in Köln: Welche weiteren Schritte oder Maßnahmen halten Sie für notwendig, um die Klimaziele zu erreichen und nachhaltige Lösungen für Köln langfristig zu fördern?

Appendix B: Full Interview Participant Overview

Participant ID	Role/Job	Stakholder Category	Mitchell's Typology	Expertise/Area of focus	Interview Length	Communication channel	Interview date
P1	Project lead Gertec	4. Private Sector & Industry Representatives: Construction & Urban Development Companies	Dominant Stakeholder	Urban & spatial planning, municipal climate protection, measure development for climate neutrality plan	46	Zoom	18.12.24
P2	Member of Climate Protection Coordination Office	1. Government and Public Sector Officials: Local & municipals governments	Dominant Stakeholder	Montoring & controlling, climate neutrality plan with impact measurements	63	BigBlueButton	27.11.24
P3	Two members of Environmental and Consumer Protection Office	1. Government and Public Sector Officials: Local & municipals governments	Dominant Stakeholder	Climate adaptation management, heat protection measures, air pollution control, noise reduction	48	Zoom	25.11.24
P4	Researcher Wuppertal Institute	2. Academic and Research Institutions: Climate scientists & Environmental Researchers	Dependent Stakeholder	Research Unit Sustainable Mobility and Transport Policy, development of measures, implementation concepts, impact assessments (climate neutrality plan)	60	Zoom	21.11.24
P5	Urban planner in Cologne	4. Private Sector & Industry Representatives: Construction & Urban Development Companies	Dominant Stakeholder	Spatial planner with focus on urban climate & air pollution control, creating climate adaptation concepts for municipalities	48	Zoom	21.11.24
P6	Mayor city of Cologne, deputy chief mayor	1. Government and Public Sector Officials: Local & municipals governments	Dominant Stakeholder	Chairman of the Climate Alliance, council member responsible for climate protection (control function)	46	Zoom	19.11.24
P7	Climate council member, scientist	5. Community & Grassroot Organizations: Local Community Groups	Dependent or Demanding Stakeholder	Co-founder Scientists4Future, Climate Council member, advising the city on climate policy, initiative Klimaerklärung Köln	77	Zoom	18.11.24
P8	Project lead & researcher Wuppertal Institute	2. Academic and Research Institutions: Climate scientists & Environmental Researchers	Dependent Stakeholder	Head of Urban Change Research Unit, project manager climate neutral plan, responsible for mobility and economy	71	Zoom	13.11.24
P9	Member of IHK Köln	4. Private Sector & Industry Representatives: Industry Associations	Dominant or Definitive Stakeholder	Chamber of Industry and Commerce, exchange between companies & the city, mobility sector (Sustainable Urban Mobility Plan)	62	Zoom	12.11.24
P10	Member of Environmental and Consumer Protection Office	1. Government and Public Sector Officials: Local & municipals governments	Dominant Stakeholder	Responsible for air quality planning, environmental protection, impact compensation planning & urban land-use planning	46	Zoom	06.11.24
P11	Local architect	4. Private Sector & Industry Representatives: Construction & Urban Development Companies	Dependent Stakeholder	Architect in Cologne area, privately engaged in politics & environmental concerns	45	FaceTime	30.10.24

