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Fostering Climate Change Adaptive Capacity:  
Analysis on Social Housing Institutions based on the  
Adaptive Capacity Wheel Framework.

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## ABSTRACT

Over the past decades we have been witnessing constant changes in the climate, as well as growing evidence of its related risks for human systems. We have also experienced an upsurge in climate change adaptation strategies, policies, and plans at all governmental levels that emerge in response to climate change risks and needs. The need for adaptation demands the promotion of society's adaptive capacity, which can be fostered by institutions. Moreover, adaptive capacity of society is linked to individual adaptation measures, which can be implemented at the household level, where housing institutions play an important role. Housing institutions are considered as a potential provider of adaptation within dwellings, having the power to implement adaptation measures and foster adaptive capacity of tenants. This thesis addresses the question, to what extent are social housing institutions (SHIs) fostering climate change adaptive capacity. Following a methodological design based on the Adaptive Capacity Wheel (ACW) to perform a critical evaluation. This evaluation is carried out using Vienna as a case study. Results of SHIs in Vienna are synthesised and compared with similar social housing contexts like the Dutch and the Danish. The findings highlight strengths and weaknesses of SHIs around the dimensions of the ACW. Lessons learned from the comparative analysis support certain practices of SHIs in Vienna and provide important lessons for change as well.

## ZUSAMMENFASSUNG

Im Laufe der letzten Jahrzehnte waren wir Zeugen des ständigen Klimawandels sowie der zunehmenden Beweise der damit verbundenen Risiken auf den Menschen. Auch erlebten wir einen deutlichen Anstieg von Anpassungsstrategien, -maßnahmen und -plänen auf sämtlichen Regierungsebenen zur Reaktion auf die Risiken und Anforderungen des Klimawandels. Der Anpassungsbedarf bedingt die Förderung der Anpassungsfähigkeit der Gesellschaft, die durch Institutionen begünstigt werden kann. Des Weiteren, ist die Anpassungsfähigkeit der Gesellschaft mit individuellen Anpassungsmaßnahmen verbunden, die auf der Haushaltsebene durchgeführt werden können, wo Institutionen des sozialen Wohnbaus (SHIs) eine bedeutende Rolle spielen. Diese Institutionen gelten als potenzielle Anbieter zur Klimaanpassung und haben die Möglichkeit bestimmte Anpassungsmaßnahmen umzusetzen, welche die Anpassungsfähigkeit ihrer Mieter fördern. In dieser Masterarbeit wird untersucht, inwieweit die Institutionen des sozialen Wohnbaus die Klimawandelanpassungsfähigkeit fördern. Dafür wurde ein methodisches Design entwickelt, dass auf dem „Adaptive Capacity Wheel“ (ACW) beruht, um eine kritische Evaluierung durchzuführen. Diese Evaluierung wurde in Wien als Fallstudie ausgeführt. Die Auswertung der SHIs in Wien wurde synthetisiert und mit ähnlichen sozialen Wohnbaukontexten wie dem niederländischen und dänischen verglichen. Die Ergebnisse zeigen Stärken und Schwächen der Anpassungsfähigkeit der SHIs an den Klimawandel auf. Erkenntnisse aus dem internationalen Vergleich bestätigten die Wirksamkeit bestimmter, in Wien angewandter Praktiken und lieferten wichtige Ansätze für Änderungen.

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## 1. INTRODUCTION

We are living a time of increasing uncertainty, a time where planning for the long term has gone from being a necessary strategy, to being a risk, that is strongly fuelled by the ongoing changing global situations. In recent years there has been growing evidence of climate change impacts on natural and human systems (IPCC 2014 :4). At the same time, knowledge on how to cope with its risks, minimize them, and adapt to climate change (RODERS & STRAUB 2015) has emerged. It has been stated that, adapting to climate change is an absolute necessity (IPCC 2014), though current population growth challenges the achievement of goals, and exacerbates the stakes at the same time. It is believed, that the answer to achieving climate change adaptation may lay in cities, as they possess the ideal environment with the necessary conditions and resources to ensure human well-being (KRELLENBERG et al. 2016). But, there is still little evidence on the role that city-level actors, such as institutions, play in fostering adaptation to climate change (GUPTA et al. 2010). Furthermore, institutions are linked to individual adaptive capacity, given that individual adaptation actions are not autonomous but, highly constrained by the regulatory structures within institutions (ADGER et al. 2005). Thus, institutions hold the power to boost or constrain individual adaptation to climate change (RODERS et al. 2015).

The intention behind this research was born within the link that exists between individual adaptation, adaptation at the household level, and the role that institutions play here. It was further reinforced by the lack of assessments around institutions and their capacity to foster adaptation to climate change (GUPTA et al. 2010; GROTHMANN et al. 2013). Pursuing to narrow down the study scope, and raise the level of specificity, the research is limited to observe and evaluate to what extent are housing institutions fostering climate change adaptive capacity. Furthermore, it seeks to understand the intrinsic characteristics of selected institutions, and how these influence the adaptive capacity of society. In this respect, the evaluation involves the analysis of actor's roles engaged in the institutions, and the context in which the institutions are embedded.

To theoretically frame my research intention, the first part of this thesis (Chapter 2) introduces a literature analysis, addressing the fundamental problematic by using a structure I called the "Problematic Triad". This structure uses three dimensions to present

current concerns around climate change adaptation at three different levels, going from bigger to smaller scale, from the general concept of adaptation to climate change, adaptation in the city, until reaching the scale of adaptation at the household level. The Problematic Triad explains and delimits the research, identifies the research gap, and provides the basis for the generation of the research questions. In chapter 3, I introduce important theoretical concepts, vital for the search of solutions to the problematic triad. Chapter 3 also serves as a delimiting borderline of the research. Through the theory, the specificity of the research emerges, thus delimiting the object of study, namely the institutions involved in the development of social housing and their capacity to foster adaptation to climate change.

In order to answer the research questions and perform the assessment of selected social housing institutions, I make use of the Adaptive Capacity Wheel framework developed by GUPTA et al. (2010). The ACW framework described in Chapter 4, provides a flexible methodology that ensures the critical evaluation of social housing institution's capacities to foster adaptation to climate change. Taking further methodological adaptations introduced by GROTHMANN et al. (2013), I came up with a comprehensive methodological design that was able to guide the selection of the case study, the collection of data, evaluation, analysis, and the presentation of results.

The selected case study, Vienna's social housing institutions, is presented in Chapter 5. Vienna's peculiar institutional context, climate change adaptation policies, well-fare traditions, as well as its social housing development, structure, management and history, turned it into a relevant case for the research. Selected social housing institutions were evaluated in their ability to foster climate change adaptive capacity. I was able to identify the strengths, weaknesses, but more importantly, the areas where there is capacity to improve (Chapter 6). However, Viennese social housing institutions behold specific characteristics that are worth comparing. In order to do so, I systematized findings of Vienna's case study, and compared them with similar social housing contexts in Europe. In Chapter 7, I bring Vienna's results in perspective with comparable contexts like the Danish and Dutch. This methodological step was vital to generate a general overview on the capacity of European social housing institutions to foster adaptation to climate change, a list of strengths, weaknesses and lessons we can learn from them.



## 2. THE PROBLEMATIC TRIAD: THREE DIMENSIONS OF CONCERN

### 2.1. The problem of Climate Change Adaptation

There is no way to deny the existence and constant evolution of climate change. Since the fifth IPCC Assessment Report, evidence from recent decades has highlighted and reinforced the existence and importance of climate change impacts on human systems (IPCC, 2014). In addition to the identified impacts across different sectors, there is a rising awareness over the impacts that climate change has in cities (HUNT et al. 2010).

Even though climate change impacts show a large variation depending on location and site, the most important ones according to HUNT et al. (ibid) are: (1) extreme impacts on built infrastructure (i.e. wind, storms, floods, extreme heat, and droughts); (2) health effects (i.e. heat and cold related mortality, disease related to food, and water); (3) impacts on energy use, water availability, and resources. Despite the fact that impact perception is not directly linked to daily life, their consequences pose a direct threat to human lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure (IPCC 2014 :5). In other words, climate change impacts are affecting our immediate surroundings and beyond. The need for adjustments to help moderate or avoid the impacts has been long stated, but still, humanity has yet not achieved to tackle them effectively (RIPPLE et al. 2017).

Tough strategies to minimize the risks of climate change have emerged constantly in political agendas around the world presenting solutions in form of adaptation measures, they show a lack of implementation (BIESBROEK et al. 2010). In recent years, studies have explored the reasons behind this deficit. According to DUPUIS et al. (2013), there are several factors that represent limitations for such strategies. For instance, the uncertainty of knowledge affecting directly decision making, the high level of ecological change that problematizes the certainty of interventions, the cost-benefit relation and availability of resources that often represent structural barriers, and the design and execution flaws of adaptation policies on the side of institutions. All of the afore mentioned, have notable consequences on the perception and belief of society towards their adaptive capacity. Additionally, lack of political will to address climate change at the local level has resulted in maladaptation measures due to short-term approaches that unleash future vulnerabilities and risks (FORD et al. 2011).

Changes and impacts related to climate change vary according to location and context, however, there is growing evidence of agreement stating that the solution could be found in cities (KRELLENBERG et al. 2016). It is believed that the ideal environment to achieve the fundamental changes required for assuring wellbeing of humans can only be held by cities, since they bear the conditions and resources for such performance (KRELLENBERG et al. 2016; HÖLSCHER et al. 2019). Grounding adaptation to climate change at the city level can benefit from a higher relevance of risks and opportunities, and a higher number of private and public agents (HUNT et al. 2010).

## 2.2. The Paradox of Cities

In 2006, the UN reported that around half of the world's population was already living in cities (UN 2006). By 2008, population living in urban areas already exceeded the 50% proportion and since then the numbers have been continuously growing (ibid). Forecasts for 2050 indicate that general population growth will be observed primarily in urban centres (IPCC 2014). Dense and populated cities consequently, house a larger concentration of climate risks and potential impacts which grow along with demographic rise (ibid.). However, the role that cities represent for climate change adaptation is still largely unexplored with scarce information about the connections between governmental policies and the city's level of response (HUNT et al. 2010).

Existing adaptation strategies and policies are often not targeted to the city level. Additionally, the available data required for planning adaptation is collected on a wider scale, bigger than city level, leaving the local specificities aside and limiting therefore the capacity to adapt (IPCC 2014: 563). Furthermore, cities behold many different hierarchical structures that have direct consequences on adaptation capacity to climate change and that are considered as barriers or limitations (HUNT et al. 2010). Actors within these structures are also constrained by interlinked mechanisms such as funding, institutional systems, technical expertise and leadership (GUPTA et al. 2010).

Additionally, impacts of climate change are more likely to be identified and studied across different sectors (i.e., agriculture, industry) and different regions rather than the city level

or the local level (i.e., developed countries) (HUNT et al. 2010). Policies and development plans at the national level give scarce attention to adaptation at the city level, compared to the attention given to sectors like agriculture, industry or mobility (IPCC 2014: 564). Adaptation to climate change should be embedded at the city level and understood by the local authorities in order to raise local awareness, respond to citizens and civil society pressures and needs, and work to build inclusive solutions. The IPCC identifies, that “[...] *many aspects of adaptation can be implemented only through what urban governments do, encourage, allow, support, and control [...]*” (IPCC 2014: 575).

However, all the cumulative opportunities seen in cities to adapt to climate change contrast with the real practice (HÖLSCHER et al. 2019). Within a city, the capacity for adaptation does not look the same at the local, neighbourhood, or individual level. Adaptation decisions do not happen within a vacuum. They are immersed in an institutional context that is part of the city scale, where institutions facilitate or constrain adaptation (VINCENT 2017). In this sense, adaptation is limited by institutions, by regulatory structures, and social norms (ADGER et al. 2005). Furthermore, local policies have only a limited range where climate change adaptation measures are feasible and binding for institutions and society in general. Thus, highlighting the importance of local institutions to perform as an extension of adaptation policies (ROSALES 2019: 194).

### 2.3. Adaptation in the City

According to the Center for Climate and Energy Solutions (C2ES, on the World Resources Institute, 2017), a high percentage of the global manmade emissions is due to energy production and consumption (72%). Within this percentage, 32% of gas emissions are caused only by electricity and heat consumption at the household level (see Figure 1). In 2019, results of a study conducted by a research team from the University of Michigan published by PBS organization, shed light on household emissions in the U.S. Data from 1995 to 2014, showed that yearly household emissions represent over 20% of all country’s emissions. Meaning that households in the U.S. are being responsible of around 5.43 gigatons of carbon dioxide emissions every year (PBS 2019).

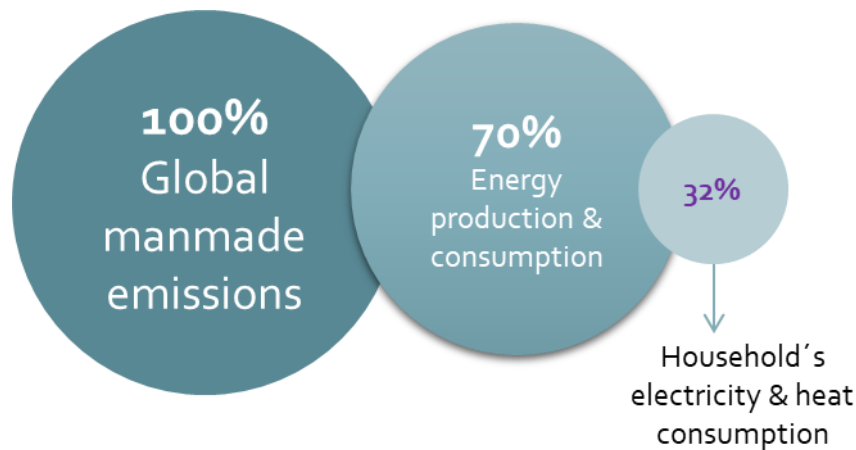


Figure 1. Global manmade emissions and the Household share. Source: C2ES, 2017. Self-elaboration.

In many European cities there has been a noticeable decrease in energy demand for heating in the winter, but increasing demand for cooling in the summer (HUNT et al. 2010). Thus, evidencing adaptation needs at the city level, but mostly at the household level.

Moreover, adaptation at the household level is directly linked with individual adaptation, which actions are not autonomous according to ADGER et al. (2005). Individual adaptation is highly constrained by regulatory structures, i.e. housing institutions, that have the power to issue internal normative or regulations that may boost or constraint adaptation to climate change (RODERS et al. 2015). Considering previously mentioned global emission values caused by households (see Figure 1) and the link between household adaptation and individual adaptation, the presence of institutions plays an important role among adaptation to climate change. Individual adaptation is constrained by institutions at the city level, the role that these institutions may have on household adaptation (see Figure 2). For instance, in cities where a large percentage of households live in dwellings under management and regulation of housing institutions, the role of housing institutions fostering individual adaptation to climate change at the household is a major component in achieving climate change adaptation.

However, regardless of the importance given to the role of institutions over individual adaptation to climate change, there is a lack of methodologies developed to assess the way in which institutions stimulate the capacity of adaptation of individuals (GUPTA et al. 2010; GRECKSCH 2013; GROTHMANN et al. 2013). The low amount of research that evaluates the ability of institutions to foster adaptive capacity in society is striking (WRR 2006). Assuming that housing institutions entail an important role when fostering the adaptive capacity of

their tenants. The study and understanding of the underlying characteristics of these institutions can guide us to determine how they enable or constraint adaptive capacity. Furthermore, studies have highlighted the relevance of implementing climate change adaptation actions within housing institutions, since (1) they are highly connected with the preservation of the common interest; (2) as institutions they offer a social service, have a legal obligation to perform towards climate change adaptation; (3) not responding to climate change adaptation threatens the value and service of their dwellings; (4) and within the European context, housing institutions may profit further from adaptation actions on housing stock created in times when climate change was still unexplored (RODERS et al. 2013; RODERS et al. 2015; RODERS et al. 2015a; VAN HAL & FEMENIAS 2009).

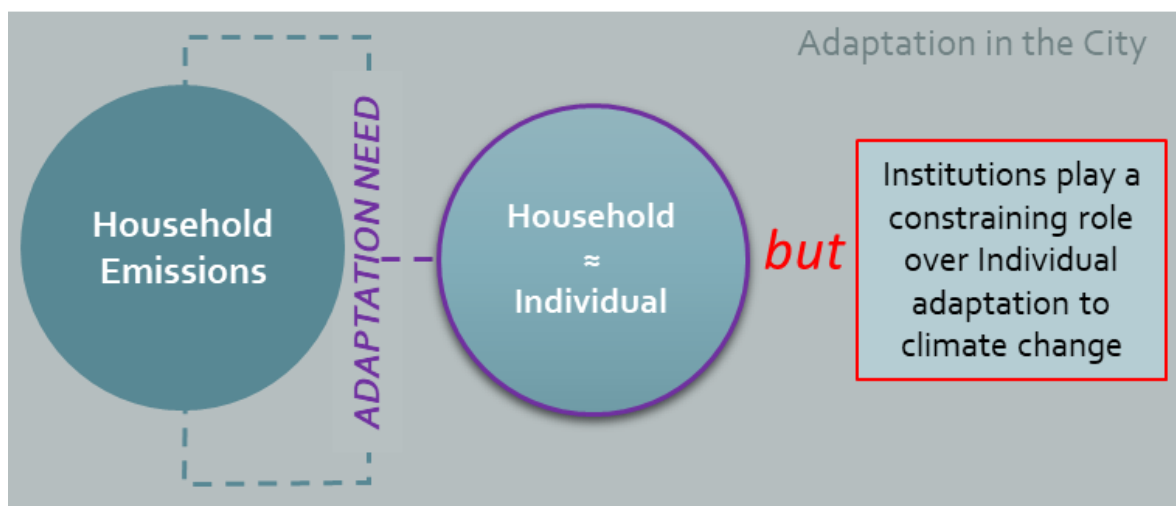


Figure 2. The need for Individual adaptation within housing and the constraining role of Institutions within the city level. Self-elaboration.

#### 2.4. Delimiting the Research Gap.

Recalling the “Problematic trinity” the myriad of impacts resulting from climate change have reached the point where they are affecting our immediate surroundings and therefore our daily lives. Efforts to address climate change and adapt to the new realities, have surfaced at many political and geographical levels. However, implementation and progress towards effective adaptation has still not showed effectivity (RIPPLE et al. 2017).

Metaphorically speaking, Cities represent the light at the end of the tunnel being considered to be the scale at which the necessary characteristics for effective adaptation to climate

change are available (IPCC 2014; KRELLENBERG et al. 2016; HÖLSCHER et al. 2019). Furthermore, Cities represent as well a leverage point against climate change, considering they house more than half of the world's population, consume 7% of its natural resources, and are directly and indirectly responsible for 60 to 80% of global greenhouse gas emissions (NUTTALL 2013).

But despite the existing information on adaptation at the city level and the benefits it represents for climate change adaptation, individual and collective actions are limited. Coexisting in a context (i.e. the city) where institutional systems have a direct influence on adaptive capacity, may consequently constraint it. However, as mentioned before, there are very few studies that explore the role of city-scale institutions in fostering adaptation to climate change (GUPTA et al. 2010). Moreover, there are even fewer studies and methodologies to help identify the potential of institutions to foster the capacity of adaptation to climate change.

In this study I pursue to fill the gap of research that evaluates the ability of housing institutions to foster adaptive capacity. Furthermore, along the study I will elaborate on possible contributions to the evolving methodology for assessing adaptive capacity of institutions.

In a nutshell, my research should help to: (1) identify weaknesses and strengths of housing institutions in fostering adaptation to climate change; (2) to analyse different policies related to adaptation and its direct relation with the adaptive capacity of institutions; (3) but most of all, to identify how housing institutions foster adaptive capacity of tenants, and consequently of society.

## 2.5. Research Questions

Based on the literature review, I was able to identify a common ground where adaptation to climate change plays a connecting role between housing and the city level: On the one hand, it represents a human and environmental necessity. On the other, it represents a duty and social responsibility from housing institutions. Following this connection and with the

aim of assessing how housing institutions foster adaptive capacity, the conceptual research questions that will guide this study are:

**To what extent are social housing institutions fostering climate change adaptive capacity?**

Operationalizing the different aspects of this question, the following sub-questions will be analysed as well:

- In what manner does the intrinsic characteristics<sup>1</sup> of housing institutions influence their adaptive capacity and that of tenants?
- In what way does housing institutions regulations shape tenant's adaptation capacity?
- What role do institutional actors within housing institutions play in the improvement or limitation of tenant's adaptive capacity?
- How can social housing institutions improve the adaptation capacity of tenants?

It is important to clarify that the research questions follow a conceptual character that will have to be adapted to the empirical specificities of the case study. In chapter 4, the methodology chosen to carry out the evaluation is introduced. Within this methodology the selection of a case study is vital, once this step is reached, the research questions will have to take an empirical character and be adapted to the selected case study.

### 3. THEORETICAL AND CONCEPTUAL FRAMEWORK

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<sup>1</sup> Grothmann's (et al. 2013) intrinsic characteristics of institutions are formal rules, informal norms, customs, practices and beliefs (in chapter 5).

In this chapter I will introduce the theoretical basis of the research. The concepts hereafter are the basis for the design and amendment of the research methodology. In the following, I will further elaborate using the three-dimension approach from the problematic triad (see Figure 3).

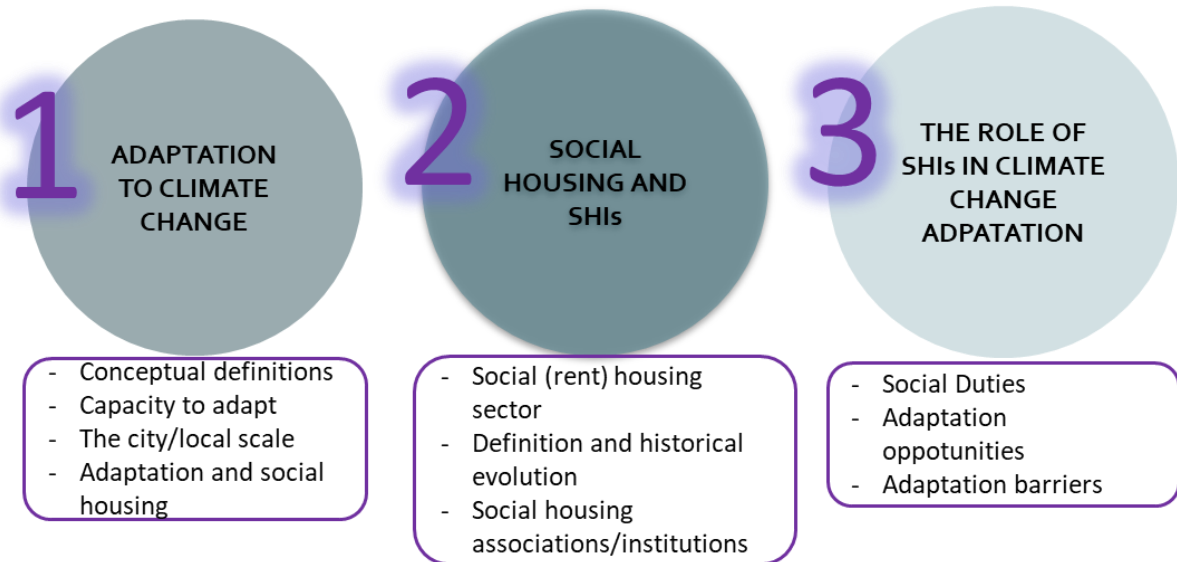


Figure 3. Content overview of Theoretical and conceptual framework chapter. Self-elaboration.

### 3.1. Adaptation to Climate Change

As climate change research and knowledge has advanced, there has also been an increasing recognition of human system's adaptation to climate change (DE FRANCA DORIA et al. 2009). Between 2005 and 2010 the amount of scientific research addressing not only climate change but climate change assessments (encompassing impacts, adaptation, and vulnerability) has more than doubled itself (IPCC 2014: 3). Historically, increasing and notorious climate change impacts on human systems have led to behavioural and physical adaptations (RODERS et al. 2015). Among the studies, there is a leading amount of documentation related to adaptation and its effects over lives, livelihood, health, ecosystems, economies, societies, cultures, services, and infrastructure (IPCC 2014: 4). The regular and systematic evolution around adaptation as a concept has led to the creation of guidelines, design recommendations, strategies, and even adaptation policies. Most importantly, it has led to a settled definition of the concept of adaptation to climate change (GROTHMANN et al. 2013).



The latest Assessment report issued by the IPCC defines adaptation as:

*“The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustments to expected climate and its effects”* (IPCC 2014: 5).

It is important to highlight that even within the different assessment reports issued by the IPCC along the years (2001 to 2014) there has been a minor evolution of the concept. In the third assessment report, the definition of adaptation to climate change elaborated on the **“adjustment of human systems in response to actual or expected climatic stimuli”** (IPCC, 2001: 365). In the fourth assessment report, it was portrait as **“initiative and measure to reduce vulnerability against climate change effects”** (IPCC, 2007: 76). For ROSALES, “adaptation refers to the **act of change in order to cope or deal with changing or dynamic climate”** (2019: 44). Such minor changes and variations within the definition of the concept underline the high level of agreement among researchers (GROTHMANN et al. 2013).

However, homogeneity breaks apart when we try to delimit the objectives behind climate change adaptation targets. For instance, DE FRANCA DORIA et al. (2009) identified and listed adaptation goals. For instance, to maintain climate-related risks at present levels, reduce risks if the current levels are deemed to be unacceptable, and minimize exposure of the most vulnerable population. ADGER et al. (2005), argues that adaptation goals correspond to individual responses, meaning that an adaptation action that works for an individual could not work or be the focus of another. That given, the adaptation goal of one institution may not be the goal of another. Furthermore, the goals behind adaptation to climate change are strongly linked to the capacity to adapt (also adaptive capacity). ROSALES, remarks that the capacity to adapt to climate change is context and place specific. Therefore, the concept cannot entail a “one-size-fits-all” strategy for adapting (ROSALES 2019: 49).

### 3.1.1. Scale matters in Adaptation to Climate Change

Following ADGER et al. (2005), adaptation is a constant flow of activities, actions, decisions and attitudes that shape our lives in all aspects. As such, they are influenced by the norms and processes characteristic of the society we live in. At the same time, these norms are shaped by framing types among strategies and policies characteristic of this society.

Along with the need for adaptation to climate change, the significance over the proper scale of action has been acknowledged (DE FRANCA DORIA et al. 2009). As mentioned in the chapter 2.3, it is believed that the ideal environment to achieve adaptation can be hold by cities (IPCC 2014; HÖLSCHER et al. 2019; KRELLENBERG et al. 2016). Furthermore, studies have recurrently highlighted the importance of linking adaptation to climate change with urban development in cities (IPCC 2014:563). Thus, contributing to the conception that the city scale is key to achieving effective adaptation to climate change. Cities represent benefits within adaptation to climate change. On the one hand, the level of attention to risks and opportunities increases on the side of public and private actors on a local (city) scale. On the other, the smaller the scale, the greater the probability of like-minded actors, that can facilitate decision-making (HUNT et al. 2011). Smaller (local) scales allow systems to better organize themselves and their interactions towards specific common goals (ADGER et al. 2005). Furthermore, building adaptive capacity at the local level (city level), benefits strongly from cross-sectoral and vertical integration of local and national entities, which supports bilateral responsibility and collaboration (LEE et al. 2020).

Moreover, given that adaptation is a concept that in order to reduce climate related risks makes use of actions that include infrastructure adjustments, changes in behaviour, organizational management, technological solutions, etc., it can be boosted by political embeddedness. For instance, common public awareness, involvement and discourse of non-governmental actors, and a common view for “sustainable development” among stakeholders (ROSALES 2019; LEE et al. 2020).

Adaptation to climate change at the city level can also profit from a wider availability of documentation and research resources. Taking advantage of the local (city) scale can improve the collection of data required for planning, establishing specific risks, elaborating more certain hazard-forecasting and in general to combat the lack of specificity in data (IPCC 2014: 563).

Actions for adaptation to climate change have emerged constantly in political agendas around the world. Europe is the region with the largest percentage of cities (76%) with ongoing adaptation policies embedded at all levels (LEE et al. 2020). However, out of that large percentage, there is very few documentation of adaptation at the household level and few research over adaptive capacity of housing (FORD et al. 2011; SHEARER et al. 2016). Though the number of cities around the world addressing housing adaptation measures has been increasing in the last decade, like New York, Boston, London, and Melbourne (RODERS et al. 2015), there is still scarce evidence of the achievements of such adaptation goals through implemented plans, strategies, regulations, and budgets (RODERS et al. 2015a).

Adapting the built environment to climate change is perceived as one of the central actions towards the hazards of climate change (SHEARER et al. 2016). Climate change adaptation exhibits an important opportunity within housing in general. It has the capacity to produce co-benefits around the urban area of development. Co-benefits like safety, health, comfortable environments, and quality housing, that despite the possible trade-offs can be achieved through institutional links, careful planning and the combination of adaptation and mitigation actions and approaches (IPCC 2014: 578).

### 3.1.2. Adaptation and Housing

The relation between adaptation to climate change and housing appears to have a strong link. Firstly, housing production contributes directly to climate change, performing activities like land clearing, use of fossil fuels, and exploitation of resources for the construction industry. Secondly, there is a direct relation between the characteristics of developed housing and indirect climate change effects. Further sources of gas emissions related to infrastructure (i.e. construction materials, location, scale and housing related infrastructure) contribute not only to the degree of hazard exposure, but also to the degree to which individuals contribute additionally to climate change (i.e. increased carbon dioxide emissions from car use due to poorly located housing developments) (SHEARER et al. 2016).

Housing adaptation to climate change does not look the same in the private as in the social sector. The gap is not only seen in their different adaptive capacities, their adaptation goals,

and their resources. But most importantly, development is not undertaken by the same stakeholders or under the same administrative features (RODERS et al. 2013; SHEARER et al. 2016). Following RODERS et al. (2015), entities in charge of social housing provision should try and profit from implementing adaptation measures, since they are already considered social mediators. Including adaptation measures can further contribute to their social role, their acceptance in society, and their image as caretakers of the social interest. Additionally, due to the institutional context in which social housing developers are immersed (characteristic of the city level) (ADGER et al. 2005; VINCENT 2017), the integration of adaptation measures can be seen as a legal obligation, given the legal status of the social housing sector.

According to GROTHMANN et al. (2013), several studies confirm that social factors like the presence of institutions, strongly affect the capacity to adapt to climate change. Thus, pointing out to the possibility of a relation between institutions involved in social housing development and the adaptation capacity from social housing users. But in order to follow this assumption, it is vital to define both, social housing and social housing institutions.

### 3.2. Social Housing and Social Housing Institutions (SHIs)

#### Evolution and conceptualization of social housing

The conceptualization as well as the historical evolution of social housing has notorious differences across European nations (MUSTERD 2014; HEGEDÜS et al. 2017). The beginning of the social housing sector dates since the late nineteenth century, where its creation followed welfare regime ideologies around the provision of livable, decent households, with suitable facilities and characterized by affordable rental schemes (MUSTERD, 2014). Though historical forces of globalization, i.e., neoliberalism, privatisation, financialization, have affected the provision and development of housing thoroughly, a certain percentage of the social housing stock and some of the actors involved have survived (MATZNETTER, 2020b). However, today many European nations are no longer characterized as primary and unique suppliers of welfare. New actors have emerged in the picture, i.e., supra-national agreements, sub-national entities and institutions such as social housing institutions (MATZNETTER 2020a.).

The definition of social housing across Europe responds to the different welfare schemes based on ownership, institutional settings, levels of governance and degree of cooperation (HEGEDÜS et al. 2017). A greater amount of studies classify **social housing based on ownership**: “social housing is that which is administratively allocated on the basis of need” (HAFFNER et al. 2009-2010 in SCANLON et al. 2014: 3). According to the OECD, **Social housing is that owned or supplied by the state or independent organisations**, created under the premise of providing housing with rental prices below the market-rental prices (2020). HEGEDÜS et al. (2017) claim that the most agreed definition of social housing is: “*dwelling directly or indirectly subsidised, lent at below pure- market rental prices and allocated administratively*” (HEGEDÜS et al. 2017). Thus, providing a merged version of the definitions before.

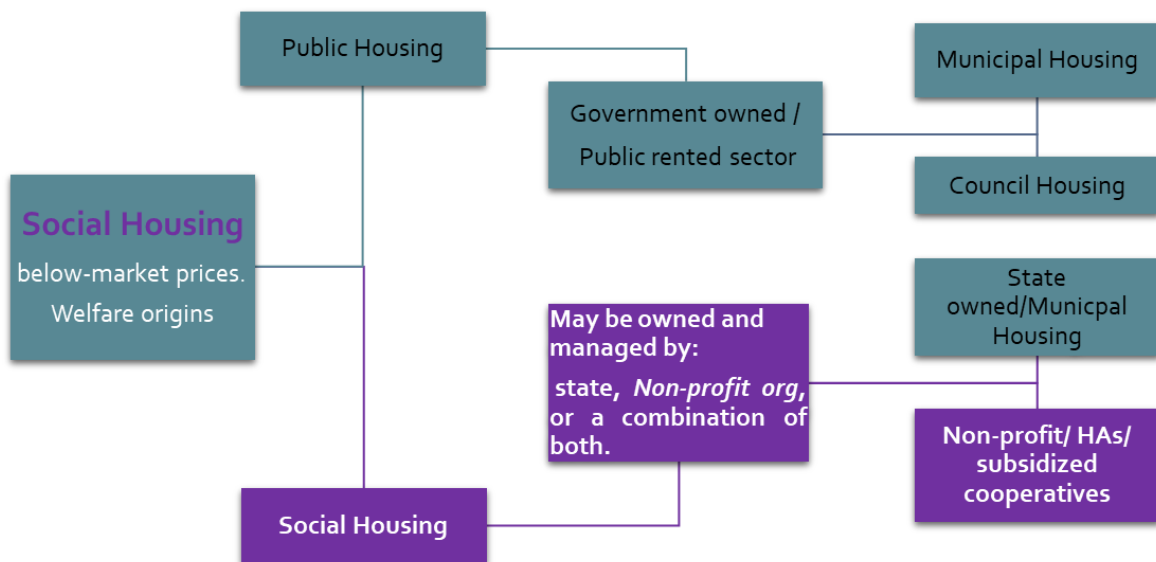


Figure 4. Conceptual map of the structure and division of the social housing sector. Source: based on SCANLON 2014. Self-elaboration.

Social housing is characterized by two owner-typologies: municipal or council housing, owned by municipalities or the state; and owned by non-profit organisations most commonly referred as housing associations (HAs) (SCANLON, 2014) (see Figure 4). Social housing owned by non-profit associations took a stand in the 1960’s and 1970’s, when a rapid decrease of council housing (state owned) was observed, together with an increase in cooperation schemes where municipalities and housing associations came together (MUSTERD 2014). Such a trend could be observed in many European countries and was mainly driven by the aim to reduce the pressure of governmental budgets and also due to

neo-liberal ideas that believed that HAs, as private institutions, could provide a more efficient and caring response for tenants (SCANLON et al. 2014).

Across European countries the amount of social housing dwellings varies (see Figure 5). The role of HAs as providers of social affordable housing is in constant evolution. Today, HAs are also involved in the provision of employment services, mobility and digitalization initiatives, cooperative housing models, parking platforms, electric car infrastructure, and many other services that touch on the development of housing (Housing Europe, 2019).



Figure 5. Share of Social Housing stock in Europe. Source: The State of Housing in the EU, 2019. Housing Europe, the European Federation of Public, Cooperative and Social Housing. Brussels, September 2019

The relation between HAs and the state relies on subsidies and capital lending (MUSTERD 2014). HAs as institutional structures, are directly related to urban development, urban planning, and the construction sectors (MATZNETTER, 2020a). Since their creation they have evolved on to a more independent working structure, sometimes presenting independent financing schemes, and balancing investment and returns (MUSTERD 2014).

Partnerships between HAs and governments take place at the local and municipal level and are structured under legal understandings that compel housing associations to follow legal authority in all their actions (McDERMONT 2010: 67). In this sense, local governments provide the resources, land and money. They are in charge of permissions and approvals, having still a considerable control over the performance of HAs (ibid: 70). Further forms of control appear among housing related regulations and policies at the local, national and the European levels. Compelling housing associations to implement certain measures in construction processes, conception, and planning of housing developments (SHEARER et al. 2016).

Furthermore, housing associations have moved towards a supportive evolution, acquiring expert knowledge on user needs, on building technologies and above all, on their social role and their goal to help the most vulnerable (McDERMONT 2010). HAs have positioned themselves as important stakeholders in the social housing stock (RODERS 2015a). Moreover, housing associations are considered major potential providers of climate change adaptation measures within social housing dwellings (RODERS et al. 2015). They draw special attention to the provision of quality of life and healthy housing, through the creation of plans and adaptation strategies (RODERS et al. 2013). But, despite their commitment to serve society, housing associations have presented a purely incidental implementation of adaptation measures (RODERS et al. 2015).

Literature over housing associations make a rather structural use of the term association, mostly related to the historical and increasing partnerships between local governments and organisations involved in housing provision (development) (McDERMONT 2010). Regardless of the structural use of the word association, housing associations as such, are also systems with specific intrinsic characteristics that are addressed in the literature as institutions (GUPTA et al. 2010).

Following the definition given by the Institutions Project of the International Human Dimensions Programme (IDGEC 1999: 14), institutions are “**systems of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among occupants of the relevant roles**” (GUPTA et al. 2010). As such, social housing associations (HAs) are also social housing institutions (from now on **SHIs**) since they are characterized by their own rule system, decision-making procedures, practices, roles and interactions. Although, the concept of institutions has been used quite loosely in literature on climate change and adaptive capacity, several studies highlight the importance of institutions as social factors among adaptive capacity of human systems (GROTHMANN et al. 2013). There is as such, no evidence of the presence of the concept of adaptation within the definition of institutions. But, there is rather a noticeable presence of the concept of institutions within adaptation literature (GUPTA et al. 2010). Reflecting on the definition of institutions provided by the IDGEC, there is a noticeable relation between internal rules, procedures, and programs and the way participants react to such. In this sense, assuming that social housing institutions may develop internal adaptation programs (rules or procedures) that influence their participants or immediate society to perform adaptation measures or encourage response towards climate change, it can be recognized that they have adaptive capacity and that they can or not foster it.

According to GUPTA, social housing institutions that foster adaptive capacity, (1) support the inclusion of different actors, measures and perspectives; (2) seek to improve themselves through feedback; (3) motivate users to change their behaviour; (4) support leadership initiatives and are able to mediate and mobilise resources for the implementation of adaptation measures (GUPTA et al. 2010).

### 3.3. The role of SHIs in Climate Change Adaptation

SHIs as housing developers, are considered big contributors to climate change (gas emission produced from construction process). Nevertheless, they also have the power to implement adaptation measures along the planning, construction, maintenance, and retrofitting process (SHEARER et al. 2016). Thus, playing an important and active role in the implementation of adaptation measures.



According to RODERS et al. (2011), housing institutions have six different duties, that are legally bounded: (1) provision of quality in the dwellings, (2) housing rent management, (3) formulation of policy and tenant-participation management, (4) finance and administrative duties, (5) livability and (6) housing care or maintenance. The relation of most of the duties with adaptation to climate change is evident. Alone the quality, livability, policy, tenant participation, and maintenance are highly related with adaptation needs.

SHIs in their role of owners, have the power to implement physical adaptation measures in dwellings. However, such power is limited by the amount of knowledge that SHIs have about adaptation including its risks, prognoses, possibilities, and opportunities (RODERS et al. 2013). Furthermore, with the growing implementation of people-centred approaches among climate change related fields (KRELLENBERG et al. 2016), SHIs are keener of the involvement of tenants, believing that they should take initiative for adaptation implementation (RODERS et al. 2015). However, such tenant-centred approach is limited by many factors like the perceptions and beliefs of individuals (GROTHMANN et al. 2013) and the cost of adaptation and the link to the fear of higher rents within social housing (RODERS et al. 2015). In addition, an overall lack of specific technical knowledge and finance frameworks over adaptation actions limits the implementation of such (RODERS et al. 2013).

Social housing institutions willing to include adaptation measures, have to consider them as part of their organisational strategy. Meaning that adaptation measures must be present along management, design, development, and re-development of dwellings within their housing stock (RODERS et al. 2015a). Moreover, social housing institutions that pursue tenant-centred approaches within adaptation, will certainly have to improve the way they foster adaptation to climate change, in order for such initiatives to be possible. For instance, increasing awareness among tenants, financing frameworks, and developing internal policy (RODERS et al. 2015a). However, this is where the turning point of this research appears. The different measures adopted and implemented by SHIs along their housing stock and housing development can influence the social patterns of their tenants. Meaning, that SHIs adaptation decisions (measures and actions) will directly affect the adaptive capacity of the tenants. In this regard, it is important to ask to what extent can SHIs implement measures? What opportunities can be identified in the development and maintenance of the social

housing stock? But also, what are the important limitations and barriers present in the level they are embedded.

### 3.3.1. Adaptation opportunities within SHIs

In recent years the importance and consideration of adapting the built environment to climate change has grown significantly (SHEARER et al. 2016). The risks that climate change represent for human systems at all scales, have become a driver in the effort for adaptation (KLEEP & CHAVEZ-RODRIGUEZ 2018). It is believed that a way of increasing implementation of climate change adaptation measures within housing can be achieved through the involvement of social housing institutions (RODERS et al. 2015a).

SHIs have a considerable influence over measures **taken at the building level** on social housing. Documented measures at this level include adaptation to climate change by applying lighter colours on facades or solar reflective coatings, shading sunscreens, external insulation systems (panels), window shading, and greenery. Such measures are implemented to reduce the temperature and overheating in the living areas of the dwellings, and the demand and implementation of cooling systems that can represent future climatic risks (RODERS et al. 2013; IPCC 2014; RODERS et al. 2015a). Further measures like innovative house-cooling ideas for owners, early warning systems, water management, water and materials re-use, consumer education, technological solutions for water saving (i.e. low-flow systems or dual flush toilets), rainwater harvesting and even new participatory approaches for water planning draw over the behavioural and social side of adaptation measures (see, e.g., Eakin et al. 2007 for Participatory water planning) (IPCC 2014:8.3).

Adaptation can also be seen at a bigger scale, **the neighbourhood level**. Though SHIs have a limited influence range at this level, recent observations by RODERS et al. (2015a) have highlighted a tendency for partnering. SHIs partner with municipalities in order to implement adaptation measures. As well, measures at the neighbourhood level respond to communal risks. For instance, overflowing sewage due to extreme rainfall can be minimized through water retention systems, like green-roofs, or effective drainage through open and absorbing surfaces (open pavements) (RODERS et al. 2013; RODERS et al. 2015a). Extreme heat, heat islands, and overall temperature increases represent an important challenge at

the neighbourhood level (IPCC 2014). Measures towards climate change adaptation include, cooling systems based in strategical implementation of evaporative trees, selection of materials and housing design (in housing blocks or big developments), attention to orientation, double facades, running water sources, wind sun-covered corridors, planned ventilation, etc. (RODERS et al. 2013; IPCC 2014; RODERS et al. 2015a).

However, it is believed that effective adaptation involves a combination of measures like self-organizing strategies, adaptive learning, and certain variety in actors, frameworks, and processes. Thus, an overall adaptation culture (KRELLENBERG et al. 2016). In this sense, effective adaptation within social housing should come in the form of strategies that involve conceptual approaches like; policy development (guidelines, normative, programs, concrete adaptation measures), involvement of external actors (external actors: financial, knowledge-expertise, sectoral institutions), and partnering approaches (cooperation of stakeholders) (RODERS et al. 2015).

According to RODERS's et al. (2015) research results, where five strategies to enhance implementation of climate change adaptation measures in social housing were evaluated by means of a survey among Dutch SHIs. Findings showed that implementation is being limited not only by current financial struggle, but also by the low priority that climate change adaptation presents within the political agendas (RODERS et al. 2015). Further limitations and barriers involved limited knowledge, awareness and willingness for policy development, and an overall fuzziness on the definitions of mitigation and adaptation measures (RODERS et al. 2015). Such barriers along with scarce understanding of future climate changes are strong triggers for maladaptation (FORD et al. 2011). When we analyse institutions, the importance of obstacles is magnified. Their field of action, the relationship they have between local authorities and users, as well as their social responsibility, result in a specific list of limitations that only apply to the SHIs.

### 3.3.2. Adaptation barriers within SHIs

Institutions are embedded in a governance context that provides them with rules and roles in the form of formal policies or informal behavioural patterns (GUPTA et al. 2010). There is evidence that housing institutions in the social rented sector (SHIs) are more likely to not

implement climate change adaptation measures, due to the absence of policy guidelines and financial resources (RODERS et al. 2015). Engagement of sectoral institutions and stakeholders is vital at the local level, in order to maximize the implementation of adaptation actions and the effectiveness of them (HUNT et al. 2011). However, the lack of concrete adaptation policy guidelines directed to social housing is still one of the biggest barriers (RODERS et al. 2015).

Though adaptation policies have emerged on different governance scales, at the local level the information presented in policies and strategies is diffuse. SHIs and tenants must present a level of awareness towards climate change before adaptation strategies can be developed effectively and implemented (RODERS et al. 2011). Consequently, lack of concrete policy measures leaves room for SHIs to avoid the unwritten duties for adaptation (RODERS et al. 2013).

At the institutional level adaptation to climate change can also become an important issue due to the constant interaction between institutions and actors. For instance, it can deepen existing conflicts between actors over differences in targets, goals, values, and perspectives. There is also a high risk of following adaptation paths that respond to cost benefits or cost savings, instead of a path that follows the minimization of climate change related risks (ADGER et al. 2005). Thus, highlighting the possibility of maladaptation decisions when interactions are being driven by interest and power demonstrations. Nevertheless, the permanent and recurrent importance of the tenant make SHIs sensitive towards fulfilling their adaptive requests (RODERS et al. 2015).

Overall, the performance of adaptation measures is limited by the lack of resources, mostly in retrofitting programs (RODERS et al. 2015). Moreover, financial scarcity has a negative impact not only over new construction but also over renovation cycles, further prolonging retrofitting periods (25-40 years) (RODERS et al. 2015). Thus, contributing to the vulnerability range of tenants facing increasing climate change related risks.

Further constraints towards climate change adaptation include tenant's insecure tenure positions, which reflects their unwillingness to invest in adaptive measures in the house they live in, but do not own. This unwillingness consequently displays a lack of initiative when it comes to invest and participate in adaptation measures at the community level (IPCC, 2014:

581). The following table summarizes the main challenges for adaptation within climate change according to GROTHMANN et al. (2013). The list of limitations and barriers is quite substantial. Yet, the set of opportunities detailed in chapter 3.3.2 is promising.

### Challenges for adaptation to Climate Change

- Uncertainty and perception of climate change related risks
- Lack of awareness and related knowledge.
- Lack of comprehensive, holistic and clear approaches
- Effective coordination and integration at the policy level.
- Equitable distribution of adaptation measures and actions
- Lack of financial, political and regulative resources.

In the course of chapter 3, the groundwork for the research was prepared. The significance of SHIs in city-level adaptation to climate change was recognized. Advantages and disadvantages were found in the governmental, institutional and policy environment in which SHIs are embedded. The history and evolution of SHIs positioned them as important supporting entities around climate change adaptation (McDERMONT 2010). Specifically, they have developed internal rules and regulations, particular decision-making processes, and value-driven practices. As such, SHIs have the capacity to foster adaptive capacity on their own (GUPTA et al. 2010). However, it has been found that the implementation of measures is merely incidental (RODERS et al. 2015), making important the investigation of SHIs fostering climate change adaptive capacity.

The next chapter displays a detailed description of the chosen methodology. It presents the Adaptive Capacity Wheel as assessment framework and the adaptations around it. Until now, the research questions have been handled as general questions. In the moment the case study is selected, the research questions take a specific tone, delimiting the research around the case study.

#### 4. RESEARCH DESIGN & METHODOLOGY

In this chapter I will describe the research design applied for this thesis. The focus of my study was to evaluate the ability of SHIs to encourage and support adaptive capacity. In this sense, the Adaptive Capacity Wheel by GUPTA et al. (2010) (from now on also ACW) offered a suitable base for an assessment framework. Though, the particularities of my research pushed for a more detailed methodology design, I brought together a combination of different methodological steps as complement to the ACW framework. The following figure (Figure 6) depicts the methodological process step-by-step, it gives a particular overview of the empirical section.

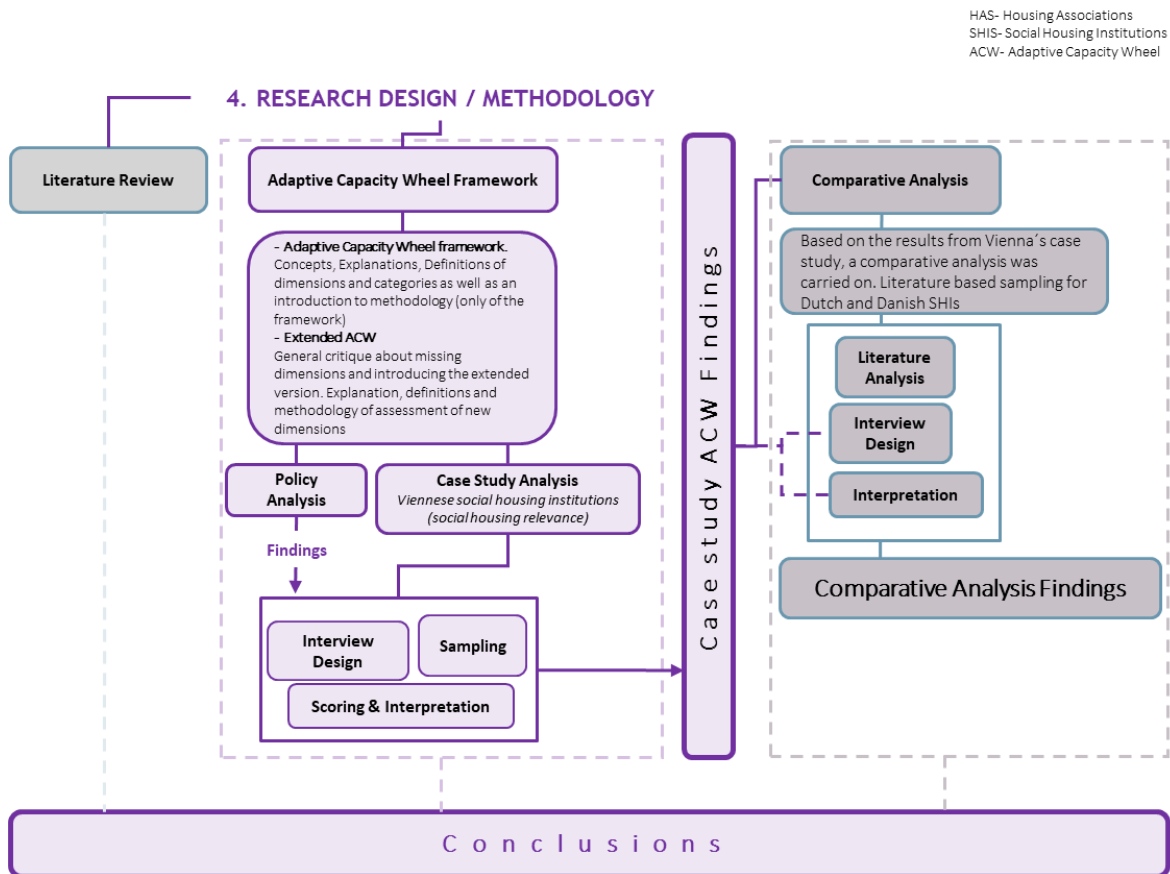


Figure 6 Master Thesis Research Design: a graphic explanation of the research methodological process. Self-elaboration.

# Master Thesis Road-Map

Fostering Climate Change Adaptive Capacity: Analysis on Social Housing Institutions based on the Adaptive Capacity Wheel framework.