Appendix C: Themes, Sub-themes, and Codes Table

Themes, Sub-themes & Codes					Frequency
	Themes	Sub-themes	Codes	Sub-codes	
Code system					269
	Co-benefit and Climate Action Barriers				0
		Important that co-benefits leave a choice			1
		Barriers for climate action			0
			Barrier: misaligned economic development in energy sector		1
			Barrier: competing local financial priorities		1
			Barrier: city's area of incluence limited		1
			Barrier process inefficiency		2
			Barriers for urban planning		1
			Barriers for co-benefits		0
				Co-benefit rebound effect	1
				Challenge of proving co-benefits on per measure basis	1
				Privacy concerns for health data	1
				Proper monitoring/ co-benefit quantification is needed	10
				NIMBY problem, e.g. parking spots	1
				2 sustainability goals block each other	1
	Co-benefit Opportunities				0
		Co-benefit potential not fully used			2
		Co-benefit importance on local level			8
		Potential to increase effectivness of co-benefits			0
			Limited Recognition of Co-benefits		1
			Need for Outcome-Oriented Municipal Budgeting		1
			Need for clear metrics and visual presentation		1
			Need for Simplified and Localized Assessment Methods		4
			participation events to include citizens		1
			Employer-financed e-bikes		2
			tools like ClimteView		2
			Climate neutrality monitoring platform by city		1
	Economic Considerations				0
		Question where to invest against CC			1
		Cost distribution			0
			Co-benefit cost distribution		1
				Vulnarable groups would benefit	7
			Cost benefit distribution doesn't work in reality		5
			Costs for private sector		3
			Costs for the city		3
		Co-benefits as economic argument			0
			Cost of climate damage vs. investment in climate protection		1
			Socially equitable expansion of renewable energy		3
			Co-benefits as value creation reversal		1
			Cost-benefit analysis of climate neutrality strategy		1
			Enhancing Local Economic Retention Through Reduced Car Dependency		2
			cost savings through co-benefits always important		1
			financial barriers		5
			Difficult to convince critics		4
			no financial barrier		4
	Cooperation & Collaboration				0
		Importance of cooperation			4
		Barriers for cooperation & collaboration			0
			Barrier: Reluctance of key actors to engage		1
			Barrier: Conflicting agendas and lack of compromise		1
			Barrier: resistance to being told how to act		1
			Barrier: Diverse perspectives and challenges in stakeholder engagement		1
			Barrier: bureaucratic hurdles by city administration		2
			Barrier: conflict of political opposition		1
			Barrier collaboration: networking uncommon in climate communities		1
			Barrier: poor cooperation between departments		7
			Barrier: complexity of many actors		5
		Co-benefits improve cooperation			0
			Confirmation of cooperation benefit		3
			Successful alignment of interest groups		1
			Co-benefits offer easier entry point for productive dialogue		1
			Mutual support through interconnected goals		2
			Tangible experience of added value in local projects		1
			Unrecognized added value in existing projects		1
			Co-benefits aid alignment of existing projects with climate goals		1
			Cooperation has room for improvement		2
			Cooperation goes well in Cologne		6
	Making Climate Action Tangible				0
		Co-benefits of Climate Mitigation vs Adaptation			0
			Co-benefits of climate adaptaion		6
			Co-benefits of climate mitigation		2
		Switch concept: CO2 should be co-benefit			4
		Temporal and spatial argument			2
		Co-benefits are tangible for quality of life			2
		CO2 reduction/climate neutrality is abstract			6
	Advocacy Potential of Co-Benefits				0
		Co-benefit used as argument for local climate action			18
			Examples of co-benefits as rationale		6
		Climate policy (or CC) acceptance			0
			Acceptance not the issue		9
				Goal of measure is enough, mentioning co-benefit not necessary	1
			Co-benefits improve acceptance		13
		Denial of advocacy potential			0
		Confirmation of advocacy potential			20
		Importance of co-benefits			0
			Co-benefits enhance urban climate and air quality		1
			Addressing diverse needs through co-benefits		1
			Strong emphasis on co-benefits		2
			Leveraging Co-Benefits for Urban Marketing and Quality of Life Promotion		1
			Co-benefits are essential for effective climate action		3
		Acknowledgment of co-benefits in policy or by Cologne			6
	Different terminology for co-benefits				8
	Main goal: "co-benefit" but leads to C02 reduction				5
	Main goal: CO2 reduction but has co-benefit				6
	Co-benefit improved air quality				17
		Denial of link between air quality and climate action			1

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Lukas Strauss

Berlin, January 20th 2025

Declaration of Independence

I certify that I have written this thesis independently and have not used any sources or aids other than those specified, that all statements taken verbatim or in spirit from other writings have been identified and that the thesis has not been used in the same or a similar form for other examinations and has not been submitted to any other examination authority.

I have clearly labelled all passages that are taken from other works in terms of wording or meaning (including translations) as borrowed material, stating the exact source (including the World Wide Web and other electronic data collections). This also applies to attached drawings, pictorial representations, sketches, and the like.

In addition, I confirm that when using IT/AI-supported tools, I have listed these tools in full in the "Overview of tools used" below with their product name and version number, my source of supply (e.g., URL) and details of use, and that I have completed the checklist truthfully. Excluded from this are those IT/AI-supported writing tools that were classified by my responsible examination office as not subject to notification by the time I submitted my thesis ("whitelist"). In the preparation of this thesis, I have consistently acted independently and with control over the use of IT/AI-supported writing tools.

I am aware that in the event of violations of these principles, a procedure for attempted cheating or deception will be initiated in accordance with the subject-specific examination regulations and/or the interdisciplinary statutes governing admission, studies, and examinations at Humboldt-Universität zu Berlin (ZSP-HU).

Berlin, 20.01.2025

Whitelist

The following programmes do not have to be listed or evaluated. These programmes can be used without further information:

- ✓ Microsoft Office, LaTeX, OpenOffice, iWork, Google Docs
- ✓ Google Scholar, ResearchGate, Web of Science
- ✓ Databases of the university library
- ✓ Reference management programmes (Zotero, Endnote, Mendeley, etc.)

Overview of tools used

Completion instructions:

Please indicate which programmes you have used in your work. Please enter which programme you used for each type of use. Several programmes can be entered for each type of use. If you have used a programme in a different way than listed in the table, please add this type of use in the fields provided.

If you are unsure whether a programme falls under "artificial intelligence", please enter it. You will not suffer any disadvantages by naming the programme.

Checklist: IT/AI-supported writing tools:

Type of use	**Programme**	**If relevant: sections concerned** (Please indicate page numbers if not applicable to the entire document).
Generating ideas/brainstorming		
Literature research	Elicit Scopus	
Translations of texts	ChatGBT DeepL Translator	Section 4.4, p. 37 Section 5.2, p. 42-56
Summarising sources		

Have content explained in a different way (e.g. constructs, methodological approaches, analyses	ChatGBT	
Creating text sections that serve as a template		
Revision of your own text elements	ChatGBT	
Analysing data (e.g. writing codes, defining suitable evaluation methods, creating illustrations)	MAXQDA 24.7.0 ChatGBT TurboScribe	Section 5.2, p. 42-56
Spell checking, grammar and writing style	ChatGBT	
Visualisations for illustrative or decorative purposes		

Further explanations:

No text passages in this thesis were written entirely by AI. Some self-authored text passages were merely checked with the listed AI-tools. All text passages are created by me or otherwise marked accordingly.