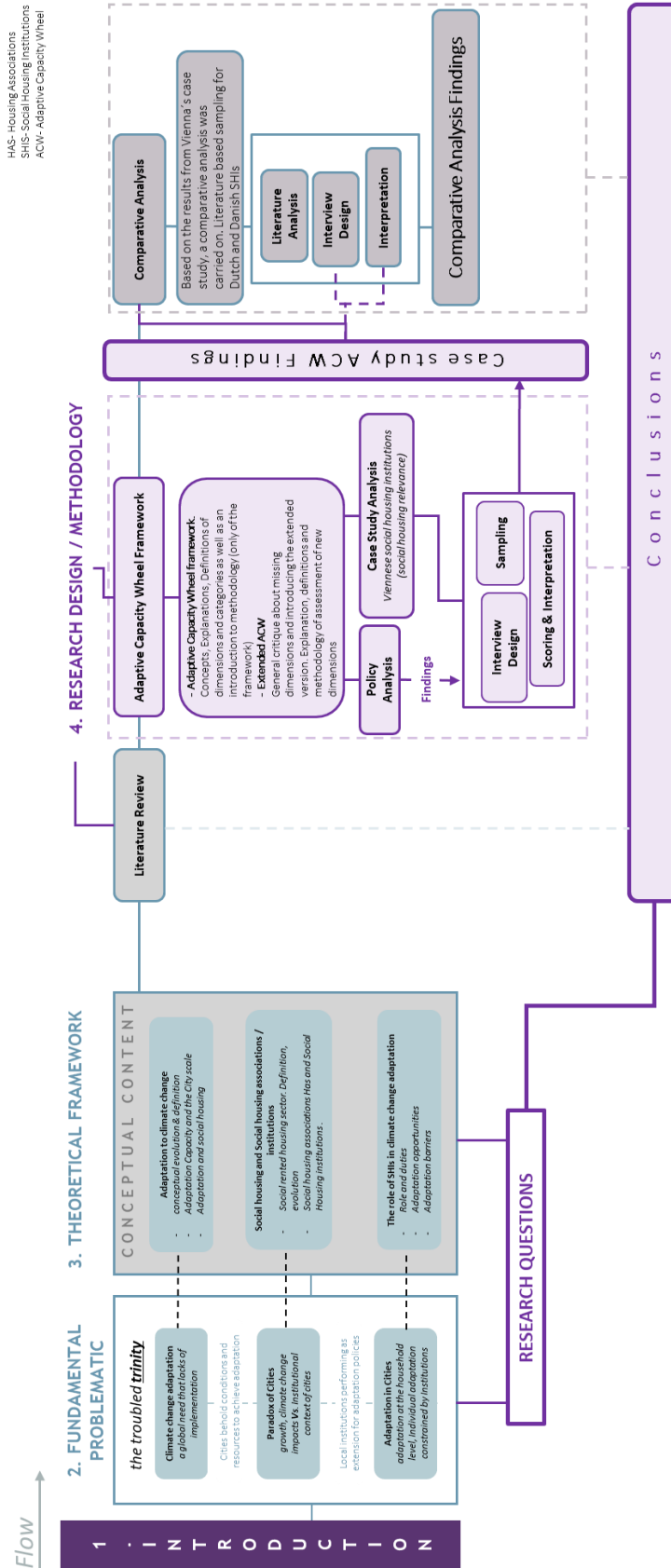


Figure 7. Master Thesis Road-Map. Self-elaboration

The first research stage, the **literature analysis**, evolved around three main dimensions: climate change adaptation, the city level, and the role of institutions. The qualitative content within the literature analysis is presented in the first two chapters of the thesis: Chapter 2 the fundamental problematic, which pursues to state the issues, challenges and gaps within the research, and Chapter 3 the theoretical framework, that provides the conceptual content anchoring, supporting and guiding the methodology.

The lack of adaptation assessment frameworks to evaluate the capacity of institutions to adapt to climate change was constantly noted along the literature research (ADGER et al. 2005; GUPTA et al. 2010; GROTHMANN et al. 2013; RODERS et al. 2015a). However, I was also capable of noticing important similarities among several researchers over the use of qualitative approaches, which set a trend to follow.

In the empirical part of the research I make use of the Adaptive Capacity Wheel framework from Gupta et al. (2010). A framework created to assess how institutions foster the adaptive capacity of society towards climate change. This framework offers a suitable way to answer the research questions, as well as the possibility to find leverage points for improvement within the researched institutions. The use of the framework, gave me the opportunity to find ways to enhance how institutions foster adaptive capacity.

#### 4.1. Adaptive Capacity Wheel (ACW), an assessment framework

The adaptive capacity wheel provides a framework to assess and evaluate how and to what extent institutions foster and encourage adaptive capacity. According to GROTHMANN et al. (2013) it is applicable to a wide range of different institutional contexts.

The framework is based in six dimensions with twenty-two categories among them. The dimensions are developed to assess how institutions encourage: (1) the integration of varied perspectives, actors and solutions; (2) constant learning from actors; (3) behavioural adjustments; (4) of leadership qualities and action; (5) mobilization and implementation of resources for adaptation; and (6) fair governance principles (GUPTA et al. 2010).



1. **Variety**, arguing that there is not one-size-fits-all framework given that climate change involves a variety of actors, institutions and levels of governance. This dimension is applied as a way to evaluate the variety with which an institution is adapting to climate change. *Variety* encompasses the involvement of a varied perspective, actors, stakeholders and solutions.

2. **Learning Capacity**, assuming that institutions should encourage actors to learn as part of fostering adaptive capacity, this dimension looks over the capacity to enable continuous learning from social actors. Additionally, an exercise of reciprocity is implied where the institutions are also capable from learning from social actors.

3. **Room for autonomous change**, institutions fostering adaptive capacity permit social actors to adjust their behaviour autonomously. As such, institutions should provide required means and information. This dimension assesses whether institutions provide continuous access to information, social actors are capable to implement measures and whether actors are capable to improvise.

4. **Leadership**, as a driver of long-term, large-scale change is a way to assess how institutions push leaders to act. Leadership can be visionary, entrepreneurial (designing tools), and collaborative (use of instruments). This dimension evaluates the support of institutions for the emergence of leaders.

5. **Resources**, this dimension looks over the way institutions mobilize resources for the implementation of norms and rules but also for the possibility of changing those norms. Resources include: financial, human, political, legal, and technological sources.

6. **Fair governance**, implies the equitable application of resources, balance between effectiveness and efficiency, legitimate policy-making, equitable policy processes, equality of the outcomes, transparency in the processes, and a higher level of response for all different voices in society. All in all: legitimacy, equity, responsiveness and accountability.

#### 4.2. Extended ACW

Though the assessment framework proposed by Gupta et al. (2010) is considered to be applicable among a wide range of institutions and institutional settings, it has experienced critic over the omission of psychological factors (GROTHMANN et al. 2013; GRECKSCH, 2013).

GROTHMANN et al. (2013), introduces the importance of psychological factors to the adaptive capacity wheel framework. Arguing that the inclusion of *adaptation motivation* and *adaptation belief* within the dimensions of the framework is crucial, since they represent the

subjective conception of objective climate change risks and opportunities. Thus, motivations and beliefs influence the roles and responsibilities of individuals. Furthermore, motivation and belief, can either decrease or support chances of adaptation.

The research will include the proposed dimensions:

7. **Adaptation motivation**, evaluates the motivation of actors to implement, support, promote measures for adaptation to climate change. Adaptive capacity can be reduced if there is lack of motivation. Main determinants of motivation are: risk perception, chances and potential impacts.

8. **Adaptation belief**, draws on the belief of actors to be capable of successfully adapt to climate change. Furthermore, the dimension also includes the belief of actors over the existence of adaptation measures available (effective and realisable belief).

The following figure (Figure 8) presents the extended version of the adaptive capacity wheel framework, now integrated by eight dimensions. Further studies confirm the importance of including psychological factors as the “energy that makes the wheel turn” (GRECKSCH 2013). They additionally prove the efficiency of the framework and its quality as an informative and communicative tool that enables the discussion of strengths and weaknesses with actors, stakeholders and experts (GRECKSCH 2013; GRECKSCH 2015).

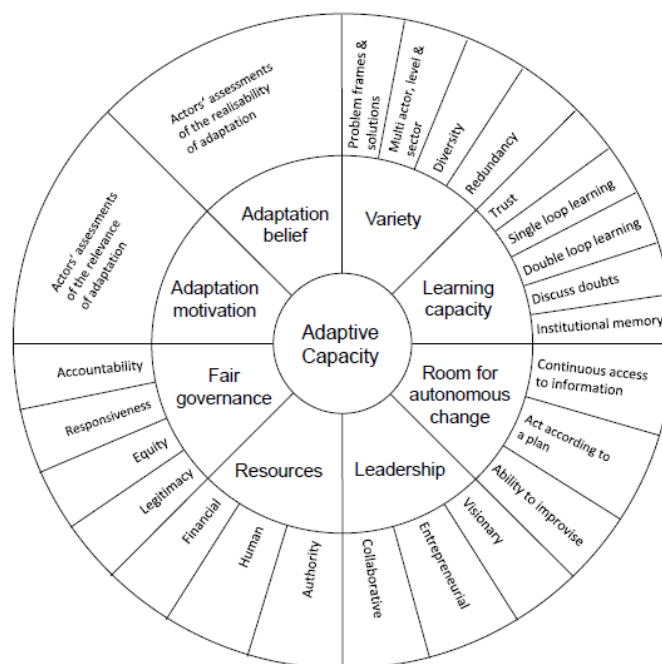


Figure 8. Extended version of the Adaptive Capacity Wheel framework by GROTHMANN. source: GROTHMANN et al. 2013.

For the implementation and use of the framework, Gupta et al. (2010) proposes a five-step methodology. Starting with a clear understanding of the object and the context of study. **Preparing the research** is the first step **(1)**, where the researcher should comprehend each dimension and the connection with the case study. **The data collection (2)**, follows a qualitative or semi-quantitative approach and can make use of various methods (interviews, observations, policy analysis, etc.). **Analysing the collected data (3)** by means of a rating methodology. **Interpreting the data (4)** involves the communication of results. Sharing the strengths and weaknesses found on the institutional context, possible observations of (inter)dependencies and tensions among the dimensions and finalizes with general findings. It can also include recommendations for improvement. The fifth and final step **presenting and communicating the data (5)**, includes the graphic design of the score diagrams (ACW graphics).

In the following chapters I will give a detailed description of each of the five steps of the ACW framework applied to social housing institutions.

#### 4.3. Selection of the Case Study

In the literature review I introduced the importance of tackling not only adaptation to climate change but also adaptive capacity at the city level. I highlighted, the need for adaptation at the household level, and the influence of institutions within the city level, over the adaptive capacity of society. In a wider scope, I seek to understand how institutions promote actions to adapt to climate change that result in the enhancement of adaptive capacity. In the light of the stated need to adapt to climate change at the household level, social housing institutions are being targeted. Therefore, I evaluated the ability of social housing institutions to foster adaptive capacity among its tenants.

It was decided to feature Viennese social housing institutions as case study. SHIs in Vienna are seen as the main actors within housing provision (LANG & NOVY 2014). Vienna is also one of the role models in Europe for highly institutionalized social housing (REINPRECHT 2014). The latter, in addition to the facility of access to information and meeting arrangements, were the main reasons for choosing it as case study.

Furthermore, the social housing sector in Vienna represents around 46% of all housing dwellings (AIGNER 2019). From that amount, around 60% is managed by social housing institutions (REINPRECHT 2014), a feature particularly important for the research. Additionally, housing policies, as well as urban planning, and development policies at the city level, have a strong presence of adaptation strategies and climate change response (MOCCA et al. 2019).

All of the above, followed by a personal interest for understanding present housing challenges conformed the final selection of the case study: Social Housing institutions (SHIs) in Vienna. The findings of Vienna's case study will be compared with similar social housing contexts in Europe. Putting Vienna's challenges in perspective with comparable contexts is vital to generate a general overview of adaptation to climate change within social housing. At this stage it is important to re-think and adapt the research questions. The particularity of the case study should be included in the RQ's. In this sense, the research questions change from their conceptual character to an empirical one and are formulated as follows:

**To what extent are housing institutions in Vienna fostering climate change adaptive capacity of tenants?**

- In what manner does the intrinsic characteristics<sup>2</sup> of housing institutions in Vienna influence adaptive capacity of tenants?
- In what way does Viennese housing institutions regulations shape tenant's adaptation capacity?
- What role do institutional actors within housing institutions in Vienna play in the improvement or limitation of tenant's adaptive capacity?
- How can social housing institutions in Vienna improve the adaptation capacity of tenants?

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<sup>2</sup> Grothmann's (et al. 2013) intrinsic characteristics of institutions are formal rules, informal norms, customs, practices and beliefs (in chapter 5).

#### 4.4. Sample Selection

SHIs in Vienna are listed within the Austrian Federation of Non-Profit Building Associations (GBV). To date, all institutions (SHIs) registered in Vienna make a total of 60 associations. Since, the resources for the qualitative research could not behold 60 interviews, I set a sampling process in action in order to delimit the scope of the empirical part.

As a first stage, I involved the elaboration of a chart, including the amount and location of social housing projects for each SHI. The results were further clustered following representativeness of institutions. Meaning, I selected institutions with higher number of projects.

Notably, SHIs in Vienna in charge of developing social housing projects share one similarity. They are selected through the municipal housing funding schemes (Wohnfonds Wien) and the developer competitions (Bauträgerwettbewerbe) (both will be detailed in the following chapter). Therefore, the **sampling process** combined the list of GBV members with the highest number of dwellings in Vienna and the list of SHIs that won a development competition in the period 2009-2014. I developed a matrix (see Table 1) in which I was able to identify overlapping between SHIs with high number of housing stock and SHIs that won the developer competitions between 2009 and 2014. This process helped me conceptualize the base for the data collection and delimited the sampling of SHIs to be assessed qualitatively. I made sure I was securing the relevance, the representability, and the actuality of the institutions to be interviewed. Considering the structure of SHIs and the main stakeholder behind their operations, the sampling selection was limited to 13 selected interview partners (see red marked SHIs in table 1). The selected interview partners were contacted.

List of SHIs members of the GBV (list by number of social housing units / dwellings)				Possible overlapping	List of SHIs based on Wohnfonds_Wien (recently closed development competitions 2009-2014)		
Non-Profit Building Associations	NAME	# of Social housing dwellings	Administrated under / Main company		Recent developers under Wohnfonds_Wien	Location / Development	Project
Gemeinnützige Wohnungsaktiengesellschaft Wohnpark Alt-Erlaa	AEAG	3716	GESIBA		GESIBA	10., Sonnwendviertel	Bauplatz C.03.01
FAMILIE, gemeinnützige Wohn- und Siedlungsgenossenschaft registrierte Genossenschaft mit beschränkter Haftung	FAMILIE	2751	SOZIALBAU		SOZIALBAU	10., Sonnwendviertel	Bauplatz C.03.02
Gemeinnützige Bau-, Wohnungs- und Siedlungsgenossenschaft "Vindobona" registrierte Genossenschaft mit beschränkter Haftung	VINDOBONA	1976			BWS	23., In der Wiesen Süd / 22., Kostengünstiges Wohnen in Wien – Donaustadt / 10., Sonnwendviertel	Bauplatz 5 / Bauplatz 1 / Bauplatz C.02.04
KROTTENBACH - Gemeinnützige Bau-, Wohnungs- und Siedlungsgenossenschaft "Krottenbach" registrierte Genossenschaft mit beschränkter Haftung	KROTTENBACH	2613	ÖSW		Heimbau	23., In der Wiesen Süd	Bauplatz 7
MERKUR - Gemeinnützige Bau- und Wohnungsgenossenschaft "Merkur" registrierte Genossenschaft mit beschränkter Haftung	MERKUR	5653	WIEN SÜD		AH	23., In der Wiesen Süd	Bauplatz 7
MIGRA Gemeinnützige Wohnungsges.m.b.H.	MIGRA	3469			MIGRA (+ ARWAG)	22., aspern+ Die Seestadt Wiens, Tranche 1 / 02., Nordbahnhof – 2. Phase – Interkulturelles Wohnen	Bauplätze D16, D17 / Bauplatz 15B
NEUES LEBEN - Gemeinnützige Bau-, Wohn- und Siedlungsgenossenschaft "Neues Leben" registrierte Genossenschaft mit beschränkter Haftung	NEUESLEBEN	2155			NEUES LEBEN	02., Nordbahnhof – 2. Phase – Interkulturelles Wohnen	Bauplatz 2b
Neusiedler Gemeinnützige Bau- Wohnungs- und Siedlungsgenossenschaft registrierte Genossenschaft mit beschränkter Haftung	NEUSIEDLER	2500			Wiener heim	23., In der Wiesen Süd	Bauplatz 3/13
Urbanbau Gemeinnützige Bau-, Wohnungs- und Stadterneuerungsgesellschaft m.b.H.	URBANBAU	1976	SOZIALBAU		URBANBAU	02., Nordbahnhof – 2. Phase – Interkulturelles Wohnen	Bauplatz 3bA
Volksbau, gemeinnützige Wohn- und Siedlungsgenossenschaft registrierte Genossenschaft mit beschränkter Haftung	VOLKSBAU	1976			VOLKSBAU	10., Sonnwendviertel	Bauplatz C.02.03
WBV-GPA - Wohnbauvereinigung für Privatangestellte Gemeinnützige Gesellschaft mit beschränkter Haftung	WBV-GPA	8871			WBV-GPA	22., Kostengünstiges Wohnen in Wien – Donaustadt	Bauplatz 2
Wohnbau, gemeinnützige Wohn- und Siedlungsgenossenschaft registrierte Genossenschaft mit beschränkter Haftung	WIEN SÜD	5653			WIEN SÜD	23., In der Wiesen Süd	Bauplatz 1, Bauplatz 9/10,
WOGEM Gemeinnützige Wohn-, Bau- und Siedlungsgesellschaft, Gesellschaft mit beschränkter Haftung	WOGEM	2445			WBG	22., aspern+ Die Seestadt Wiens, Tranche 1	Bauplatz D9
ÖSW - Oesterreichisches Siedlungswerk Gemeinnützige Wohnungsaktiengesellschaft	ÖSW	2613			ÖSW	22., Kostengünstiges Wohnen in Wien – Donaustadt / 10., Sonnwendviertel	Bauplatz A / Bauplatz C.02.02
Wohnbau, gemeinnützige Wohn- und Siedlungsgenossenschaft registrierte Genossenschaft mit beschränkter Haftung		1976	SOZIALBAU		Gartenheim	22., aspern+ Die Seestadt Wiens, Tranche 1	Bauplatz D9
					ÖVW	22., aspern+ Die Seestadt Wiens, Tranche 1	
					Siedlungsunion	22., Kostengünstiges Wohnen in Wien – Donaustadt	Bauplatz A
					EBG (+ Heimbau)	22., Kostengünstiges Wohnen in Wien – Donaustadt	Bauplatz B
			SOZIALBAU		Neuland	22., Kostengünstiges Wohnen in Wien – Donaustadt	Bauplatz 3
			GEWOG / NHG		NEUE HEIMAT	02., Nordbahnhof – 2. Phase – Interkulturelles Wohnen	Bauplatz 9
					EGW	22., Die Seestadt Wiens, Bauplatz D10 (with ÖVW)	Bauplatz D10
					ARWAG	22. Bauplätze D16 und D17	
					SCHWARZATAL	22., Nordbahnhof	Bauplatz 15C

Table 1. Sampling Matrix showcasing overlapping SHIs in Vienna. Source: GBV members list and the Closed Developer Competitions from the Housing Funds scheme from 2009 to 2014. Self-elaboration

## 4.5. Data Collection

Following the recommendations of the framework, data collection can be through interviews, observations and/or policy analysis, depending on the context where the selected case study is immersed (GUPTA et al. 2010). For the research I opted for qualitative in-depth interviews with experts from SHIs in Vienna as data collection method. However, to avoid biased results given that the social housing context in Vienna is particularly complex and highly influenced by the welfare typology in which it is based, I implemented a combination of qualitative and semi-quantitative methods. As semi-quantitative method I implemented a **policy analysis**, through which I examined informal, formal, internal and external policies at the city, regional and national level related to adaptation to climate change applied to housing.

Both, the qualitative (interview based) and the semi-quantitative (policy analysis) approaches, are suitable for a context where the institutions operate, to certain degree, under control of the municipality. This combination of data collection methods has been already used and documented before by GROTHMANN et al. (2013).

The policy analysis I carried out followed the methodology and approach of Dupuis et al. (2013). Understanding the framing or perspective of policies in order to figure out how much flexibility do institutions have to support different types of adaptive actions, and what level of legal obligation do they have over the implementation of measures within policies. The detailed policy analysis process and relevant literature will follow.

### 4.5.1. Policy Analysis

In chapter 3.5, the governance context, the absence of adaptation policy guidelines, the fuzziness around existing adaptation plans, and the overall lack of resources through which SHIs can foster adaptation to climate change, were listed as important adaptation barriers for institutions (HUNT et al. 2011; GUPTA et al. 2010; RODERS et al. 2015). Moreover, the procedures by which SHIs carry out their work involve legal agreements between them and local governments, thus, being subject to comply with regulations, guidelines and even to take certain roles defined by local authorities (McDERMONT 2010: 67).

In Vienna, social housing institutions perform under a long tradition of socially oriented housing policy, strong tenant regulations, structured financing and subsidies, and under a really well-known heritage of the well-fare system (REINPRECHT 2014; AIGNER 2019). Additionally, housing policy in Vienna is characterized by a strong, far-reaching presence of the state intervening both the private and the public market (KADI et al. 2021). Thus, highlighting the importance of policy analysis as an additional step in assessing the capacity of institutions to foster adaptation to climate change.

For this empirical step, I selected the policy analysis framework developed by DUPUIS et al. (2013) due to its special attention to the implementation of adaptation policies. According to DUPUIS et al. (2013), the implementation of adaptation policies is highly related to policy framings. Framings or perceptions, translate into formal policies and therefore into concrete policy realizations (DUPUIS et al. 2013). Understanding the framing or perspective of adaptation policies that touch on social housing development and management at the city (local) level can help figuring out how much flexibility do institutions, in this case social housing institutions, have to support different types of adaptive actions. It can also shed light on the policy constraints that impact the way in which institutions limit the adaptation actions of the users, in this case the tenants (GUPTA et al. 2010).

Table 2 shows the three different framing types from DUPUIS et al. (2013), the climate change-centred framing (CCA), the adapting to climate variability framing (CVA) and the vulnerability-centred adaptation framing (VCA). Rather than exploring the discrepancy between adaptation framings and the actual adaptation needs within social housing, I will make use of the framings to establish a connection between adaptation policy goals, strategies, points of view and design, with institution’s performance. Since institutions may act as possible mediators, they may also oppose to policy goals, values or beliefs or support them. The way in which decision-makers frame the problematic and the targets in policies is highly linked with the failure of implementation (DUPUIS et al. 2013).

<i>Framing</i>	<b>Target</b>	<b>Point of View</b>	<b>Policy design</b>
CCA, Climate Change- Centred	To solve the impacts originated from climate changes.	The source of Vulnerability is merely linked with climate changes	Adaptation policies are only additional to the existing policies. Highly technological and innovation based.



<b>CVA</b> , adapting to climate variability	To reduce the risks from current climate variations	Climate variations will occur regardless of human influences.	Adaptation policies are mostly centred at the reduction of present risks.
<b>VCA</b> , vulnerability- centred adaptation	To implement a more holistic-approach: increasing welfare of vulnerable groups, focusing on resource managements and aiming for sustainable development	Problems are not only caused by climate changes, but by the interaction of other factors (social, environmental, economic) that limit the capacity to adapt.	Policy design should also evolve along the holistic- approach

*Table 2. Adaptation Framings. Source: DUPUIS et al. 2013. Self-elaboration.*

Following the methodology of DUPUIS et.al (2013) in the policy analysis I explored seventeen policy instruments, strategies and programs embedded at different governance levels, but with implementation effect at the city level (see Table 3). Focusing on strategies and measures tackling adaptation to climate change applicable to social housing. Firstly, I tracked the existence of adaptation measures (or related, i.e. mitigation, resilience and climate related risks minimization) and secondly, I analysed them to define their type of framing in order to verify possible connections between the framing and the tractability (feasibility) of the same.

<b>Name</b>	<b>Years</b>	<b>Type</b>	<b>Level</b>
STEP Urban Development Plan	2014-2025	Strategy	Municipal
The City of Vienna's Climate Protection Program.	2010-2020/2021	Program	Municipal
Urban Heat Island Strategy	since 2016	Strategy	Municipal
Smart City Framework Strategy	2019-2050	Strategy	Municipal
Viennese development, planning and building law	Version 2021	Law	Municipal
Urban Energy Efficiency Program 2030	2019-2030	Strategy	National
Energy framework Strategy 2030 for Vienna	-2030	Strategy	National/Regional
Austrian Strategy for adaptation to climate change	2017/2019-to date	Strategy	National
Vienna Housing Subsidies and Housing Rehabilitation Act	Version 2021	Law	Municipal
Austrian Climate Change Act (KSG)	2011-2020	Law	National
Eco-design-Regulation	2007- 2021	Law	National
Energy- Efficiency Act 2014-2020 National	2014-2020	Law	National
Government Program	2020-2024	Program	National
Klima- und Energiestrategie	2018-2030	Strategy	National
ÖREK Austrian spatial development concept	2011-2020	Strategy	National
15a Agreement on building emissions	Version 2021	Law	National
Klimaaktiv Program	2020-	Program	National

*Table 3. List of analysed policies in Vienna, according to level, year and type. Self-elaboration*

In a first step I conducted an exhaustive key-word based search and extraction of measures within policies related to: (1) climate change adaptation, adaptation, climate change measures, coping to climate change, amongst others; (2) housing development, provision, maintenance, renewal; (3) sustainable development and sustainable housing, etc. I proceeded to link each measure lexically to a framing type: CCA, VCA or CVA, according to its characteristics, goals and design. In the final step, I linked the framing with its feasibility, but most importantly I pursued to identify a possible relation between the framing and the capacity of housing institutions to foster adaptive capacity of its tenants. The main findings of the policy analysis, together with the literature review became the basis of the interview design. Correlation between findings and definitions of the adaptive capacity wheel dimensions was identified through the elaboration of a chart (see Appendix d).

The findings of the policy analysis are presented within the case study chapter (Chapter 5). In this chapter I will showcase the predominant type of policy framings from the analysed policies, and their characteristics. I will highlight the possible relation of their tractability issues with the adaptation barriers for social housing institutions.

#### 4.5.2. Interview Design

The adaptive capacity wheel framework proposes an essential interview guideline that includes one question per dimension, together with introductory and closing questions (GUPTA et al. 2010). Furthermore, the framework recommends the design of one question per criterion in case the data collection was performed via policy/ document analysis. Since the research I am conducting involves both policy analysis and qualitative interviews, I pursued a combination of both, dimension directed question's and criterion directed question's.

The interview design unfolded in two steps. Firstly, I formulated interview questions that secured the data collection of the dimension's criteria of the adaptive capacity wheel framework. Secondly, I involved findings and insights delivered by the **policy analysis** into the design of the interview guideline (see Annex d). I brought together remaining questions from the policy analysis and basic questions for the dimensions and criteria of the ACW for the elaboration of the **standardized Interviews** (see Appendix a). I structure the interview in three

main sections that elaborated on internal and external policies, the relationship between institutions and tenants, and future challenges and scenarios.

Further on, I proceeded to contact all thirteen SHIs selected from the sampling where via email (see chapter 4.3). Little or no response from the institutions and even refusal to participate in the research were very present. After a third round of contact attempts, I decided to introduce an adjustment into the sample step, in order to include any active member of the Non-Profit Building Association (GBV) willing to participate. I achieved a total of six interview partners (See Annex C. List of Interview partners). Most of them involved in the project development department of SHIs, responsible for new development, new construction, and renewal and maintenance of social housing units. This feature was particularly beneficial for the research, since interviewees were highly familiar with local construction policies, local and federal adaptation strategies, laws and programs around climate change adaptation and most importantly, their knowledge and experiences with the housing funds scheme were solid.

I started the interviews with introductory presentations, giving background of the research and presenting the goals and scope of the same. I started with a question that pursued to appraise their position and that of the institution they represented, towards climate change and its overall perceptions of risks and opportunities within housing development.

Standardized interviews lasted between forty minutes and one and a half hours. I conducted them online from early August until late September 2021. Each of the interviews were recorded (Voice only) under consent of the interview partners and were characterized by a story-telling approach promoted by the ACW framework. Such approach left occasionally criterions unaddressed or without insights due to time constraints, however, it didn't hamper the presentation of results which involved all interviewed SHIs and therefore all criterion's findings.

#### 4.6. Data Analysis, Scoring and Interpretation

Interview recordings were partly transcribed, in order to analyse and categorize each response, following a qualitative content analysis methodology proposed within the ACW framework by GUPTA et al. (2010). The analysis undergoes two steps before presentation of results, the scoring and the interpretation that will be described in the following.

**Analysing** the data from the interviews and classifying it according to each criterion is followed by the **scoring**. GUPTA et al. (2010) recommends a multiple researcher's approach, where the data is scrutinized by different researchers to achieve robust and transparent results. GROTHMANN et al. (2013) applied the scoring and submitted it to a second revision by another researcher. Regarding the present research and considering the scope of interview partners, the scoring approach was adapted, implementing only one rater, me as the author of this master's thesis.



Figure 9. Scoring five-level coloured scale. Source: GROTHMANN et al. 2013. Self-elaboration.

The scoring for each institution was based in GROTHMANN's et al. (2013) scoring methodology I adopted his five-level coloured scale for the ratings (see Figure 9), where 1 stands for "very low", 2 = low, 3 = medium, 4 = high and 5 = very high. Using the definition for each criterion, I analysed and rated interviewee's answers. The scores of each criterion make out the aggregate scores for the dimensions through a simple calculation (addition of criterion's scores divided by the number of criteria in the dimensions, leaving out the criteria that had no insights).

The ratings were further used for the development of graphic explanations (see Figure 10) in the form of a wheel, following GUPTA et al. (2019). For each interviewed SHI interviewed I developed a scoring wheel where the outer circle showcases the ratings of each criterion (criteria without colour were not addressed in the interviews), the middle circle shows the

average score of the dimension and the inner circle the average score of all dimensions together. Thus, the average score from the whole social housing institution.

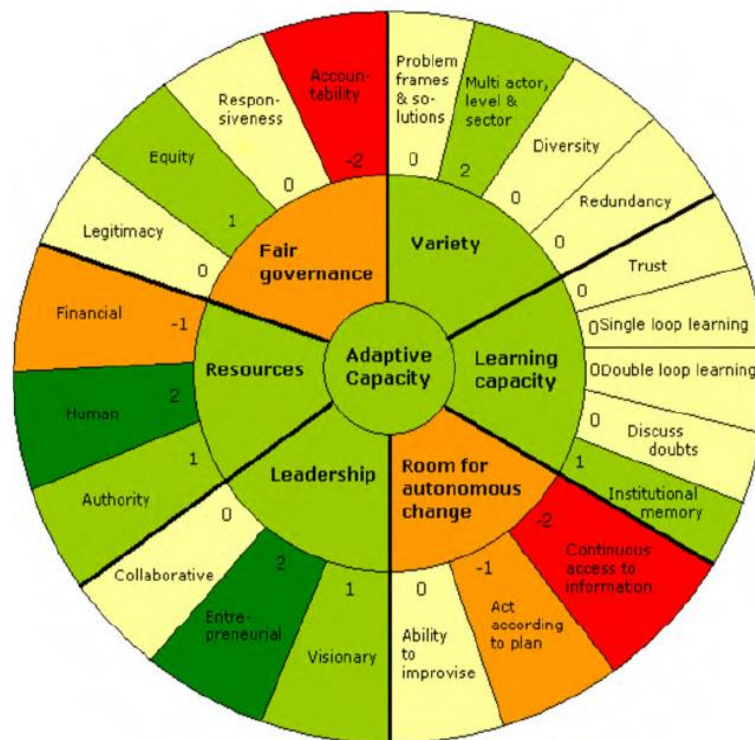


Figure 10. Adaptive Capacity Wheel Graphic based on the application of the framework on Dutch municipalities. Source: GUPTA et al. 2010.

As final step, I generated an aggregated score for adaptive capacity as a whole. This general ACW graphic was used to exemplify the main findings of the case study. Based on the ratings of each dimension of the SHIs, a general average per dimension for all institutions was generated followed by an overall average of the adaptive capacity of all SHIs in Vienna.

The **interpretation** of results paid special attention to highlighting strengths and weaknesses per dimension and to present findings in a way that the contextual causalities, inter-relations and explanations were described. Given that, within the ACW dimensions are inter-related, explanations should also elaborate on tensions and influences between them. In order to keep record of the scoring and to facilitate interpretation, I developed a grid where the classification of qualitative interview answers, the correlation of policy analysis findings and the definition of criterions within each dimension of the ACW was placed. This helped me generate the interpretation of scores and to verify them, bringing all elements together in one grid. Such grid was generated for each social housing institution interviewed.

The presentation of findings makes use of the ACW graphics for each institution, using the colour scheme to illustrate the scores of criteria and dimensions. Findings mainly summarize all SHIs scores and are presented per dimension, alternating ACW graphics for exemplification of results. For instance, findings of the variety dimension encompass discoveries from this dimension of all SHIs interviewed.

#### 4.7. Comparative Analysis

Vienna as a selected case study presents a variety of particularities, not only in terms of its institutional context, but also in terms of social housing development, structure, management and climate change adaptation policies. Due to these peculiarities, it was decided to integrate a final step into the methodology, a step that could give the study a broader and less context-bound perspective. A follow-up **comparative approach**, based on the general Viennese ACW scoring and findings. The main objective of this methodological step is, comparing Vienna with case studies in similar contexts (political, welfare, social, institutional).

The **comparison** aims to explore the different postures of SHIs in other contexts and draw on their abilities to foster adaptive capacity. Thus, possible lessons can be found that can be applied in the Viennese context or vice-versa.

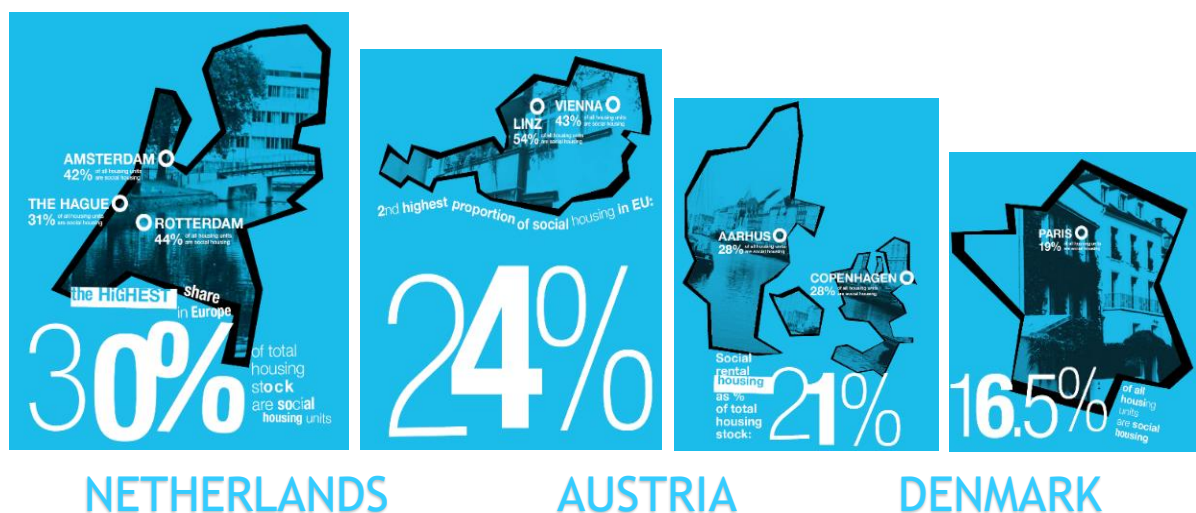


Figure 11. Social housing stock percentages per Country (EU). Source: Housing Europe, the European Federation of Public, Cooperative and Social Housing. Brussels, September 2019.

Based on similarities like the average of housing stock under ownership and maintenance of housing institutions (see Figure 11) (also referred as housing association in Dutch and Danish literature), their service attitudes and social duties, the implementation of integrated project delivery methods (i.e. partnerships and collaborations), and the housing provision formats, SHIs of the Netherlands and Denmark were chosen for this comparison. I established a special emphasis over SHIs performing in the cities of Amsterdam and Copenhagen in order to keep the city level active throughout the study.

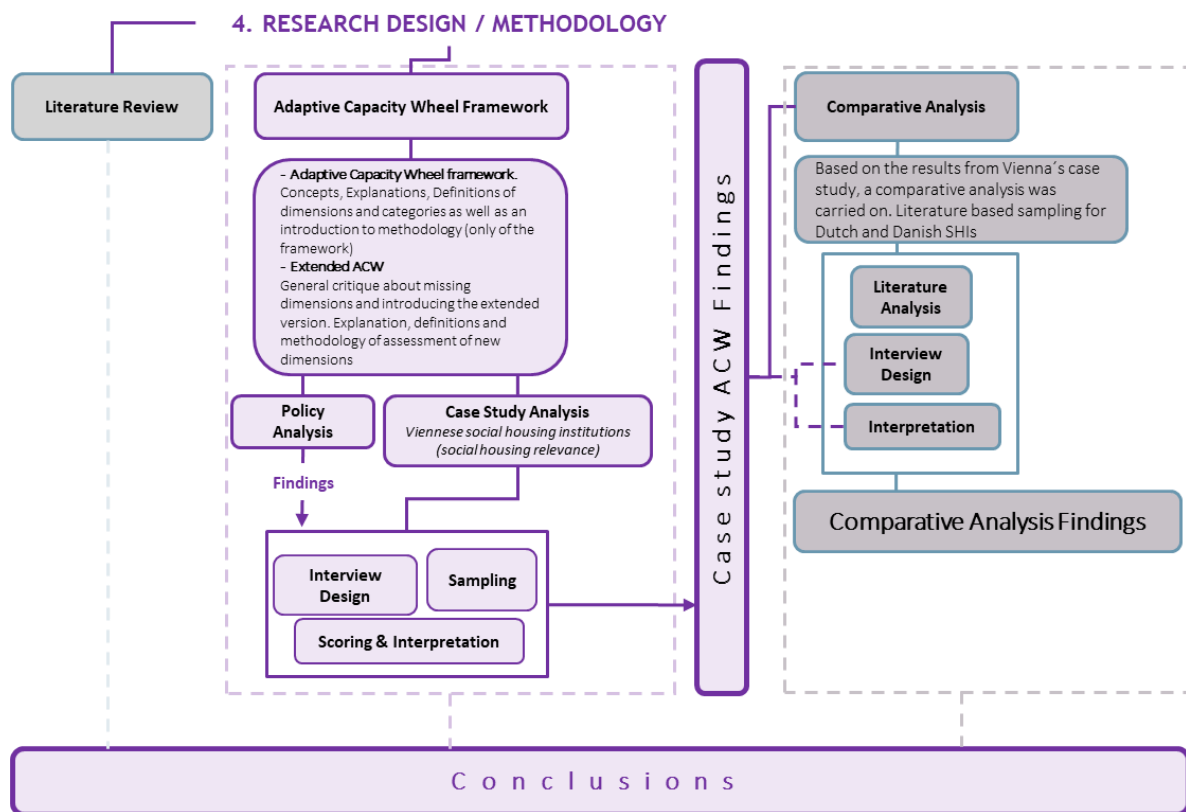


Figure 12. Master Thesis Road-Map, Research and Methodology steps. Self-elaboration.

The qualitative comparative analysis was inspired by the ACW (adaptive capacity wheel) framework. I took and incorporated a preparation by means of literature review, a data collection, carried through in-depth online interviews with experts in the topic, and an interpretation of results. Methodological steps like the policy analysis, scoring and development of ACW graphics, performed for the Viennese case study were not carried out due to scope of the comparative analysis.

The design of Interview-guidelines for interview partners based in Denmark and the Netherlands (see Appendix b. Interview Guideline, Comparative Cases: NT and DK) was based on interim findings of the case study of social housing institutions in Vienna (see Figure

12). The interviews involved three main sections: an introductory part, seven questions and sub questions addressing dimensions of the adaptive capacity wheel, and a section that elaborated on the outlook and future adaptation challenges of social housing in the respective context.

A total of three interviews with international experts from Denmark and the Netherlands were carried (see Appendix C. List of Interview Partners) in October 2021. The interviews were held online, lasted about an hour and were recorded (only voice) for analysis purposes.



## 5. CASE STUDY

In this chapter I will present an essential description of Vienna's social housing profile. Focusing on its background, development, actual status, and characteristics of social housing, I try to provide a deep description of the institutional context of social housing institutions. In the first part of this chapter I showcase the facts and definitions of social housing in Vienna. The historical development of the social housing market and social housing institutions. The second part deepens further into presenting particularities of Viennese social housing institutions. Here I elaborate on SHI's institutional situatedness, their role, attitude, and financial practices. In the third and final part of this chapter (chapter 5.3), I present the findings of the policy analysis carried over policies at the national, regional and city (local) level in Vienna that touched on housing development and management. Throughout the whole chapter I highlight the presence, evolution and role of social housing institutions and the role they entail among climate change adaptation at the city level.

### 5.1. The Viennese Social Housing Profile

Vienna's social housing context is internationally known as one of the best-practice examples of social and public housing production. Vienna, also referred as the *tenant city*, presumes a housing market where the rented sector represents 80% of the total housing units (see Figure 13) (municipal 25%, non-profit 21%, together make 46% of social housing rental market, and private rent regulated 27%) (AIGNER 2019; MATZNETTER 2020b).

According to REINPRECHT, social housing in Austria is commonly defined as “**housing operated by non-profit or limited-profit institutions**” (includes public entities and policies) (REINPRECHT 2014:61). However, in order to better understand the context and perceived success of the Viennese housing stock a short historical evolution is provided in the following.

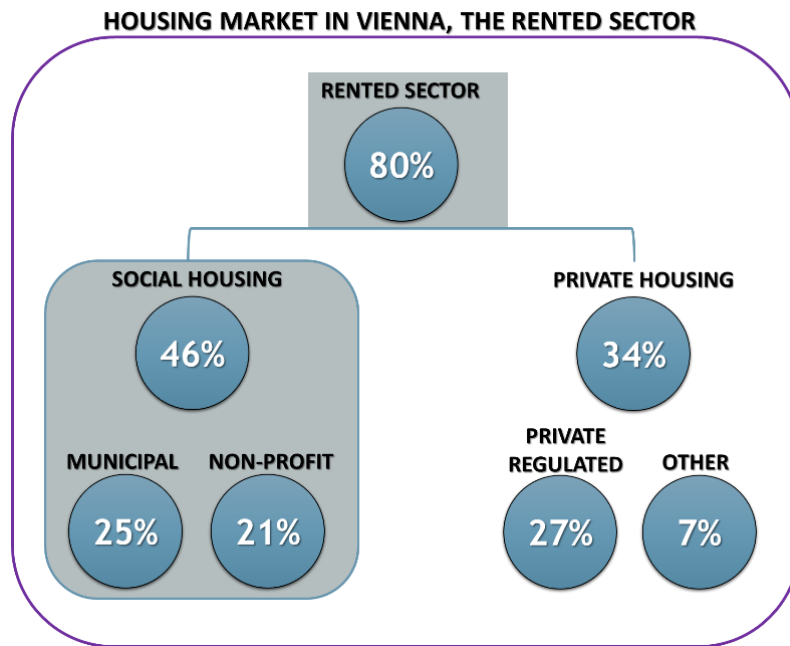


Figure 13. The Tenant City of Vienna: Percentages of the rented housing sector. Source: AIGNER 2019; MATZNETTER 2020b). Self-elaboration.

#### *Evolution of the social housing market*

Vienna has a well-known tradition of socially oriented housing policy that dates from the 1920's (AIGNER, 2019). Housing policy has been characterized by strong tenancy regulations, structured financing, subsidies, and a firm presence of housing institutions (REINPRECHT 2014). Back in 1918, an extensive housing construction programme emerged as one of the milestones of the present Austrian welfare-system. Housing became the face and heart of the welfare state, a welfare state characterized by comprehensive policies, strong presence of institutions and ideologies, and by exhibiting a corporatist, conservative tendency, and an underlying resistance to change (MATZNETTER 2020b). Many of the characteristics of the welfare state are still present nowadays. The welfare state evolved into a strong tradition and heritage of (corporatist) social elements, that still can be observed in low-rent systems, good quality housing, quality of life, and affordable housing, between others (REINPRECHT 2014).

Throughout the years Vienna's housing system has shown strong stability, holding on to housing ideologies from post-war programs, a time in which the majority of current housing stock was consolidated, maintaining the presence of limited-profit housing institutions and introducing subsidy systems (KADI 2015).

The presence of housing institutions as independent providers throughout history became key. Their tasks were eased through the elaboration of legal frameworks and funding schemes that enable them to participate in the elaboration of housing programs (REINPRECHT 2014). Nowadays, social housing institutions are considered an important, social oriented and highly professionalised third sector, as well as strong players in opposing profit-maximizing trends (REINPRECHT 2014; MATZNETTER 2020b).

In Vienna, the current social-public housing sector represents around 46% of all housing dwellings within the city (see Figure 13). It is composed of two main sub-segments, the council housing sub-segment (municipally owned) with around 220.000 housing units and **the subsidised rental housing sub-segment** with around 200.000 units (AIGNER 2019). Between 2004 and 2015 municipal housing provision halted and outsourced the construction of subsidised housing to non-profit housing associations. Resuming housing developing activities back in 2015, to provide completed housing developments by late 2019, mid-2020 (City of Vienna, 2021). Meanwhile, the subsidised rental housing segment established itself as the dominant form of housing provision, typified by cooperative formats, limited-profit status and reinvestment schemes (FRANZ & GRUBER 2018).

Social housing provision now, shows a weaker presence of municipalities, but a stronger involvement of the third sector, including private builders and real estate investors like, Banks and Insurance companies (REINPRECHT 2014; FRANZ & GRUBER 2018). In Vienna, around 60% of social housing units are under management and ownership of third-sector actors (364.000 units). About 136.000 units are managed by registered housing institutions, highlighting the important position of SHIs within the Austrian housing political landscape (LANG & NOVY 2014; REINPRECHT 2014).

## 5.2. Social Housing Institutions in Vienna

Within the social housing landscape, social housing institutions in Vienna are the main actors in housing provision (LANG & NOVY 2014). They are limited-profit institutions governed under the Non-Profit Act, which regulates their management and financial operations mainly establishing rental costs, profit limitations, and reinvestment (REINPRECHT 2014). The role of the municipal government can be described mainly as regulative entity with a steering role,

ensuring rent-costs, affordability, quality over architectural, ecological and social aspects. As such regulative entity it demands the ownership of a third of the constructed dwellings by subsidized SHIs housing development projects (FRANZ & GRUBER 2018).

SHI's are considered as both, membership organisations and business firms. As membership organizations, they have a relation with tenants based on trust and closeness (bonding, social capital). As business organizations, they entail a series of anonymous market interactions and rather weak relations with other actors (LANG & NOVY 2011). In Vienna, professional housing institutions have a clear distinction between membership and business within their structure. Viennese SHIs show a strong tendency to engage more into membership aspects, thus prioritizing the establishment of social relations and public engagement (LANG & NOVY 2014).

Even though social housing institutions are legally limited to new construction, renting, management, renovation and renewal, they are also conceptualized as drivers for state-led, top-down housing provision (LANG & NOVY 2014; REINPRECHT 2014). They are seen as main housing providers, having a strong intermediary role between tenants and governmental entities. They are therefore, important contributors for the achievement of national and local housing goals, ecological targets and tenant's participation. Furthermore, they have established direct links between tenants and housing management entities (LANG & NOVY 2014).

Social housing institutions are financed through public support and subsidies like, direct construction subsidies, and to a lesser extent, tax concessions and subsidies to consumers (REINPRECHT 2014). In 1984 The Viennese City Council founded the "Vienna Land Provision and Urban Renewal fond", a non-profit organisation with a coordination role between the municipality, urban developers and homeowners (wohnfonds\_wien fonds für wohnbau und stadterneuerung 2020). Pursuing quality in housing, the organisation makes use of developer's competitions as a regulatory and financing instrument where projects entering public contests undergo an assessment process. Projects aiming for the construction of more than 500 dwellings must undergo the competition's processes, smaller projects are assessed by the land advisory board.

Through the competitions, the municipality facilitates access to land and funding, making sure selected projects from SHIs fulfil certain housing criteria (LANG & STOEGER 2018). Projects entering the competitions are assessed and evaluated by an extensive jury conformed by experts, municipal representatives and external jurors (wohnfonds\_wien, fonds für wohnbau und stadterneuerung, Wien 2018). The implementation of a “four-pillar-model” is evaluated (see Figure 14)



Figure 14. "Four-pillars-model" quality criteria from the developer's competitions. Source: Wohnfonds Wien under <http://www.wohnfonds.wien.at/>. Self-elaboration

Competitions for subsidised housing are publicly announced and held under non-anonymous procedures. They aim for the development of sustainable, innovative, ecological and high-quality dwellings (Wohnfonds\_wien, fonds für wohnbau und stadterneuerung, Wien 2018). SHI's in competition must implement the conceptual criteria of the four-pillars-model into their projects in order to be eligible for housing subsidies. The majority of recent and current social housing development projects from SHIs, underwent the election process of the developer's competitions and were elected from the jury (FRANZ & GRUBER 2018).

Social housing institutions in Vienna, currently manage more than 200.000 rental units. Through 57 active SHIs, they contribute with almost 38% of the annual housing construction total, investing both in new construction and renovation (City of Vienna, 2021). Thus, playing an important role not only within housing provision policies but also among housing related adaptation strategies at the city level.

### 5.3. Housing Policy Profile

The housing policy landscape in Vienna is characterized by a strong, far-reaching presence of the state intervening both the private and public market, through a multi-scalar structure and a decentralized decision-making process (KADI et al. 2021). Most recent housing policy interventions at the municipal level are targeting the current housing challenges like the increasing demand for housing, due to population growth, stabilization of land and renting prices, and higher presence of private foreign and for-profit real estate investment. However, most housing policies tend to be characterized by a strong presence of measures designed to stabilize the social housing market, ensure land for subsidized housing and regulate rental terms (e.g. Tenancy Law Act<sup>3</sup>) (KADI et al. 2015). Some policies are designed to boost the importance of funding for new housing construction and deep renovation (e.g. Viennese housing subsidies<sup>4</sup>, Soft urban renewal program<sup>5</sup>). They show a strong presence within urban development plans like STEP2025 (KADI et al. 2015; GRUBER & FRANZ, 2019; KADI et al. 2021).

Historically, Vienna's urban development policies have earned it a solid reputation as a model of sustainable development. The presence of sustainable oriented urban development policies started since 1979 with the foundation of the Department of Environmental protection. Strategies for high-density and mixed-use planning, green and affordable housing, and the importance of public green spaces have had a strong impact in the Viennese social housing sector since then (MOCCA et al. 2019). However, policies addressing climate change like the national Austrian strategy for adaptation to climate change or the Austrian development concept (ÖREK), have been characterized by vague structure and formulation. Such vagueness has resulted in cases of conflict of interests and a troubled implementation (MAUERHOFER et al. 2017). Vagueness and fuzziness within urban environmental policies have been addressed before as source of maladaptation measures to climate change in social housing (RODERS et al. 2015). MOCCA et al. (2019) argues that the discourse of environmental protection in Vienna has been increasingly incorporating economic development strategies, mixing environmental concern with

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<sup>3</sup> Mietrechtsgesetz, Fassung vom 15.02.2022

<sup>4</sup> Wiener Wohnbauförderungs- und Wohnhaussanierungsgesetz, Fassung vom 15.02.2022

<sup>5</sup> Stadterneuerungsgesetz, Fassung vom 15.02.22

economic opportunism. At the same time, such embedded economic perspectives have further consequences on policy framings. For instance, adaptation policy is likely to be influenced by intra-policy-coordination, values, goals or beliefs of actors involved, and by the preferences of local stakeholders involved in the formulation and implementation of framed policies (DUPUIS et al. 2013). Many reasons of concern are observed among the framing of environmental policies in Vienna. Although there is evidence of the perceived historical success of environmental policies, I couldn't identify observations of the relation and impact of environmental policies and adaptation to climate change in social housing. Identifying, documenting, and analyzing environmental policies in Vienna that apply to social housing is an important step in answering the questions of this research. Understanding existing policy framings can yield results related to the opportunities, constraints and possible obligations of social housing institutions to adapt to climate change.

The following chapter (chapter 6.1) reports the results of the policy analysis described in the methodology (4.5.1). The results and findings are used in the subsequent empirical step, the interview design. Remaining questions and possible areas of conflict were introduced in the standardized interview design.

## 6. CASE STUDY FINDINGS

Throughout this chapter I report the results of the chosen methodology. Both the semi-quantitative approach via policy analysis and the qualitative approach conducted through expert interviews yielded results encompassed within the ACW methodology. The ACW framework stresses on presenting results by emphasizing the strengths and weaknesses of institutions being evaluated. In the case of the policy analysis, I highlighted the potential benefits or limitations offered by the analysed policies in terms of enabling SHIs to foster adaptive capacity. Within the qualitative results of the interviews, the approach attempts as well to highlight the strengths and weaknesses of SHIs found in each of the ACW dimensions. Results are presented by dimension and are accompanied by illustrative graphics and quotes from the interviews.

### 6.1. Policy Analysis Findings

In chapter 3.3.2, a detailed description of important adaptation barriers for SHIs was introduced. Within described barriers the absence of adaptation guidelines, and a strong presence of fuzziness within adaptation measures in existing strategies were listed as main barriers for policy implementation (GUPTA et al. 2010; HUNT et al. 2011; RODERS et al. 2015). Following DUPUIS et al. (2013) policy analysis methodology, I analysed seventeen policy instruments in Vienna, that are linked to the production of social housing (see Table 5). Among the main findings is worth noting that policies at the national level present a less fuzzy design than local policies when it comes to climate change adaptation measures. At the same time, national policies presented a more specific focus on housing provision, maintenance and renovation, and the impact on climate change that the introduced measures may have if implemented.

National policies exhibit a greater presence of **VCA-type framing (vulnerability centred adaptation)**, where measures seek not only to address climate change as such, but also to tackle the range of issues that contribute to climate vulnerability (DUPUIS et al. 2013). Policies at the national level, such as the Austrian strategy for adaptation to climate change



(2019) and the Energy efficiency act (2014-2020), implement a more comprehensive perspective than local policies. They touch on well-being improvement of vulnerable groups, good resource management, and sustainable development. However, its placement at the national level and its non-binding character contributes to the low tractability that characterizes VCA-framed policies, and to the low implementation level on side of institutions, specifically in the case of SHIs.

<b>Name</b>	<b>Years</b>	<b>Type</b>	<b>Level</b>
STEP Urban Development Plan	2014-2025	Strategy	Municipal
The City of Vienna's Climate Protection Program.	2010-2020/2021	Program	Municipal
Urban Heat Island Strategy	since 2016	Strategy	Municipal
Smart City Framework Strategy	2019-2050	Strategy	Municipal
Viennese development, planning and building law	Version 2021	Law	Municipal
Urban Energy Efficiency Program 2030	2019-2030	Strategy	National
Energy framework Strategy 2030 for Vienna	-2030	Strategy	National/Regional
Austrian Strategy for adaptation to climate change	2017/2019-to date	Strategy	National
Vienna Housing Subsidies and Housing Rehabilitation Act	Version 2021	Law	Municipal
Austrian Climate Change Act (KSG)	2011-2020	Law	National
Eco-design-Regulation	2007- 2021	Law	National
Energy- Efficiency Act 2014-2020 National	2014-2020	Law	National
Government Program	2020-2024	Program	National
Klima- und Energiestrategie	2018-2030	Strategy	National
ÖREK Austrian spatial development concept	2011-2020	Strategy	National
15a Agreement on building emissions	Version 2021	Law	National
Klimaaktiv Program	2020-	Program	National

*Table 5 List of analysed policies according to level, year and type. Source: Self elaboration*

Recent studies on Vienna's environmental policy-making have shown that the vertically structured process, results in little opportunities for non-public actor's involvement and present a lack of coordination and de-synchronisation between other governance levels (local, regional, national). Meaning that civil society is not motivated to participate or take part in the measures, they are often seen as recipients of measures (MOCCA et al. 2019).

Thus, contributing to the idea that policy framings can rather hamper the adaptation capacity of civil society than foster it by promoting inclusion and participation.

Among city level policies, I was able to recognize the presence of some explicit goals, measures and strategies. Regardless of whether they were totally or partially detached (lexically) from the concept of adaptation to climate change or to housing (i.e. Austrian strategy for adaptation to climate change, 2030: 105). Though when policies presented measures and strategies in relation to environmental protection, the approach was strongly characterised by a housing market stabilisation perspective (rental price stabilization) rather than risk minimization or hazard response. For instance, the Urban Development Plan of the City of Vienna (STEP 2025) within its strategy for the built city, introduces measures for adaptation of buildings (Wilhelminian buildings). Focusing on energy efficiency (thermal and energetic rehabilitation), risk minimization, and future preparations like integrating Willhelminian buildings into far reaching spatial planning projects as a form of neighbourhood quality improvement (ibid). Actions to achieve these strategies include the so called gentle urban renewal and quality improvement of buildings dating from the 1950's to 1970's. Specifically, future preparation actions are highlighted by a strong focus on urban centres activation. Actions pursue to tackle underused commercial and industrial zones, providing them with easy accessibility. Thus, evidencing the prioritisation of measures that incentivise economic development. However, I was able to identify greater clarity within policy design (content) at the city level, which can contribute to the implementation and tractability of policies. This assumption will be tested in the interviews.

Policies embedded at the city level are highly responsive to specific climate variations (i.e. urban heat). The great majority of policies introduce measures and strategies that respond to impacts from rising temperatures, contribute to the improvement of local urban climate, prevent overheating, pursue thermal comfort, and minimization of vulnerability towards heat (as seen in Urban Heat Island Strategy, the Viennese Development, Planning and Building Law 2021, and the Urban Energy Efficiency Program 2030). Measures concerning adaptation to climate change within city level policies have more of an “additional” character which is characteristic of the **CCA framing-type (climate change centred)**. This means that policies aim to add on other existing policies, trying to tackle the more recent hazards and assuming that the risks come from the general assumption of climatic change

(DUPUIS et al. 2013). Even though, CCA framed policies are desirable at the city level due to their capability for long term anticipation, prevention, and the introduction of innovative actions, they are also more prone to present feasibility issues (ibid). They require a specific knowledge base for climate prognoses, technical competences, and a certain adaptive capacity level (DUPUIS et al. 2013). Since SHIs are considered as highly specialised and professionalised third sector entities (REINPRECHT 2014), it could be assumed that they possess the required knowledge and technical competences mentioned by DUPUIS et al. (2013) to adapt to climate change and that like this, the feasibility issue of CCA framing policies could be overcome.

Nevertheless, at both levels the national and the city level, the explored policies showed a strong correlation between the implementation probability and the character of the policy (binding or non-binding). Non-binding policies presented a greater variety of measures but a rather low implementation, while binding policies were more scarce but more often implemented.

Finally, policies in Vienna follow the corporatist model of the city, which links environmental and social aspects with economic development (MOCCA et al. 2019). Vienna relies on economic strategies and housing subsidy schemes for the implementation of both, environmental measures, and strategies for adaptation to climate change. Creating instruments like the funding scheme “the developer’s competition” that act as intermediary implementation mechanisms. However, are such instruments sufficient to ensure adaptation to climate change? and more importantly for this research, how well do they contribute to foster adaptive capacity?

## 6.2. ACW Results: Viennese Social Housing Institutions.

Hereby the findings of the adaptive capacity wheel framework are presented. The structure follows the framework’s recommendations, showcasing general findings from all interviewed SHIs summarized in the eight different wheel dimensions. Within each dimension I aim to communicate the identified weaknesses and strengths of interviewed SHIs in Vienna in their ability to foster adaptation to climate change. Each dimension is

accompanied by at least one graphic explanation (ACW graphic) that seeks to exemplify the scoring (see Figure 15).

I started the interviews by giving space for the interviewee to introduce himself and the institution he represented. Throughout the introductory section I focused on unravelling perceptions towards (1) climate change, and (2) adaptation to climate change. It was a starting point for the discussion of the potential risks and challenges that both, climate change and adaptation to climate change represent for the SHI.

SHIs in Vienna, consistently conveyed a high level of general interest towards climate change adaptation. Outlining a wide variety of solutions and adaptation measures implemented throughout diverse internal and external processes within the SHI. Measures ranged from encouraging internal strategies to establishing climate-friendly working environments within institutions, for members and employees to be interested, and motivated to contribute to adaptation, the development of housing projects with a wider variety of adaptation measures, as well as the encouragement of tenants to adopt them. SHIs in Vienna displayed high awareness of the risks that housing development activities and the construction sector entail over climate change. SHIs are responding to adaptation needs by researching, developing, integrating, experimenting, and innovating in different housing sub-fields.

#### *VARIETY*

Results highlighted a homogeneous high level of **variety** among social housing institutions in Vienna (see Figure 15 for an example of high score in the variety dimension from the SHI Gemeinnützige Siedlungs-Genossenschaft Altmannsdorf und Hetzendorf). Interviewees underlined the dynamics within the developer's competitions (from Vienna's housing funds) as a framework that provides an arena where different experts and actors at different governance levels come together, and offers a safe environment for the emergence of varied discourses and solutions for climate change adaptation measures. The developer's competitions are strongly based in cooperation and exchange, SHIs participating are encouraged to work together with other experts.

“We act as contractors and work together with architecture companies and other experts in the construction, technic, and sustainability fields” (Interview partner PARZER, ÖSW 2021).

Such funding framework enables SHIs to learn from each other, exchange experiences and valuable information. Thus, boosting the implementation of effective adaptation measures and avoiding the replication of previous failures.

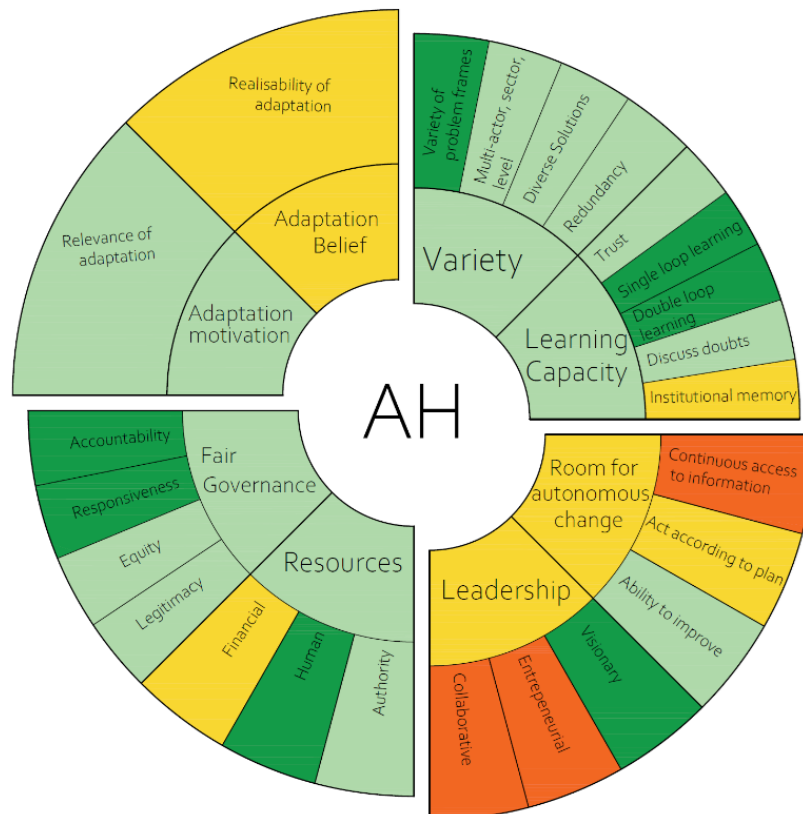


Figure 15. ACW scoring results of the Gemeinnützige siedlungs-Genossenschaft Altmannsdorf und Hetzendorf. Self-elaboration.

The high and very high rates among the variety of solutions refers to the design and implementation of tailor-made adaptation measures from SHIs, as well as to the wide availability of options to tackle climate change risks and problems. However, the existence of a great diversity of solutions was constantly linked to cost increase.

“There are many measures that one could implement, but that means either money or problems with construction laws” (Interview partner VUKOVIC, AH 2021).

Social housing institutions have to weigh the importance of adaptation measures against the feasible construction costs, always bearing in mind that social housing lies in the affordability of rental units.

“In Vienna we care for both, the affordability and the ecology. It should be possible to tackle both aspects, we need affordable housing as much as we need to take care of the planet” (Interview partner GEHBAUER, WBV-GPA 2021).

An important link was detected between the possibility of redundancy, i.e. the possibility of having back-up systems or mixed systems (energy supply combined with district heating and photovoltaic) and the limitations and barriers encountered in building laws and regulations. Due to law restrictions some institutions presented low ratings in the redundancy criterion (see Figure 16 for an example). For instance, the majority of interview partners underlined the limitations of the law on the use of certain materials in the facades, or the installation of green walls (e.g. The Fire Protection Law has strong limitations on the use of wood for housing construction).

“Law limitations must be observed. There are technical innovations that we would like to try but can’t follow due to law limitations. [...] laws are still really limiting. Looking at other places likes Vorarlberg, they construct everything with wood, that does not happen in Vienna, apparently in Vienna burns differently” (Interview partner PARZER, ÖSW 2021).

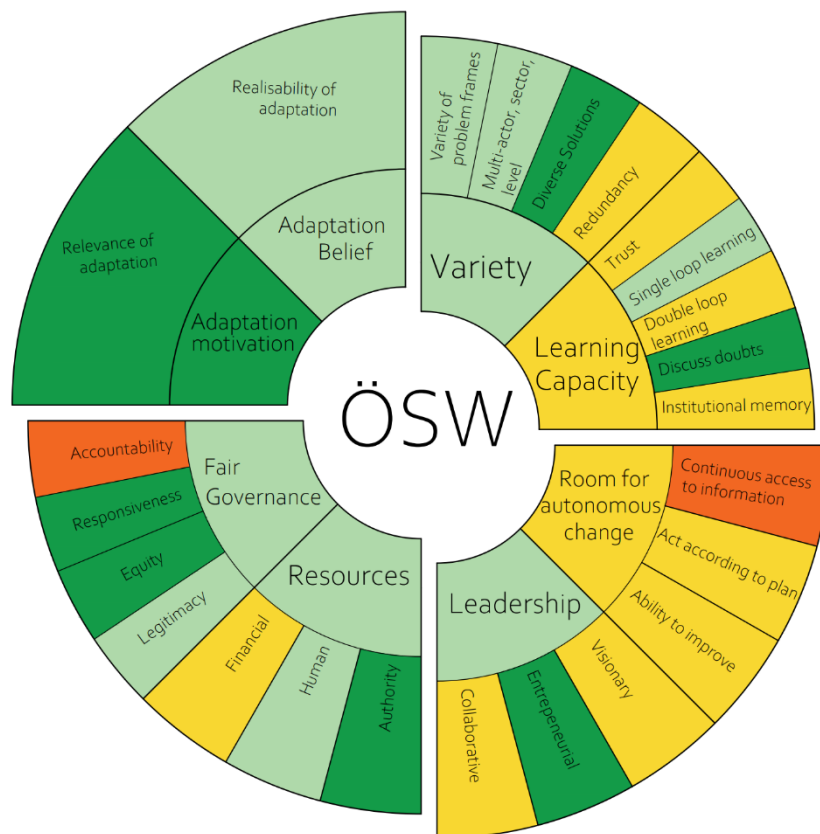


Figure 16. ACW scoring results from the the Österreichisches Siedlungswerk Gemeinnützige Wohnungsaktiengesellschaft. Self-elaboration.

## LEARNING CAPACITY

Social housing institutions demonstrated medium to high **learning capacity**. On one side, there was evidence of high single-loop learning from institutions showing skills to learn from past experiences. For instance, SHIs portrait themselves prepared and motivated to try and implement new climate change adaptation measures. Measures like, working together with management departments of existing housing developments, in order to gather information of the outcomes of previous implemented adaptation measures. Best, good and bad practices of past implemented adaptation measures are used to improve design and construction practices in current and future projects (ÖSW, AH, EGW, ARWAG, NEUES LEBEN).

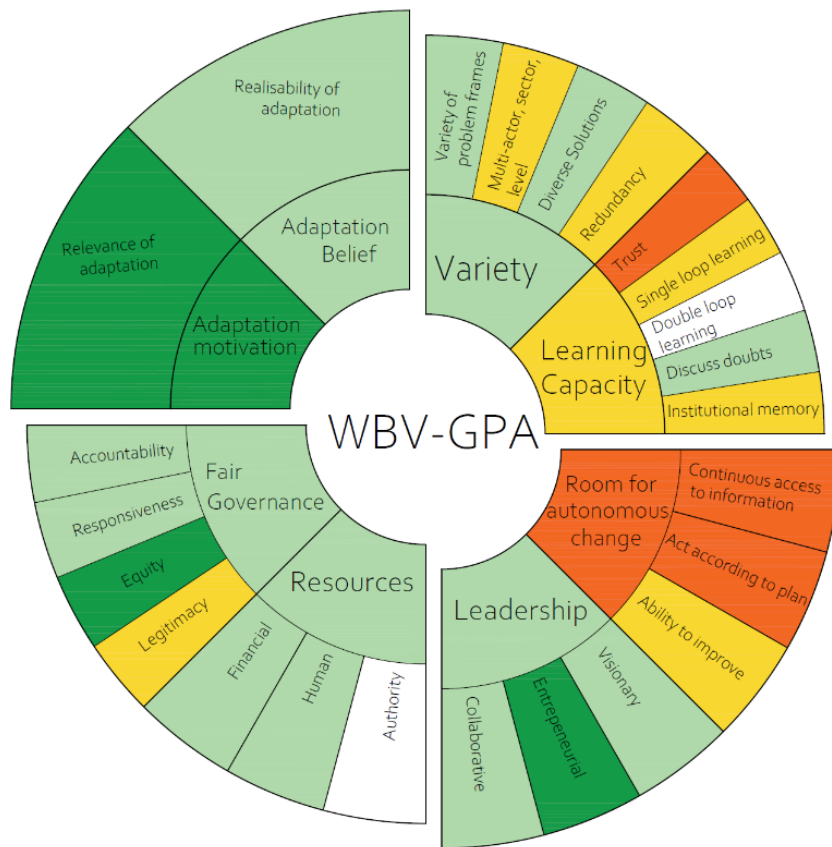


Figure 17. ACW scoring results from the Wohnbauvereinigung für Privatangestellte Gemeinnützige Gesellschaft. Self-elaboration.

However, lower rates of trust were observed in most of the interviewed SHIs (see Figure 17 for an example of low ratings in trust criterion from the SHI WBV-GPA). Within institutional patterns, trust is reflected in the capacity of SHIs to learn, to interrogate institutional practices, assumptions and ideologies (GUPTA et al. 2010). Even though results of the policy analysis accentuate the closeness between SHIs and governance parties, interview insights

evidence a lack of trust between SHIs and tenants. The overprotective design framework of SHIs were tenants, or in most of the cases future-tenants, have low to non-access into decision-making processes fuels the absence of trust.

Furthermore, interdependencies between trust and other categories give as result middle, low and even no-evidence of double-loop learning and openness towards the discussion of uncertainties (see Figure 17). SHIs that do not foster trust are not offering actors, tenants and civil society, opportunities to question assumptions. Trust is also the base for collaborative forms of work. Adaptation measures may need the collaboration and participation of tenants, a lack of trust can lead to the absence of interest and participation in initiatives for adaptation measures. Some SHIs showed promotion of trust among and with tenants by allowing and inviting tenants to implement adaptation measures.

*“We as institution invite the tenants and trust them by the implementation of measures [...] they do not need any permit or special permission process”* (Interview partner PARZER, ÖSW 2021).

*“We do allow much and we are ready to have a dialogue about their adaptation wishes”* (Interview partner JUNKER, EGW 2021).

Promoting trust among tenants showed recurrently higher adaptation belief rates, given that trusting actors are capable of successfully adapt to climate change, and higher room for autonomous change rates, since individual adaptation measures were more welcomed and supported.

#### *ROOM FOR AUTONOMOUS CHANGE*

Room for autonomous change is the dimension that assess the capacity of institutions to foster social actors, in this case tenants, to individually or autonomously adapt to climate change. Whether if they implement individual physical measures or behavioral changes, institutions should enable access to information, strategies to act according to plans, and a safe environment to allow improvisation (GUPTA et al. 2010).

Social housing institutions in Vienna scored in average a middle range of room for autonomous change. The availability and will for communication of important adaptation



information was scarce. Tenants are allowed to implement certain individual adaptation measures. But institutions communicate this information only once at the hand-over of dwellings, sometimes not even then (WBV-GPA). There was no evidence of a continuous access to information about individual adaptation measures (ÖSW, WBV-GPA, AH, ARWAG, NEUES LEBEN), nor of strategies formulated for the tenants to perform adaptation measures following an elaborated plan.

Tenants are expected to make use of preparations that institutions integrate in the construction stage. For instance, the ÖSW foresees adaptation measures in the design stage. Preparations for future solar shading on terraces, jalousies on windows, water connections and special walls for the installation of green walls in balconies, and terraces are foreseen and installed so that, should the tenant wish to make use of them, they can do so.

Capacity to improvise is hampered by the lack of information and strategies. Having no guidelines along with few resources minimizes the capacity of tenants to self-organize and innovate. Furthermore, some institutions expressed concerns over the benefits, the implementation risks and the technical requirements of individual adaptation measures (WBV-GPA, ÖSW, EGW, ARWAG, NEUES LEBEN).

*“It is difficult to implement individual measures. We do not see any ecological value under individual measures”* (i.e. cooling devices) (Interview partner GEHBAUER, WBV-GPA 2021).

Given that housing developments are under ownership of SHIs, future concerns of the risks that some individual adaptation measures could bring along (i.e. fire risks, power shortages or breaks, etc.) were also expressed. Nevertheless, institutions like the EGW (see Figure 18) presented a higher rating in each criterion of the present dimension. They have gained experience in fostering social capital through construction groups<sup>6</sup> projects. This experience can be seen in activities like, the provision of courses for tenants where they get to learn how to recycle at home, the organization workshops for balcony-greening, and house airing

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<sup>6</sup> Construction groups (Baugruppen) are defined as a community or group of people (future tenants) who have similar interests, needs, wishes and ideas about housing. Some housing institutions in Vienna work under this concept to develop individual forms of housing under a communal and self-determined way to live and as a form to activate neighborhood feelings. Such groups participate to co-determine the living environment, the design and construction of communal facilities, the organization and administration of the buildings. Construction groups are seen as an alternative to conventional housing development and as a form to revitalize urban living (GWS 2021).

strategies. However, the lack of motivation from tenants is reflected in the low attendance of such courses.

Despite clarifications along the interviews on the focus of tenant’s capacity for autonomous change, interviewees tended to describe the capacity of SHIs for autonomous change within the framework of the developer’s competition. Most SHIs highlighted the great flexibility and freedom for the implementation of adaptation measures in housing projects, freedom to innovate, and to improvise adaptation measures. However, many times interviewees linked such freedom to the lack of definitions in the conceptual criteria of competitions given by the Four-pillars-model. SHIs expressed the scarce information they receive from the funding instrument in terms of tangible measures that projects must include in order to win. Furthermore, many other limitations for autonomous change came also to the surface, like economical barriers, limiting construction norms, laws and legal criteria that hamper such innovative drive.

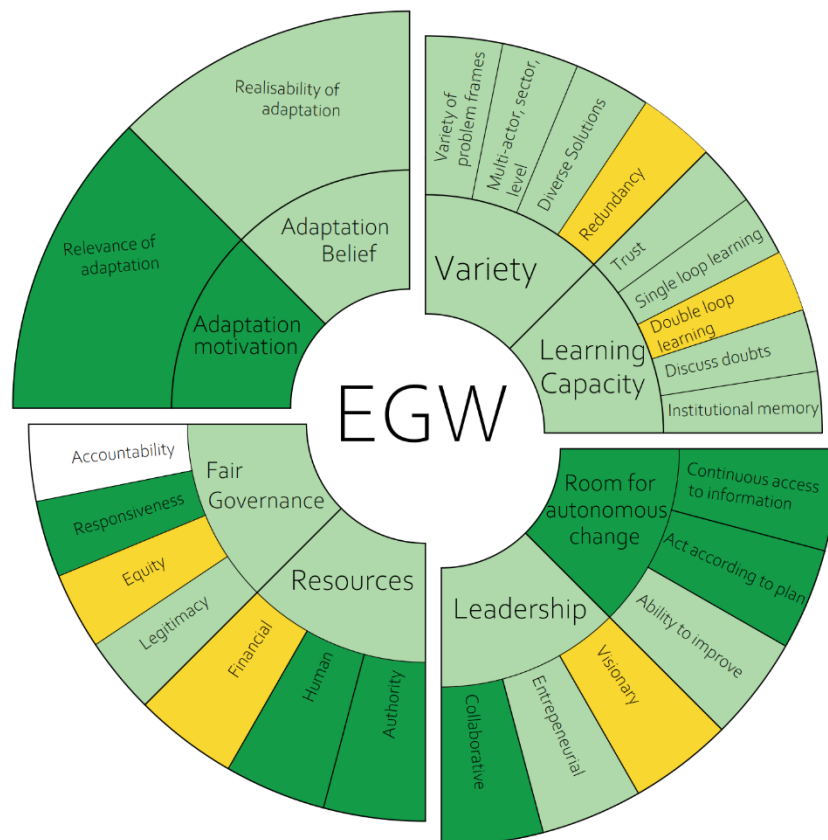


Figure 18. ACW scoring results of the Erste gemeinnützige Wohnungsgesellschaft. Self-elaboration

## LEADERSHIP

Leadership results must be presented in two sections, the first section will draw on the ability of social housing institutions in Vienna to support and encourage the emergence of leaders among its tenants. The second on the leadership that SHIs entail themselves within the developer's competition framework.

Housing institutions rated middle to low when they developed their answers by focusing on tenant's leadership. Enabling the emergence of leaders seemed to be affected by the observed lack of trust, the rather low openness for discussions and the compromised room for autonomous change. However, some institutions take the task of bringing tenants to work together, to take a stand in participation processes, and to develop internal adaptation projects (EGW, ARWAG, NEUES LEBEN). Nevertheless, leadership is highly linked with motivation. Tenants with low motivation show no interest for either taking part in already organized participation processes, nor on being the ones that organize such processes.

*"It is not so common to look at leaders taking action"* (Interview partner VUKOVIC, AH 2021).

Further experiences with construction groups highlighted the power of tenant's leadership and organization.

*"[...] they bring interesting projects, innovative ideas and push for improvement that makes everyone happy [...] Working with the tenants awakes a whole different value for climate friendly houses. In these cases, I know that the tenant has already a relation to the building, to the neighbors, and like this the way they live is different"* (Interview partner JUNKER, EGW 2021).

Thus, relation to the project fosters motivation that pushes for leadership. Meaning that involving the tenants in early on project stages could result in a higher adaptive capacity to climate change.

On the other hand, when SHIs saw themselves as part of a bigger institution, the housing funding scheme (Wohnfonds Wien), they underlined a high level of leadership that can be observed within the developer's competitions framework. SHIs mentioned often their capacity to encourage long-term visions for adaptation to climate change (AH), their

willingness to undertake adaptation actions and stimulate the development of best-practice projects (EGW), their interest for conducting research when implementing new materials and techniques in order to support, and push for political adaptation (NEUES LEBEN), and the importance of taking adaptation to the heart, in order to be able to change and break long term entrenched practices (ARWAG).

### *RESOURCES*

According to GUPTA et al. (2010), institutions are capable of generating or securing sufficient resources for the implementation of adaptation measures, supporting tenants in the implementation of individual actors, supporting groups of tenants with adaptation projects, and supporting tenants and actors to change norms, rules, and perform transitions. SHIs in Vienna were assessed in their ability to generate resources whether financial, political, human, legal or technological resources.

The setting in which SHIs carry out their activities and roles has a strong influence on the availability of resources. In Vienna, the municipal government in its effort for ensuring ecological, social and architectural quality in housing developments is constantly creating financial funds that seek for the implementation of adaptation measures. As seen in the policy analysis, this is the way in which the municipality ensures the implementation of environmental measures and measures for adaptation to climate change.

SHIs scored high in their ability to generate resources. As Figure 19 exemplifies, they were able to uniquely reflect the affinity of ideologies, rules and visions they have with municipal policies, which contributes directly with values of legitimacy.

*“Our response to the needs of adaptation measures complements the requirements of the developer competitions”* (Interview partner VUKOVIC, AH 2021).

*“Principally the wishes and direction of the institution should be also the same of the municipality and of the tenants”* (Interview partner BEIGL, ARWAG 2021).

However, in the majority of interviews, I was able to observe tensions between financial resources for the implementation of climate change adaptation measures and the overall cost of construction.

*“Costs are always something that interferes with adaptation to climate change and sustainability”* (Interview partner JUNKER, EGW 2021).

Law limitations and construction norms were also related to financial issues.

*“Sometimes, respecting the whole construction laws elevates so much the costs [...] affordability is always at risk when adaptation to climate change is preferred”* (Interview partner VUKOVIC, AH 2021).

Social housing institutions are left with the responsibility of having to find balance between affordability (characteristic of social housing) and the possible implementation of adaptation measures. Regardless of whether they strive more for affordability or for adaptation to climate change, SHIs showed an important willingness to implement adaptation measures and call for a quick evolution of policies and funding schemes in order to avoid future tensions and ensure adaptation.

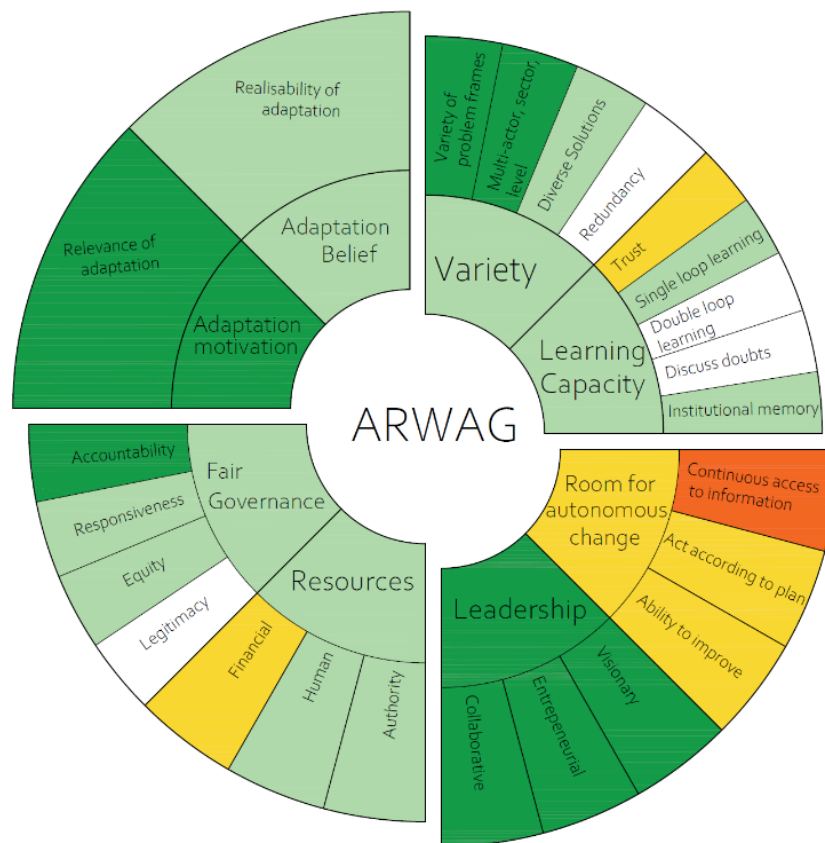


Figure 19. ACW scoring results from ARWAG. Self-elaboration.

### FAIR GOVERNANCE

This dimension assumes that institutions support adaptive capacity when all criteria within the dimension are fulfilled. That is, legitimate policy-making, equitable policy processes, accountability, responsiveness and transparency (GUPTA et al. 2010).

The carried policy analysis identified high responsive policies at the local level, tackling important climate change risks for housing in the city. This feature was synonymously reflected in the interviews, with SHIs pointing the legitimacy of municipal policies in regard of climate change adaptation.

*“Strategic policies do aim for climate protection, but always with a sense of proportion [...] the city of Vienna still takes care of climate change but never loses the needs of society (affordable housing)”* (Interview partner PARZER, ÖSW 2021).

Moreover, institutions pointed the housing funding scheme as an equitable framework, which promotes responsiveness and demands signs of accountability (WBV-GPA). SHIs voiced approval and contentment about local policies and strategies in the climate change adaptation field. They assured that the municipality is committed to adapt (ÖSW), that the type of top-down (vertical) governance characteristic of Vienna is, for the time being, an effective way to ensure the implementation of effective adaptation measures on a larger scale and with a broader scope (responsiveness and equity). Additionally, responsiveness and accountability are possible in a safe environment such as the one provided by the housing funds scheme. *“The developer’s competitions offer a safe field that SHIS use as arena to test innovations, new systems, materials and concepts”* (Interview partner JUNKER, EGW 2021).

#### *ADAPTATION MOTIVATION & ADAPTATION BELIEF*

The two extra dimensions taken from GROTHMANN et al. (2013), evaluate first, the motivation of actors to undertake, foster and promote adaptation measures. Secondly, the belief of actors towards the need to adapt to climate change, being able to adapt, and the existence of adaptation measures.

Adaptation motivation scored the highest among all dimensions, evidencing the willingness, the readiness, and the interest of SHIs to adapt to climate change and support adaptation of others. Recognizing their share of CO<sub>2</sub> emissions, SHIs stressed the many possibilities in which the construction industry (particularly social housing) can contribute to climate change adaptation. Stating:

*“We have big readiness to implement adaptation measures, and we see us as political partners from governmental institutions. With us, goals and targets can work”* (Interview partner GEHBAUER, WBV-GPA 2021).

However, perceptions on tenant’s adaptation motivation presented more oscillatory ratings. Although it was said that motivation and interest on side of tenants are becoming more frequent, most SHIs agreed that the lack of motivation is one of the most important constraints to the successful implementation of adaptation measures (along with financial, knowledge and technical resources). Additionally, the low connection between tenants and their “homes” was perceived as a form of hampering motivation. SHI Neues Leben addressed the possibility of enhancing motivation:

*“An effective form to achieve motivation from the tenants not only to act individually but to participate is to create connection, organizing groups, festivals, meetings, where tenants get to know each other”* (Interview partner KOPPITZ, NEUES LEBEN 2021).

Adaptation belief presented very contradictory views. On the one hand, SHIs like the WBV-GPA believe that their expertise, their acceptance among society, and their effective implementation of adaptation measures should be enough to be capable of successfully adapt to climate change, including the adaptation of tenants in their developments. Furthermore, SHIs like the EGW believe that higher attention and financial support to concepts that help to create connection among tenants, involvement and sense of belonging will achieve successful adaptation to climate change, but that this is a concept that not all are willing to undertake. This hints to the existence of correlation between belief and the availability of resources.

On the other hand, like Figure 20 shows, some SHIs were not so optimistic regarding both, the capacity of SHIs and of tenants to adapt to climate change. SHI Neues Leben expressed, *“I believe in order to contribute to climate change the construction field should slow down”* (Interview partner KOPPITZ, NEUES LEBEN 2021) ruling out that the application of adaptive measures would be sufficient to adapt to climate change.

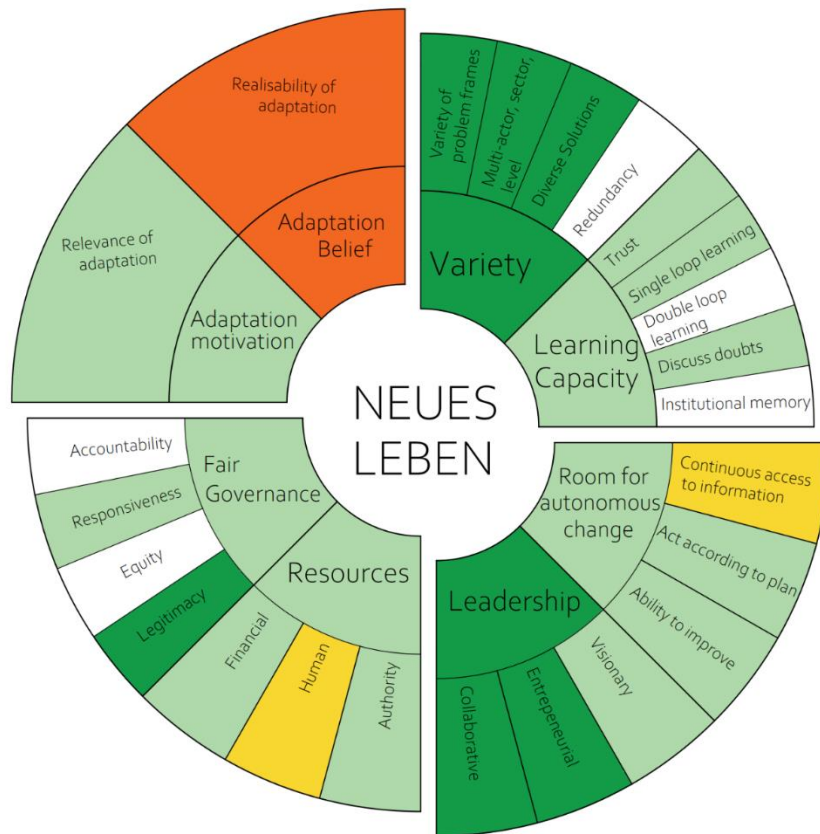


Figure 20. ACW scoring results of NEUES LEBEN. Self-elaboration.

### *Future perspectives for SHIs*

I concluded interviews with a focus on future expectations, the possible evolution of risks and challenges presented by climate change, as well as a possible vision of future scenarios for social housing and adaptation to climate change.

Positive perspectives regarding the idea of a “sustainable transition” pervaded this section of the interview. Most SHIs are confident that by identifying leverage points within housing production and maintenance, the transition is feasible and possible. Their acceptance and expectation for new regulations and financing schemes that promote climate friendly construction is high. Meanwhile SHIs are preparing to make use of the new opportunities as soon as they are available.

A detachment from old construction and design techniques points towards a greater implementation of adaptation measures and innovation among new production. But most importantly, within this section of the interview a strong emphasis was placed on the old housing stock and the great opportunity for adaptation that can be realized in it.



*“We need to use and push for more funding to renovate and adapt the old stock. Politics should also re-think the norms because many are limiting for the big renewal process that are needed”* (Interview partner VUKOVIC, AH 2021).

Adapting the local norms and strategies to focus on adaptation of the old housing stock represents a huge opportunity in Vienna where the housing stock is quite large.

*“The municipality should concentrate in revitalizing the old housing stock and not so much in developing further the new stock”* (Interview partner, KOPPITZ, NEUES LEBEN 2021).

Furthermore, interviewees highlighted the constantly growing wish and interest from tenants to adapt to climate change. Tenants appreciation and wish for measures push for more and better implementation on side of the institutions. This wish is translated into demand-offer frameworks. The more they ask, the more institutions are willing to give.

### 6.3. Case Study Finding's Discussion

SHIs in Vienna showed a strong development based in cooperation and exchange. Municipal frameworks (developer's competitions) seem to offer a platform where institutions are encouraged to work together, learn from each other, exchange experiences, and share valuable information. Such practices and customs not only enhance the emergence of variety, that can be observed in a number of innovative adaptation measures, but they also avoid the replication of failures that turn into maladaptation measures. However, regardless of the arena of exchange and cooperation in which SHIs operate, findings from other dimensions evidence the far-reaching influence of the vertical policy-making culture of Vienna. This minimises the opportunities to include new actors and results in less motivation to adapt. According to the SHIs in Vienna, one of the biggest problems limiting adaptation is the lack of motivation of the tenants.

Findings from the policy analysis pointed out the lack of definitions within strategies and law limitations at the local level, that affect the performance of SHIs when fostering adaptation to climate change. Tensions between these and the existence of variety were reaffirmed through the interviews. Even though policies at the local level tackle specific risks, their formulation is not adjusted to real needs. Law limitations, construction norms, lack of

concrete strategies and criteria are hampering adaptation to climate change on the side of SHIs. However, the high willingness, readiness and interest of SHIs to adapt and support climate change adaptive capacity was evident. They showed high expectations and acceptance for new regulations and financial schemes that can support adaptation. SHIs are confident that identifying leverage points within policy-making, fostering adaptive capacity is doable.

SHIs demonstrated a general high interest towards climate change adaptation, results indicate that their role as social servers and their desire for public engagement permeates into their housing provision tasks. However, lack of trust between institutions and tenants underlined the position of SHIs as providers of adaptation measures, rather than promoters of them. Such practices and beliefs are highly linked to the vertical policy-making culture mentioned above. SHIs perceive tenants as recipients of measures rather than as possible performers. Furthermore, SHIs argued that the vertical policy-making is, for the time being, the most effective way to achieve adaptation at a larger scale. Additionally, some SHIs see no great value on the performance of individual adaptation measures, since they are performed at such a small scale.

Moreover, the identified lack of trust permeates in many different criterions and dimensions. For instance, the absence of trust on SHIs in Vienna, results in a lower rate in dimensions like room for autonomous change, variety, emergence of leaders, and adaptation motivation, highlighting the importance of building trust among tenants.

Other identified interlinkages between learning capacity and adaptation belief noted the importance of trust. Promoting trust among tenants encourages them to act autonomously, gives them room for the implementation of individual measures, and even motivates them to adapt. Different forms for the strengthening of trust were mentioned throughout the interviews. For instance, the EGW mentioned that including tenants in decision processes, offering them information, and workshops would elevate their sense of belonging and therefore their trust. Further SHIs showed agreement over the idea that involving tenants since early project design stages improves their trust, sense of belonging, and their motivation to adapt to climate change. A strong sense of belonging consequently builds leadership, and thus fosters tenant's adaptation capacity. However, the financial costs that such activities represent to institutions, the additional expertise, and the lack of attendance

due to tenant's low interest, demonstrated the high dependence that still exists between housing production costs, affordability of social housing and the implementation of adaptation measures. On one side, human resources (expertise) are hardly accessible to tenants in the absence of a stable leadership culture. On the other, it appears that financial resources are still in concurrence with adaptation measures. The high increase in construction costs goes hand in hand with the increased implementation of adaptation measures, which endangers the affordability of social housing. Which makes me wonder if funding schemes are still not anticipating the required investment costs for the adaptation of social housing? SHIs agreed with the idea that larger funds should be available, in order to allow the implementation of far-reaching measures without jeopardizing affordability.

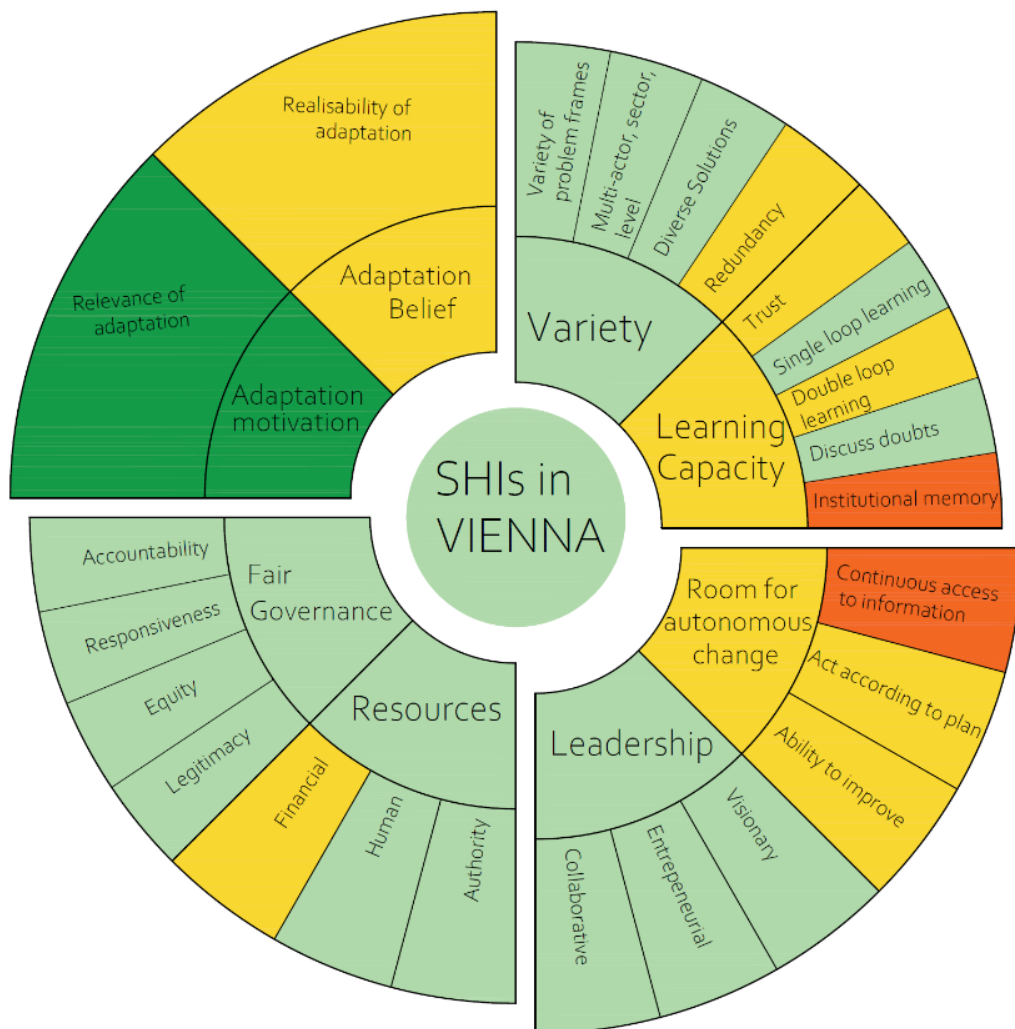


Figure 21. Average ACW scoring of all assessed SHIs in Vienna. Self-elaboration.

In sum, the intrinsic characteristics of SHIs such as internal informal norms, customs, practices and beliefs show an overall suitable profile for effective adaptation to climate change. But most importantly, they show an average high adaptive capacity. However, practices that would foster adaptive capacity of tenants still present room for improvement. For instance, implementing frameworks that strengthen the sense of belonging of tenants with more frequency; pursue that working partnerships between SHIs and governmental entities lead to the adjustment of policies, strategies, laws and funding schemes. Furthermore, building bridges of trust with tenants will not only improve their motivation to adapt, but it can contribute to generate learning-loops that enable SHIs, governmental entities and other experts involved to understand actual and future needs for adaptation. The possibility of improvement exists, the arena to do so appears to be acceptable to perform such activities. I wonder what potential there would be if SHIs, the developers' competition instrument and the policy making entities, could work even closer together, could listen to each other's constraints and could work to include the tenant. In the same way, I wonder if in any other context the constraints are the same, if SHIs work under similar conditions or if they are already at a more advanced stage where they have identified leverage points for improving adaptive capacity.

The following chapter will attempt to answer these questions by comparing SHIs in different contexts. The same RQs are followed, but the case study changes assessing SHIs in the Netherlands and Denmark.

## 7. COMPARATIVE ANALYSIS

Selecting Vienna as the case study raised a number of research concerns. Its political environmental history, its policy decision-making model, its welfare tradition and the historical development of its social housing render Vienna a unique case study. Such uniqueness allows and pushes for a targeted comparison. The comparative approach that I designed for this empirical step is described in chapter 4.6. The selection of different case studies aimed to facilitate the comparison of the ACW framework results obtained from Viennese SHIs and took special attention on the similarities of the aspects showed in the table below (Table 6).

Similarities	Denmark	Netherlands
Average of Housing Stock under ownership and maintenance of SHIs (Austria 24%)	21%	30%
Service attitudes and social duties	Specialized third sector / long social housing production tradition	Social duties controlled by the BBSH (social rented sector management order)
Implementation of integrated project delivery methods	Cooperative movement tradition	Production agreements regulated by Municipalities
Housing provision formats	Municipalities have control over: budget, amount, approval, and certain renting rights.	Regulatory instruments like the Social house-building guarantee fund (WSW)

*Table 6. Selection of comparative case studies. Self-Elaboration*

The following chapters 7.1 and 7.2 introduce the particularities of the two selected case studies. I intend to provide the necessary information for the understanding of the Danish and Dutch social housing profile. After having introduced the social housing profile of both cases, I proceed to report the findings obtained from the methodological procedure described in chapter 4.6., the comparative analysis.

## 7.1. Dutch and Danish Social Housing Profile

### *Danish social housing*

Social housing in Denmark comprises 21% of dwellings owned by SHIs (excluding the public stock), similarly the stock of social housing in the City of Copenhagen represents around 20%. Peculiar of the Danish social housing context is their rent price regulation, strongly influenced by quality and location. Rent responds by law to production costs not to market variations, meaning that dwellings of the old housing stock present lower rent prices than new developed dwellings (VESTERGAARD & SCANLON, 2014: 88). Danish social housing development is still under high control from local authorities. New construction must be approved by the municipality, as well as construction budgets and amounts. Municipalities have the right to assign 25% of new social housing units to future tenants (ibid: 80).

At the city level, social housing production in Copenhagen and generally in Denmark, has never been responsibility of national, nor local authorities. Danish social housing development has always been a task of housing institutions, considered semi-autonomous bodies, partially subsidised and under state regulation. Particular of the Danish context is their collective form of organization, a heritage of the country's mid-19<sup>th</sup> century cooperative movement. All SHIs are part of a bigger administration, the KAB (Danish Co-operative Social Housing Association) a kind of umbrella association owned by the same SHIs members that administers dwellings in ownership of SHIs. It makes sure that the non-profit characteristic remains legitimate (KAB 2021).

The cooperative movement also influenced internal institutional practices. SHIs in Denmark are highly prone to look for tenant's involvement and promote tenant democracy as a legal framework (VESTERGAARD & SCANLON, 2014: 77, 78). Tenant's democracy is seen as a basic principle of non-profit housing, like this, tenants play an important role in decision making processes (KAB 2021).

SHIs in Copenhagen are mainly financed through loans composed of, mortgage (88%), tenants deposit contributions (2%), and municipality loans (10%). The municipality does not provide direct funding but gives out loans that are yearly controlled (VESTERGAARD & SCANLON, 2014: 79; TURK 2021). In 2019, SHIs owned 20% of the dwellings in central Copenhagen (excluding greater Copenhagen area) and exhibit a strong merging tendency.

Similarly, to SHIs in Vienna and Amsterdam, SHIs in Copenhagen present big variations in size with institutions owning 40,000 units, compared to others owning only 10 or less (VESTERGAARD & SCANLON 2014: 78).

#### *Dutch social housing*

The social rented housing sector in the Netherlands is today the largest sector in Europe, with 30% of dwellings under ownership of the municipality and SHIs. In contrast to Austria, the social housing stock under ownership and management of SHIs (32% back in 2014) exceeds significantly those dwellings owned by the municipality (ELSINGA & WASSENBERG 2014: 25).

In cities like Amsterdam, social housing represents around 50% of all dwellings. Considering production amounts of social housing units (since 2013) from Vienna and Copenhagen, Amsterdam has shown a relentless work in housing production with numbers almost three times higher (Housing Europe 2021). However, privatization practices over the social housing stock show a much liberal attitude towards buying and selling of dwellings, a feature that also performs as the business component of SHIs, since they use selling revenues as investment for new housing development (ELSINGA & WASSENBERG 2014: 27,31).

Since the foundation of the first SHI back in 1850, social housing institutions in Amsterdam and all around the Netherlands, have evolved to be considered important stakeholders among the residential building level (ELSINGA & WASSENBERG 2014: 28). SHIs in the Netherlands perform as private institutions within the non-profit sector (similar to Vienna), their work is regulated by the Social Rented Sector Management (BBSH) and financed (to a certain level) by the Social House-Building Guarantee Fund (WSW) since the abolition of governmental loans and subsidies back in 1995 (ELSINGA & WASSENBERG 2014: 30; RODERS et al. 2015a: 35).

In recent years (2012-2014) there has been a notable decrease in the number of social housing institutions due to merging practices. Thus, increasing the disparity in the number of social stock owned by SHIs, with average institutions owning around 6, 300 dwellings, while others own ten times as many units or more (ELSINGA & WASSENBERG 2014: 29; RODERS et al. 2015a: 35).

According to the Social Rented Sector Management Order (BBSH), SHIs are in charge of providing housing for people in need, elderly and handicapped, maintaining quality in dwellings, consulting with tenants, running their financial affairs, and contributing to the achievement of livable neighbourhoods (ESLINGA & WASSENBERG 2014: 36). Given that governmental subsidies are not present, municipalities have very limited influence and control over SHIs. They still act as supervisors under legal statutes, a task that is performed under agreements that oversee the self-regulation of SHIs and the application of regulation checks, and balances through audits and internal supervisory boards (ESLINGA & WASSENBERG 2014:36).

The Austrian, Danish and Dutch social housing contexts show important similarities that enable their comparison. On the one hand, all three contexts are an example of the persevering development of social housing in Europe (Housing Europe 2021). Their consistent targeting of affordable housing provision can be distinguished in the accumulation of stock. On the other hand, the production, building and maintenance processes are delivered through social housing institutions. These entities show a strong presence in each of the case studies (AT, NT, DK). Moreover, SHIs act as intermediaries in the implementation of housing policies and thus have the capacity to apply environmental adaptation measures when forehanded.

Although the frameworks of economic support, monetary resources and funds are different for each case study, they all have some governmental regulatory presence. Although financial support frameworks, budgetary resources and funds have in each case different configurations, each case study shows a certain governmental regulatory presence.

This comparative analysis does not make use of the policy analysis that was carried out in the case study of SHIs in Vienna, however, in order to complete the social housing profile of the comparative case studies, it is necessary to go into describing their climate change adaptation policy. In order to complete the profile of social housing I provide in the following chapter current policies linked to social housing provision and adaptation to climate change.



## 7.2. Policy profile: SHIs and Climate Change Adaptation in DK and NT

### *DENMARK*

Denmark has recently announced policies that channel investments from the National Building Fund for green-renovation, energy-refurbishment and overall energy-efficiency renewals in social housing. Until 2026, the investment secures four billion for the implementation of measures (Housing Europe 2021: 28). Already in 2020, renovation measures in existing social housing units four-folded compared to 2019. This, was seen as the result of agreements (Green housing Agreement) between housing institutions and the government, which allocated strong funding schemes for renovation works (ibid: 51). Furthermore, the existence of a strong focus on adaptation measures related to tenant's well-being and sustainability was observed. This is being pushed by the state board of the Danish Co-operative Social Housing Association (KAB). This board, elected yearly, works closely with other KAB stakeholders (SHIs members) to present a general direction for housing development that includes plans and strategies in environmental, financial and social areas (KAB, 2021).

### *THE NETHERLANDS*

Current studies over awareness towards adaptation in the social housing production field evidenced a limited awareness level among SHIs (BOEZMAN & DE VRIES 2019). This was linked to factors like, the low level of priority in contrast to other housing issues, financial and regulatory barriers, as well as the lack of partnership and cooperation practices (ibid). Measures linked to climate change adaptation are seen as one of the many responsibilities from SHIs, since they are measures that can achieve livable neighbourhoods, one of the tasks of SHIs (ESLINGA & WASSENBERG 2014: 36). However, current economic circumstances have been influencing over the several "extra" activities from SHIs (i.e. interventions at the neighbourhood level, creation of neighbourhood centres, environmental maintenance, provision of schools, shops, etc.). A general economic crisis is being reflected in high buying reluctance and therefore low housing sales, affecting further activities within SHIs like renewal, refurbishment and new constructions (ESLINGA & WASSENBERG, 2014: 37-38). Awareness towards climate change adaptation among SHIs in the **Netherlands** was also

studied by RODERS. In his studies SHIs presented an indirect awareness, applying adaptation measures in projects but not being fully aware of it. Moreover, adaptation measures as well as mitigation measures have been related to indirect saving costs rather than to direct reduction of CO<sup>2</sup> emissions (RODERS et al. 2015a: 83).

Renewal and renovation of the old housing stock remains highly unaddressed. With national recovery plans for 2021 being declined. Measures for adaptation like housing insulation, decarbonisation, solar panelling, high-tech water heating, and ventilation systems are being funded and supported through tax breaks, tax credits for SHIs, and special governmental funds for sustainable and livable cities (Housing Europe 2021: 83).

### 7.3. Comparative Analysis Findings based on the ACW dimension

Overall similarities and differences between social housing profiles, as well as the operational, administrative, and institutional characteristics of their respective SHIs, were considered for the comparison process. The insights on Denmark and the Netherlands that I collected through a literature review, together with the findings resulting from the application of the ACW framework in Viennese SHIs were used to generate the qualitative comparison by means of Interview with experts.

In the following, I will present the findings from the partial application of the ACW framework in Denmark and the Netherlands. The structure used for the results presentation is similar to the Viennese case study. Characterized by presenting the strengths and weaknesses summarized per dimension.

#### *VARIETY*

The variety of solutions, discourses and actors among Viennese SHIs took the form of knowledge exchange and cooperation frameworks provided by Vienna's Housing Fund. Equally important, contributing to this existence of variety is the willingness of SHIs to share expertise and to cooperate with each other. SHIs in **Denmark** possess qualities of their long and strong cooperative traditions (cooperative movement heritage). However, cooperation

forms are observed at the knowledge sharing level rather than on the fieldwork. According to ZERLANG (2021), SHIs are characterized by an individual working culture when it comes to housing production.

*"There is a lot of knowledge sharing happening within organizations created by the state [...] but a single or individual way of working is more characteristic of Danish social housing production"* (Interview partner ZERLANG 2021).

Furthermore, observed practices within the Danish social housing development field, point towards a wider variety of areas of location, housing set-ups, ownership variety, and overall varied housing typologies (Interview partner BECH-DANIELSEN 2021).

*"A way of introducing variety within social housing, and most importantly within socially vulnerable housing, is by tearing down the barriers that confine it"* (Interview partner BECH-DANIELSEN, 2021).

Such practices contribute to fight the mainstream of adaptation measures towards climate change. As GUPTA et al. (2010) states, variety implies that the existence of a single and correct ideological framework, policy, strategy or solution is not possible. Hence, a greater variety among all possible interconnected housing fields may contribute to climate change adaptation.

On the other hand, variety issues in the **Netherlands** are present within the lifecycle (circularity) of old housing units or buildings. The old social housing stock represents an important challenge in relation with adaptation to climate change. The lack of variety in renovation standards and policies is reflected in commonly superficial renovations that may have only minor impacts towards adaptation to climate change. The lack of policies has greater consequences for SHIs in the Netherlands, such as their hesitance towards deep renovation plans, and their unwillingness to address a wider amount of housing stock in need of renovation.

*"They (SHIS) keep waiting for more infrastructure and input on sides of the Municipalities, in terms of renewable energy supply, alternative heating systems, etc."* (Interview partner STRAUB 2021).

Despite the lack of policies and strategies mentioned in chapter 7.2, recent policies at the national level are targeting a 100% circular economy strategy to be achieved by 2050. However, housing production does not perform as one of the biggest contributors within

the policy. But, alone the construction sector is responsible for the use of 50% of raw materials use, 40% of total energy consumption, 30% of total water consumption and around 40% of waste comes from construction and demolition activities (NL Government, 2016: 58). Tough, strategic goals of the document push for material recycling measures, no specific activities and guidelines were observed, further contributing to the mentioned lack of renovation standards and strategies.

#### *LEARNING CAPACITY*

Generally, institutions that encourage trust among each other, and adopt the learnings from past experiences exhibit a high learning capacity (GUPTA et al. 2010). The cooperative tradition of **Danish SHIs**, results in an important involvement of tenant's along decision processes. Participation and close cooperation are signs of a high level of trust between SHIs and tenants, seen as strategy to achieve common benefits (Interview partner ZERLANG 2021). However, low levels of trust between SHIs and the municipality have been problematic for a long time, a situation that has been more hostile since the creation of the Parallel society act (law package adopted in 2018). The Parallel society act is a legislation that has influence on social housing demolition, redevelopment and allocation, not only of buildings but also of tenants. The overall aim of this legislation is to address neighbourhoods with high percentage of non-western immigrants. However, this sudden, extreme and unprecedented involvement of the government within housing issues has had repercussions on the existing trust between SHIs and tenants.

*"So, inhabitants, in this case tenants, do not trust SHIs and the municipality working together"* (Interview partner BECH-DANIELSEN, 2021).

The learning capacity of SHIs in Denmark is being hampered by the strong recent political involvement. Furthermore, a remarkable difference in size and capacity among SHIs in the country plays an important role in their ability to learn. Larger and highly professionalized SHIs show themselves stronger at experimenting, leading and sharing knowledge practices, while shorter, lagging behind SHIs, show no signs of evolving nor learning.

**Netherland's** history of tenant's involvement in the long and persistent development of social housing has built strong trust bases over decades. Such trust has evolved further into policies and norms that regulate a minimal percent of tenant's agreement as vital part of

decision-making processes. For instance, when any construction works of any type and at any level, are wished to be performed, SHIs should achieve a minimal 70% approval of the tenants (or tenant's council) in order to perform such plans (Interview partner STRAUB 2021). Certainly, the low involvement from the municipality has given the SHIs chance to build communication ways and enhance trust with their tenants.

Furthermore, the learning capacity of SHIs has been affected by the recent economic crisis (ESLINGA & WASSENBERG, 2014: 37-38). SHIs have experienced a strong fall on sales, social housing capital and investment. This lack of capital can be also related (as seen in the paragraph before in Denmark) with the capacity of SHIs to generate knowledge. SHIs with bigger capital amounts are able to experiment, innovate and generate knowledge aim to adapt to climate change.

#### *ROOM FOR AUTONOMOUS CHANGE*

Individual adaptation measures in **Denmark** are possible and regulated by SHIs. However, while tenant's are aware of their adaptation rights, the existing lack of information such as strategies, adaptation actions and plans, is seen as a discrepancy and as the source of misunderstandings (Interview partner BECH-DANIELSEN 2021). Recalling Gupta et al. (2010) lack of information can certainly evolve to behaviours that affect adaptation to climate change, thus, to maladaptation practices. Furthermore, according to ZERLANG (2021), individual adaptations have no room in social housing.

*"Adaptation measures should be collective and include the collaboration of SHIs in order to implement wider measures that can benefit the majority"* (Interview partner ZERLANG 2021).

Similarly, individual adaptation measures are allowed for tenants in **Dutch** social housing units. However, two peculiar factors are limiting the emergence of individual measures. According to STRAUB (2021), the first factor is related with dwelling's occupation time. Average occupation times in social housing units in the Netherlands are considered problematic for the implementation of adaptation measures. Tenants do not tend to occupy the units for long time periods and therefore are unwilling to implement adaptation measures (cost related). The second factor is linked to the typologies of social housing units.

Individual adaptation measures and the capacity of improvisation of tenants is more commonly observed in "family house" type of units. All in all, individual adaptation measures can be demanded by tenants despite the existence or not from information and/or plans and strategies (Interview partner STRAUB 2021). However, adaptation and autonomous change in general is performed by SHIs.

### *LEADERSHIP*

Contrary to how results were presented in the Viennese case study (highlighting both, tenant's and SHI's leadership), findings from the comparative analysis draw over general leadership presented only by SHIs in Denmark and the Netherlands. Interview questions for this dimension followed a general approach to the practices and intrinsic characteristics of SHIs as a whole (see Annex b. Interview Guideline, Comparative Cases: NT and DK).

Following the strong governmental interventions in **Danish** social housing, the Parallel society act, the high levels of trust between Danish SHIs and tenants identified before, have been disrupted. On the one hand, one of the main objectives of the Act strives for close and strong cooperation (also one of the criteria of Leadership dimensions of the ACW) between SHIs, private investors and the municipality, to address social challenges within social housing developments in certain neighbourhoods. Though cooperation is being promoted for the afore mentioned actors, there is little room for tenant's entrepreneurship.

It is believed that adaptation to climate change should include measures that benefit the majority (Interview partner BECH-DANIELSEN 2021; Interview partner ZERLANG 2021), however, such beliefs and practices are showing distancing between tenants and urban planners.

*"Residents have a narrower perspective. Often striving for measures that benefit them and maybe a few amounts of people. On the other side, urban planners push for measures that can benefit the majority [...] planners and tenants are growing apart"* (Interview partner BECH-DANIELSEN, 2021).

Leadership for adaptation to climate change is being left aside in order to address current housing challenges in the Denmark. Leadership in general, has been taken away from SHIs and from tenants under the recent legislation. The prioritization of social issues over climatic

issues around housing can lead to a backlog in adaptation to climate change and to the emergence of stronger climate risks and consequences.

In **the Netherlands** the strong tenant's involvement tradition has an influence on the leadership of SHIs. *"Tenant's involvement is a strong tool among social housing"* (Interview partner STRAUB, 2021). Tenants have strong influence over renewal decisions, new construction and other activities. However, this strong cooperation is where the issues also arise.

*"Taking tenant's alongside and pursuing cooperation with them is problematic"* (Interview partner STRAUB, 2021).

Similarly, to Viennese SHIs, Dutch SHIs perceive the lack of technical and specific knowledge of tenants as problematic, it can lead to confusions, misunderstandings, maladaptation and ultimately, to the loss of trust. But Dutch SHIs follow partnering approaches (practice observed as well in Viennese SHIs) with important participation experts, like architecture firms, landscaping experts and social experts in order to achieve tenant's involvement and approval. Such collaborative practice has become more of a trend around social housing development.

## RESOURCES

**Danish** SHIs as non-profit institutions must be able to achieve availability of human and financial resources autonomously. Here like in other dimensions, the strong current involvement of the government has remarkable influences. For instance, in the achievement of financial resources. With political attention set rather on social issues of the housing field, than on climatic ones, municipal funds and loans for the implementation of adaptation measures to climate change have been rather achieved through "hitchhiking" practices.

*"Historically, funding provision is strongly related to technical issues, conditioning the availability of resources to reparation activities"* (Interview partner BECH-DANIELSEN, 2021). Today, the idea of implementing funding for the adaptation of social housing units is still rare and often achieved by undertaking refurbishment plans that address mainly technical issues, and adopting along the way adaptation measures.

Social housing institutions in **the Netherlands** are private entities with a long privatization history. They have acquired and perfected private company behaviours that can be seen

through their varied activity portfolio (performing for all sectors, from high to low income housing). Along their historical evolution, they have also taken advantage of opportunities to gain more freedom, not only financial freedom through the monopolisation of subsidies, but also technical and political freedom by identifying gaps within policies and building codes that allow them to do their bidding. SHIs tend to use their financial, technical and political freedom for the implementation of adaptation measures, though not far reaching. Not minding the few cases where this practice is performed, the fact that they may be willing to redirect those resources (and freedom of their use) is worth mentioning.

#### *FAIR GOVERNANCE*

Assessing fair governance for the Viennese case study (SHIs in Vienna) had a different approach. The additional policy analysis chosen for it, helped identifying important criteria of this dimension. It addressed the legitimacy of policy making processes, policy responsiveness, and transparency at the city level. However, for the comparative analysis fair governance was addressed by pointing out results of Viennese SHIs and by inquiring about the political situation in Denmark and the Netherlands.

Current social challenges in **Denmark** (addressed by the parallel society act) strongly permeate several areas of housing policy. Policy responsiveness shows a strong focus over so called "socially vulnerable" housing areas, identified in several neighbourhoods, mainly in the city of Copenhagen, and characterized by a high percentage of inhabitants with non-western backgrounds (related also to high percentages of crime, unemployment, low salary, low academic index) (UN Human Rights). Political will is set now and for the next ten years, in preventing the expansion and creation of this "vulnerable" housing areas and in creating more "mixed" (socially) housing areas all around Denmark (Interview partner BECH-DANIELSEN 2021). However, political responsiveness has also shown a remarkable attention to climate change. "*Great political compromises are showing agreement to CO<sup>2</sup> emissions reduction*" (Interview partner ZERLANG 2021), which highlights the big compromise with climate change adaptation.

Though, the attention is rather focusing on social challenges than adaptation to climate change in housing, the "hitchhiking" effect can also be seen here. As the push for mixed neighbourhoods rises, the affordability of housing is being taken along too. Which raises



questions on the possibility to use hitchhiking strategies to incorporate adaptation measures within the current policies (parallel society act).

As already observed in the Resources dimension, **the Netherlands** show a looser political environment, where housing institutions act in a more independent and free manner. Additionally, the political looseness has further repercussions over adaptation guidelines, resulting in the absence of real and clear adaptation measures. SHIs act in a field that is lacking guidelines for the implementation of climate change adaptation measures. Furthermore, performed adaptation measures pursue a result-oriented ideology. That is, adaptation measures are intended to result in observable and measurable improvements, such as energy savings that turn into Energy label standards for buildings (STRAUB 2021). These energy improvements are used for tenant's attraction and tenant's approval (any improvement/refurbishment measure has to achieve 70% of tenant's approval).

The high level of freedom and the low involvement of the government is seen as issue. "*SHIs are working totally independent from municipal government which makes problematic to achieve environmental targets like 100% relying on renewal energy sources.*" (Interview partner STRAUB, 2021).

Moreover, accountability attitudes suffer in an environment with so much freedom. All SHIs, independently from their sizes and capacity should comply with adaptation standards, yet they are able to develop their own internal policies around adaptation showing an extremely different housing landscape around adaptation.

#### *ADAPTATION MOTIVATION AND ADAPTATION BELIEF*

Contrary to the findings from Vienna where SHIs showed high adaptation motivation scores, the motivation of SHIs in Denmark and the Netherlands is outweighed by other social priorities within the social housing field. Social challenges present in both case studies and described throughout this chapter are the centre of attention within housing plans and strategies. If well climate change adaptation is for both, Denmark and the Netherlands, an important topic within housing (Interview partner BECH-DANIELSEN 2021; Interview partner STRAUB 2021), social mix, social development and social integration are the current priorities. Additionally, it has been observed that between the super-diverse background of

tenants in social housing and their adaptation motivation there is an important connection. The lack of integration of such tenants is directly linked to a lack of participation, of interest, and of motivation towards adaptation to climate change (Interview partner ZERLANG 2021; Interview partner STRAUB 2021). Nevertheless, adaptation measures to climate change can still be taken along when tackling social issues (Interview partner BECH-DANIELSEN 2021) by integrating the adaptation measures into present housing strategies.

However, not only adaptation motivation was found to be low, but also adaptation belief. The impact of the present social problems, specially the lack of integration in Danish and Dutch social housing is also affecting the adaptation belief.

*"We see a less amount of adaptation demands or overall climate change adaptation culture in neighbourhoods that suffer social problems"* (Interview partner ZERLANG 2021). Furthermore, in Denmark the lack of refurbishment measures and overall adaptation plans within social housing affects not only the belief of actors to adapt to climate change and their ability to do it, but the overall belief of adaptation towards climate change as a need of the society (Interview partner ZERLANG 2021). The formulation of adaptation plans and refurbishment strategies can be the key to incentivize adaptation belief. Nevertheless, such plans and strategies should be developed responding to the present knowledge and needs, avoiding the same mistakes of the past (Interview partner BECH-DANIELSEN, 2021).

#### 7.4. Discussion of Comparative Analysis: DK, NT and Vienna

Climate change adaptation has huge potential in a context where cooperation can happen. Danish and Dutch SHIs share a history based on co-operation and a close relationship with the tenants. Such practices have contributed to the establishment of strong trust foundations, not only between SHIs and tenants, but also between social housing stakeholders. SHIs show themselves ready and willing to exchange knowledge and possibly even to work together. However, in contrast to SHIs in Vienna, the Danish and Dutch social housing institutions do not yet have an exchange arena, a cooperation network such as that one represented by the housing fund *Wohnfonds Wien*. Furthermore, such a strong tenant's involvement in decision making processes can endanger the implementation of adaptation

measure, since SHIs must achieve a minimum of 70% tenant's approval for their implementation.

The current study pointed towards tensions around the housing policy field. For instance, Dutch housing policy exhibits a lack of variety in refurbishment standards, guidelines, regulations and funding. Which are reflected in the hesitancy of SHIs to implement deep, wide-range renovations where they can include various adaptation measures. Additionally, local authorities are not providing the needed infrastructure in time (i.e. renewable energy supply, alternative heating systems, adapted regulations). Thus, hindering the adaptive capacity of SHIs and of tenants.

Although the housing policy context in Denmark presents a high involvement of local governmental authorities, such involvement focuses on the social challenges that social housing faces in present time. The prioritization of social issues over climatic issues can lead to a backlog in adaptation to climate change. Furthermore, current policies leave little room for SHIs initiatives (related to leadership), let alone tenant's entrepreneurship and innovation. However, SHIs have taken up hitchhiking practices as a way to include adaptation measures in housing development and renovation. The hitchhiking trend is especially interesting when we look at the way SHIs in Vienna share experience and knowledge within the developer's competition framework. Danish SHIs could profit from the exchange of hitchhiking experiences if they were to have the exchange arena like Viennese SHIs presume.

Observing the housing and adaptation political environments of Danish and Dutch SHIs, I noted that both, a strong political involvement (Denmark) and a loosen political presence (Netherlands) can hamper adaptation to climate change. On the one side, strong political involvement (Denmark) limits actors such as tenants and SHIs to perform adaptation measures, coordinate, develop guidelines, etc. On the other side, political looseness (Netherlands) characterized by the lack of adaptation guidelines, strategies and policies, can result in absence of adaptation implementation and a general failure to achieve local, national or European climatic related targets. Accountability is not possible in a context with no policies and guidelines, nor is cooperation and involvement of important key players such as tenants, public authorities, experts in the adaptation field, NGOs, other SHIs, etc.

Further possibilities for achieving adaptation within social housing were observed. For instance, regulating tenant's involvement could bring many benefits for both, Danish and Dutch social housing. Tenant's involvement is based on trust and cooperation, such bonds can result in knowledge sharing, higher learning capacity, emergence of autonomous and collective adaptation measures. They can also help to overcome specific challenges like adaptation awareness. Identifying the right way to involve the tenant in decision making processes can ensure the implementation of adaptation measures and help to establish a united front that pushes for adaptation guidelines, policies and infrastructure on the side of the governments. A united front can push for the creation of targeted strategies, wider funding schemes that focus on the climate change issues, and settlement of adaptation needs without losing the fight against social challenges. But most importantly, involving the tenants can help for one of the main current social concerns mentioned in the parallel society act, integration. Having adaptation as a common goal can help to integrate all parties interested.

Furthermore, a united front pushing for adaptation as a common goal can focus on expanding the financial flexibility and like this, achieve the integration of tenants earlier, address the affordability of social housing units without having to leave adaptation measures behind, and involve expert actors in collaboration and partnerships.

## 8. GENERAL CONCLUSIONS

The purpose of the current study was to evaluate to what extent are housing institutions fostering climate change adaptive capacity. For this purpose, Viennese SHIs were selected as case study. SHIs in Vienna were assessed by means of the Adaptive Capacity Wheel framework on their ability to foster climate change adaptation capacity. The examination included a specific focus on the intrinsic characteristics of SHIs that influence, shape, improve or limit the adaptive capacity of tenants. Additionally, findings of Vienna's case study assessment were submitted to a comparative analysis with selected comparable contexts. Like this, SHIs in Denmark and the Netherlands were assessed and compared following an adapted ACW framework methodology.

General results of the assessment show that adaptation to climate change within the social housing field, plays an important role. Adaptation to climate change is considered a pressing current human concern, but also an opportunity for improvement at the household, institutional and political levels. The city as a context in which SHIs are embedded, showed an important influence over SHI's internal norms, their traditional practices, behaviors and attitudes. It was observed that SHIs' internal characteristics reflect to some extent, the context in which they develop. At the same time, SHIs could be the starting point for discussing how they can foster adaptive capacity in specific contexts.

In particular, results of the adapted ACW methodological framework assessment on Viennese SHIs presented a high to very high average scoring on the majority of the ACW dimensions (see Figure 21). SHIs in Vienna have developed strong cooperation practices, cherishment for knowledge and experience exchange. Such characteristics enhance the emergence of variety, the strengthening of trust, the emergence of discussions, and consequently the learning capacity of institutions. In this sense, SHIs' attitudes and practices proved this sector's vocation for specialisation and a sense of service, but more importantly it proved their high capacity to enhance adaptive capacity. Furthermore, SHIs in Vienna have access to the exchange arena of the developer's competitions, an arena in which institutions are able to practice and develop their cooperative practices. This arena is provided as a governance instrument, designed to regulate the quality of social housing production in the city of Vienna. This instrument acts as an intermediary between government and SHIs. It was

identified as a leverage point through which adaptation to climate change is driven, innovation is fostered, and experience exchanges and cooperation can be achieved.

Findings raised intriguing questions regarding the nature of Vienna’s social housing and adaptation related policies. The political environment is a complex system that influences the adaptation to climate change, not only of SHIs, but ultimately of tenants. The study was able to identify that political response in Vienna is limiting, as laws, guidelines, strategies, and regulations at the city level represent adaptation restrictions for SHIs performance. Furthermore, the observed close relation between SHIs in Vienna and political entities, is seen as an important trust-based bond that could be used for the promotion of policies that respond to actual adaptation needs. Such bond can aim for collaborative work along the design and planning of policies and adaptation strategies. Although SHIs must comply with construction regulations and laws, they possess internal freedom to introduce adaptation measure and thus, foster adaptation capacity of tenants. However, exercising this freedom and trying to introduce adaptation measures individually (as SHI) is limited by economical barriers.

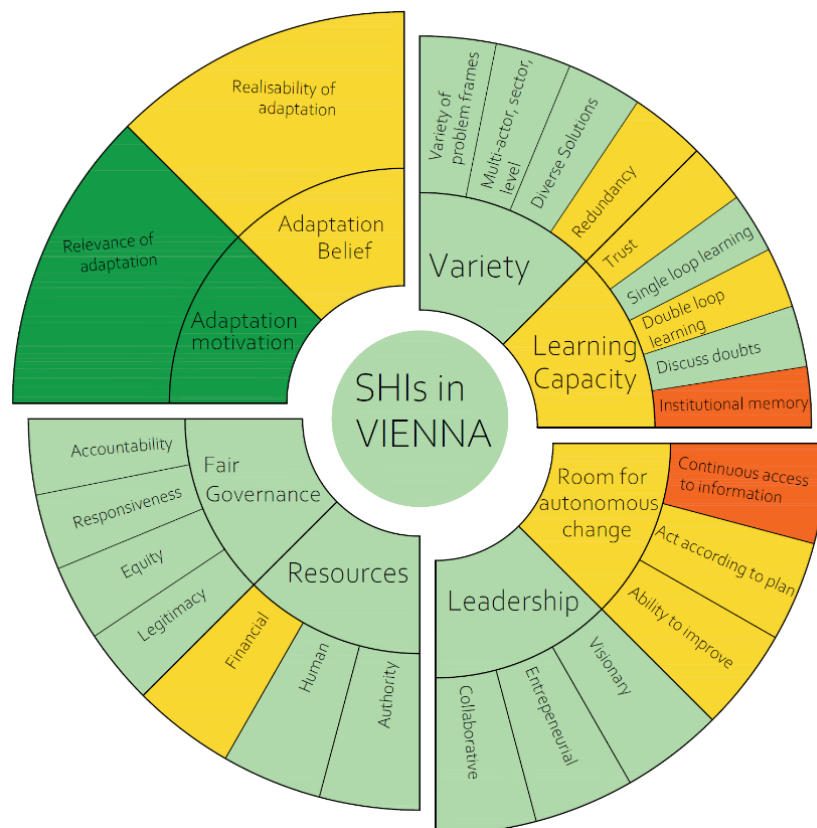


Figure 22. Average ACW scoring of all assessed SHIs in Vienna. Self-elaboration.

Average results of SHIs in Vienna demonstrated high motivation, readiness and capacity towards adaptation to climate change (see Figure 21). However, when it comes to foster the adaptive capacity of tenants I was able to identify many leverage points for improvement. Firstly, working and building up trust with tenants do not only strengthen the learning capacity of tenants, it also contributes to the emergence of leaders, opens room for autonomous changes, and reinforces adaptation belief. Secondly, working on stronger communication bonds with tenants and involving them in decision-making processes, minimizes the risks of maladaptation at the household level. Involving the tenants can foster adaptive capacity by increasing their sense of belonging and consequently their motivation towards adaptation.

In addition, results of the comparative analysis indicate that the above-mentioned opportunities for improvement could enhance SHIs' adaptive capacity. For instance, learnings from the long tenant involvement experience of Danish and Dutch SHIs, suggest that the proper integration of tenants do foster adaptation capacity by enhancing learning capacity, room for autonomous change, adaptation motivation, adaptation belief, variety, and leadership. Grooming the relation between SHIs and tenants can have a strong potential in the Viennese context. Building on the already existing bond of trust between the funding instrument (*Wohfonds Wien*) and SHIs, institutions could work their way to constitute a united SHI-Tenant front that could push for adequate guidelines, policies, and funding.

Though the comparative analysis sought to draw international lessons for SHIs in Vienna, findings from SHIs in Vienna yield significant lessons for SHIs in Denmark and the Netherlands. Danish and Dutch SHIs were embedded in both, an environment with high political involvement and loosen involvement respectively. Results from SHIs in Vienna seem to suggest that the creation of an instrument like the Vienna Housing Funds (*Wohnfonds Wien*) could come in handy. Firstly, as an instrument that promotes cooperation, quality in housing, funding, and a safe environment for including the tenants in decision-making processes. Secondly, the implementation of such instrument could push for the emergence of adaptation policies, guidelines and strategies at the city level.

Ultimately, this research shows that Viennese, Danish, and Dutch SHIs share similarities in their readiness and high motivation, not only to adapt to climate change, but also to foster adaptive capacity of tenants. Agreement over the need for adaptation from old housing

stock, was highlighted when I asked experts about future challenges and perspectives. However, this is no new topic, old housing stock renewal has been long in need for adaptation (VAN HAL & FEMENIAS, 2009). The long waiting times for shifts within the field of construction and housing development remain an issue when we talk about climate change adaptation. Time is key, greater efforts are needed to ensure that the readiness and preparation of social housing institutions is used to achieve a greater adaptive capacity to climate change. This assessment shows also that looking into social housing institutions and identifying their strengths and weaknesses, a context-specific plan can be developed. One that can communicate its results with the actors involved, raise questions on what and how to improve, and make room for variety of solutions.

The ACW framework proved to be a suitable method for the research. On the one hand, it provided a way to generate answers to the specific research questions. On the other, it proved to be a method capable of providing information on the performance of institutions in a specific context. The framework is an accessible, clear and flexible methodology that enabled the assessment of multiple institutions located in multiple contexts. Furthermore, it allowed for the comparison and contrast of SHIs from different contexts enabling cross-sectoral learnings.



## BIBLIOGRAPHY

- [IPCC, 2014] Revi, A., Satterthwaite, D.E., Aragón-Durand, F., Corfee-Morlot, J., Kiunsi, R.B.R., Pelling, M., Roberts, D.C., and Solecki, W. (2014): Urban areas in Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. *Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA*, pp. 535-612.
- [OECD] Monroy, A., Gars, J., Matsumoto, T., Crook, J., Ahrend, R., and Schumann, A. (2020): Housing policies for sustainable and inclusive cities: How national governments can deliver affordable housing and compact urban development. *OECD Regional Development Working Papers. Vol. (03)*. DOI: <https://doi.org/10.1787/d63e9434-en>
- Adger, W.N., Arnell, N.W., Tompkins, E.L. (2005): Successful adaptation to climate change across scales. *Global Environmental Change. Vol. (15)*. 77-86. DOI: doi:10.1016/j.gloenvcha.2004.12.005
- Administrative group for Urban Planning, Traffic and Transport, Climate protection, Energy and Public participation; Administrative Group for the Environment and Vienna Public Utilities (Hrsg) (2017): Energy Framework Strategy 2030 for Vienna; Online <https://www.digital.wienbibliothek.at/wbrup/download/pdf/3489410?originalFilename=true> (01.06.2021)
- Aigner, A. (2019): Housing entry pathways of refugees in Vienna, a city of social housing. *Housing Studies. Vol. (34)5*. 779-803. DOI: 10.1080/02673037.2018.1485882
- Art.-15a (2009): Agreement climate protection in the building sector (Vereinbarung gemäß Art. 15a B-VG zwischen dem Bund und den Ländern über Maßnahmen im Gebäudesektor zum Zweck der Reduktion des Ausstoßes an Treibhausgasen). StF: BGBl. II Nr. 251/2009; Online <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20006413> (27.10.2021)
- Biesbroek, G. R., Swart, R.J., Carter, T.R., Cowan, C., Henrichs, T., Mela, H., Morecroft, M. D., Rey, D. (2010): Europe adapts to climate change: comparing national adaptation strategies. *Global Environmental Change Vol. (20:3)*, 440–450. DOI: <http://dx.doi.org/10.1016/j.gloenvcha.2010.03.005>
- Boezeman, D., and de Vries, T. (2019): Climate proofing social housing in the Netherlands: towards mainstreaming? *Journal of Environmental Planning and Management. Vol. (62)8*. DOI: 10.1080/09640568.2018.1510768
- Bundes-Energieeffizienzgesetz – EeffG (2014): Bundesgesetz über die Steigerung der Energieeffizienz bei Unternehmen und dem Bund (Bundes-Energieeffizienzgesetz – EeffG) StF: BGBl. I Nr. 72/2014 (NR: GP XXV RV 182 AB 205 S. 36. BR: 9204 AB 9222 S. 832.) [CELEX-Nr.: 32009L0028, 32009L0072, 32012L0027]; Online <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20008914> (27.10.2021)
- C2ES, Center for Climate and Energy Solutions (Hrsg.) (2013): Global Manmade Greenhouse Gas Emissions by Sector, 2013; Online <https://www.c2es.org/content/international-emissions/#:~:text=by%20Sector%2C%202013-,Notes,72%20percent%20of%20all%20emissions.> (27.04.2021)

- City of Vienna (2021): Municipal Housing in Vienna. History, facts & Figures; Online <https://www.wienerwohnen.at/wiener-gemeindebau/municipal-housing-in-vienna.html> (03.05.2021)
- de Franca Doria, M., Boyd, E., Tompkins, L. E. and Adger, W.N. (2009): Using expert elicitation to define successful adaptation to climate change. *Environmental science and Policy*. Vol. (12). 810-819. DOI: 10.1016/j.envsci.2009.04.001
- Dupuis, J., Knoepfel, P. (2013): The Adaptation Policy Paradox: The Implementation Deficit of Policies Framed as Climate Change Adaptation. *Ecology and Society*, Vol. (18)4. -31 DOI: <http://dx.doi.org/10.5751/ES-05965-180431>
- Elsinga, M. and Wassenberg, F. (2014): Social Housing in the Netherlands. – In: Scanlon, K., Whitehead, C., Fernández Arrigoitia, M. (2014): Social Housing in Europe. - *Oxford; United Kingdom*.
- Federal Ministry for Climate protection, Environment, Energy, Mobility, Innovation and Technology (BMK) (Hrsg) (2020): Klimaaktiv Kriterienkatalog für Wohnbauten Neubau und Sanierung; Online <https://www.klimaaktiv.at/service/publikationen/bauen-sanieren/kriterienkatalog-wohnbau-2020.html> (11.06.2021)
- Federal Ministry for Sustainability and Tourism (Hrsg) (2017). The Austrian Strategy for adaptation to climate change, 2019; Online <https://www.bmk.gv.at/en/topics/climate-environment/climate-protection/austrian-strategy-adaptation.html> (01.06.2021)
- Federal Ministry for Sustainability and Tourism, Federal Ministry for Transport, Innovation and Technology (Hrsg) (2018): The Austrian Climate and Energy strategy; Online [https://www.bundeskanzleramt.gv.at/dam/jcr:903d5cf5-c3ac-47b6-871c-c83eae34b273/20\\_18\\_beilagen\\_nb.pdf](https://www.bundeskanzleramt.gv.at/dam/jcr:903d5cf5-c3ac-47b6-871c-c83eae34b273/20_18_beilagen_nb.pdf) (15.06.2021)
- Federal Ministry of Arts, Culture, Public Service and Sport (BMKOES) (Hrsg) (2019): Regierungsprogramm 2020-2024; Online [https://www.bmeia.gv.at/fileadmin/user\\_upload/Vertretungen/Bern/Dokumente/Regierungsuebereinkommen\\_Kurzfassung.pdf](https://www.bmeia.gv.at/fileadmin/user_upload/Vertretungen/Bern/Dokumente/Regierungsuebereinkommen_Kurzfassung.pdf) (03.06.2021)
- Ford, J.D., Berrang-Ford, L. and Paterson, J. (2011): A systemic review of observed climate change adaptation in developed nations: A letter. *Climatic Change*. Vol.(106). 327-336. DOI: 10.1007/s10584-011-0045-5
- Franz, Y. and Gruber, E. (2018): Wohnen “für alle” in Zeiten der Wohnungsmarktkrise? Der soziale Wohnungsbau in Wien zwischen Anspruch und Wirklichkeit. *Angewandte Geographie*, Vol. (42). 98-104. DOI: <https://doi-org.uaccess.univie.ac.at/10.1007/s00548-018-0533-1>
- GBV (Österreichischer Verband Gemeinnütziger Bauvereinigungen – Revisionsverband) (Hrsg) Mietglieder des Verbandes / Wien; Online [https://www.gbv.at/gemeinnuetzige-bauwirtschaft/Mitglieder\\_des\\_Verbands/](https://www.gbv.at/gemeinnuetzige-bauwirtschaft/Mitglieder_des_Verbands/) (12.07.2021).
- Gemeinnützige Wohnungs- und Siedlungsanlagen GmbH (Hrsg): Baugruppen; Online <https://www.schwarzatal.at/baugruppen/> (10.09.2021)
- Gesetz über die Förderung des Wohnungsneubaus und der Wohnhaussanierung und die Gewährung von Wohnbeihilfe (Wiener Wohnbauförderungs- und Wohnhaussanierungsgesetz – WWFSG 1989). StF.: LGBl. Nr. 18/1989; online <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrW&Gesetzesnummer=20000049> (27.10.2021)
- Government of the Netherlands (Hrsg). Housing Associations; Online <https://www.government.nl/topics/housing/housing-associations> (18.10.2021)

- Grecksch, K. (2013): Adaptive capacity and regional water governance in north-western Germany. *Water Policy*. Vol. (15). 749-815. DOI: 10.2166/wp.2013.124
- Grecksch, K. (2015): Adaptive capacity and water governance in the Keiskamma River Catchment, Eastern Cape Province, South Africa. *Water SA*. Vol. (41)3. 359-+. DOI: [http://dx-doi-org.uaccess.univie.ac.at/10.4314/wsa.v41i3.07](http://dx.doi.org.uaccess.univie.ac.at/10.4314/wsa.v41i3.07)
- Grothmann, T., Grecksch, K., Wings, M., and Siebenhüner, B. (2013): Assessing institutional capacities to adapt to climate change: integrating psychological dimensions in the Adaptive Capacity Wheel. *Nat. Hazards Earth Syst. Sci.* Vol. (13). 3369–3384. DOI: doi:10.5194/nhess-13-3369-2013
- Gruber, E., and Franz, Y. (2019): What can the Housing Market teach us? University Fieldtrips identify current transitions in Vienna’s urban development and housing market policies. *Mitteilungen der Österreichischen Geographischen Gesellschaft Annals of the Austrian Geographical Society*. Vol. 161. 379-394. DOI: 10.1553/moegg161s379
- Gupta, J., Termeer, C., Klostermann, J., Meijerink, S., van der Brink, M., Jong, P., Nootboom, S., and Bergsma, E. (2010): The Adaptive Capacity Wheel: a method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. *Environmental Science & Policy*. Vol. (13). 459-471. DOI: 10.1016/j.envsci.2010.05.006
- Hegedüs, J., Lux, M., and Scanlon, K. (2017): Social Housing after the Global Financial Crisis: New Trends across Europe. *Critical Housing Analysis*. Vol. (4)1. 1-10. DOI: <http://dx.doi.org/10.13060/23362839.2017.3.1.319>
- Hölscher, K., Frantzeskaki, N., McPhearson, T., Loorbach, D. (2019): Capacities for urban transformations governance and the case of New York City. *Cities*. Vol. (94). 186-199. DOI: <https://doi.org/10.1016/j.cities.2019.05.037>
- Housing Europe (Hrsg) (2021): The State of Housing in Europe 2021; Online: <https://www.stateofhousing.eu/#p=4> (26.03.2021)
- Hunt, A., Watkiss, P. (2010): Climate change impacts and adaptation in cities: a review of the literature. *Climatic Change*. Vol. (104). 13-49. DOI: 10.1007/s10584-010-9975-6
- IPCC (2001): Climate Change 2001: Synthesis Report. A Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change [Watson, R.T. and the Core Writing Team (eds.)]. *Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA*, 398 pp
- IPCC (2007): Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. *IPCC, Geneva, Switzerland*, 104 pp.
- KAB, Denmark (Hrsg). About KAB; Online <https://www.kab-bolig.dk/english/about-kab> (04.10.2021)
- Kadi, J. (2015): Reconfiguring Housing in Formerly “Red” Vienna? *Housing, Theory and Society*. Vol. (32)3. 247-265. DOI: 10.1080/14036096.2015.1024885
- Kadi, J., Vollmer, L. and Stein, S. (2021): Post-neoliberal housing policy? Disentangling recent reforms in New York, Berlin and Vienna. *European Urban and Regional Studies*. Vol. (1)22. DOI: <https://doi.org/10.1177/09697764211003626>
- Kleep, S., and Chavez-Rodriguez, L. (2018): A Critical Approach to Climate Change Adaptation. Discourses, Policies, and Practices. *Routledge, London*.
- Klimaschutzgesetz – KSG (2021): Bundesgesetz zur Einhaltung von Höchstmengen von Treibhausgasemissionen und zur Erarbeitung von wirksamen Maßnahmen zum Klimaschutz StF:

- BGBL. I Nr. 106/2011 (NR: GP XXIV RV 1255 AB 1456 S. 124. BR: AB 8596 S. 801.): online <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20007500> (27.10.2021)
- Krellenberg, K., Koch, F. & Kabisch, S. (2017): Urban Sustainability Transformations in lights of resource efficiency and resilient city concepts. *Current Opinion in Environmental Sustainability*. Vol. (22). 51-56. DOI: <https://doi.org/10.1016/j.cosust.2017.04.001>
  - Lang, R. and Novy, A. (2011): Housing Cooperatives and Social Capital: The Case of Vienna. *Institute for the Environment and Regional Development*.
  - Lang, R. and Novy, A. (2014): Cooperative Housing and Social Cohesion: The Role of Linking Social Capital. *European Planning Studies*. Vol. (22)8. 1744-1764. DOI: 10.1080/09654313.2013.800025
  - Lang, R. and Stoeger, H. (2018): The role of the local institutional context in understanding collaborative housing models: empirical evidence from Austria. *International Journal of Housing Policy*. Vol. (18)1. 35-54. DOI: 10.1080/19491247.2016.1265265
  - Lee, T., Yanfg, H. and Blok, A. (2020): Does mitigation shape adaptation? The urban climate mitigation-adaptation nexus. *Climate Policy*. Vol (20)3. 341-353 DOI: 10.1080/14693062.2020.1730152.
  - Magistrat der Stadt Wien (Hrsg) (2009): Klimaschutzprogramm der Stadt Wien 2010-2020; [https://www.wien.gv.at/wienatshop/Gast\\_bestellservice/Start.aspx?Artikel=137692](https://www.wien.gv.at/wienatshop/Gast_bestellservice/Start.aspx?Artikel=137692) (12.10.2021)
  - Matznetter, W. (2020a): Integrating Varieties of Capitalism, Welfare Regimes, and Housing at Multiple Levels and in the Long Run. *Critical Housing Analysis*. Vol. (7)1. 63-73. DOI: <http://dx.doi.org/10.13060/23362839.2020.7.1.504>
  - Matznetter, W. (2020b): How and Where Non-profit Rental Markets Survive: A Reply to Stephens. *Housing, Theory and Society*. Vol. (37) 5. 562-566. DOI: 10.1080/14036096.2020.1816570
  - Mauerhofer, V., Essl, I. (2017): An analytical framework for solutions of conflicting interests between climate change and biodiversity conservation laws on the example of Vienna/Austria. *Journal of Cleaner Production*. Vol. (178). 343-352. DOI: <https://doi.org/10.1016/j.jclepro.2017.12.222>
  - McDermont, M. (2010): Governing independence and expertise: the business of housing associations. –*Oxford; Portland*.
  - Ministry of Infrastructure and the Environment, Ministry of Economic Affairs, Ministry of Foreign Affairs & Ministry of the Interior and Kingdom Relations (Hrsg) (2016): A Circular Economy in the Netherlands by 2050; Online <https://www.government.nl/documents/policy-notes/2016/09/14/a-circular-economy-in-the-netherlands-by-2050> (12.10.2021)
  - Mocca, E., Friesenecker, M., and Kazepov, Y. (2020): Greening Vienna. The Multi-Level Interplay of Urban Environmental Policy-Making. *Sustainability*. Vol. (12). 1577. DOI: 10.3390/su12041577
  - Municipal Department 20- Energy Planning (Hrsg) (2019): Urban Energy Efficiency Program (SEP 2030)- Summary; Online <https://www.wien.gv.at/stadtentwicklung/energie/pdf/sep2030-en.pdf> (08.07.2021)
  - Municipality of Vienna, Vienna Environmental Protection Department MA22 (Hrsg) (2019): Urban Heat Island Strategy, City of Vienna (2018); Online [https://www.wien.gv.at/wienatshop/Gast\\_bestellservice/Start.aspx?Artikel=137692](https://www.wien.gv.at/wienatshop/Gast_bestellservice/Start.aspx?Artikel=137692) (08.07.2021)
  - Musterd, S. (2014): Public Housing for Whom? Experiences in an Era of Mature Neo-Liberalism: The Netherlands and Amsterdam. *Housing Studies*, Vol. (29)4. 467-484. DOI: 10.1080/02673037.2013.873393

- Nuttall, N., Logan, M., Njoroge, V., Ngaira, E. (2013): UNEP Annual Report 2012; United Nations Environment Programme (UNEP). *UNEP Division of Communications and Public Information*. Available Online 02.2013 [www.unep.org/annualreport](http://www.unep.org/annualreport)
- Ökodesign-Verordnung (2007): Verordnung des Bundesministers für Wirtschaft und Arbeit zur Schaffung eines Rahmens für die Festlegung von Anforderungen an die umweltgerechte Gestaltung energieverbrauchsrelevanter Produkte (Ökodesign-Verordnung 2007 – ODV 2007) StF: BGBl. II Nr. 126/2007 [CELEX-Nr.: 32005L0032]; online <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20005348> (27.10.2021)
- ÖROK (Austrian Conference on Spatial Planning) (Hrsg) (2011): Austrian Spatial Development Concept ÖREK 2011; Online [https://www.oerok.gv.at/fileadmin/user\\_upload/Bilder/2.Reiter-Raum\\_u.\\_Region/1.OEREK/OEREK\\_2011/Dokumente\\_OEREK\\_2011/OEREK\\_2011\\_EN\\_Downloadversion.pdf](https://www.oerok.gv.at/fileadmin/user_upload/Bilder/2.Reiter-Raum_u._Region/1.OEREK/OEREK_2011/Dokumente_OEREK_2011/OEREK_2011_EN_Downloadversion.pdf) (11.06.2021)
- Reinprecht, C. (2014): Social Housing in Austria. Chapter 4. - In: Scanlon, K., Whitehead, C., Fernández Arrigoitia, M. (2014): Social Housing in Europe. - *Oxford; United Kingdom*.
- Ripple, W. J., Wolf, C., Newsome, T. M., Galetti, M., Alqmgir, M., Crist, E., Mahmoud, M. I., Laurance, M.F., and 15,364 scientist signatories from 184 countries. (2017): World Scientist's Warning to Humanity: A Second Notice. *BioScience Vol. 67(12)*. Available under: <https://academic.oup.com/bioscience>
- Roders, M. J. (2015a): Partnering for climate change adaptations by Dutch housing associations. Doctoral Thesis. *Architecture and The Built Environment, TU Delft*.
- Roders, M. J., Straub, A., and Visscher, H. (2013): Evaluation of climate change adaptation measures by Dutch housing associations. *Structural Survey. Vol. (31)4*. 267-282. DOI: 10.1108/SS-01-2013-0009
- Roders, M. J., Straub, A., and Visscher, H. j. (2011): Climate Change Effects on Living Quality; Awareness of Housing Associations. *Management and Innovation for a Sustainable Built Environment*. Amsterdam, The Netherlands. ISBN: 9789052693958
- Roders, M., Straub, A. (2015): Assessment of the likelihood of implementation strategies for climate change adaptation measures in Dutch social housing. *Building and Environment. Vol. (83)*. 168-176 DOI: <http://dx.doi.org/10.1016/j.buildenv.2014.07.014>
- Rosales, J. (2019): Climate Change Adaptation. Delve Publishing, *Oakville*.
- Scanlon, K., Whitehead, C., and Fernández Arrigoitia, M. (2014): Social Housing in Europe. *Oxford, UK*.
- Shearer, H., Coiacetto, E., Dodson, J. and Taygfeld, P. (2016): How the structure of the Australian housing development industry influences climate change adaptation. *Housing Studies. Vol. (31)7*. 809-828. DOI: <http://dx.doi.org/10.1080/02673037.2016.1150430>
- Stadt Wien, Wohnfonds Wien (Hrsg) (2021): Online [http://www.wohnfonds.wien.at/kontakt\\_impresum](http://www.wohnfonds.wien.at/kontakt_impresum) (24.05.2021)
- Stangl M., Formayer H., Hiebl J., Orlik A., Höfler A., Kalcher M., Michl C. (2021): Klimastatusbericht Österreich 2020; Online [https://www.klimafonds.gv.at/wp-content/uploads/sites/16/print\\_Klimastatusbericht-Oesterreich\\_20210407.pdf](https://www.klimafonds.gv.at/wp-content/uploads/sites/16/print_Klimastatusbericht-Oesterreich_20210407.pdf) (10.08.2021)
- Taiebat, M., Xu, M. (2019): 5 charts show how your household drives up global greenhouse gas emissions. – In: PBS News Hour: Science. Online [www.PBS.org](http://www.PBS.org) (21.09.2021).

- Turk, Suheylya. (2021): Affordable housing production for low income groups by land use zoning plans in harbor areas of Copenhagen. *Urban, Planning and Transport Research. Vol. (9)1*. 234-257 DOI: 10.1080/21650020.2021.1914150
- United Nations (2006) Population newsletter. World urbanization prospects: the 2005 revision. Number 81. Available under: [http://www.un.org/esa/population/publications/popnews/Newsltr\\_81.pdf](http://www.un.org/esa/population/publications/popnews/Newsltr_81.pdf)
- United Nations Human Rights, Office of the High Commissioner (Hrsg) (2020): UN human rights experts urge Denmark to halt contentious sale of “Ghetto” buildings: Online <https://www.ohchr.org/en/NewsEvents/Pages/DisplayNews.aspx?NewsID=26414&LangID=E> (09.10.2021)
- van Hal, A., and Femenias, P. (2009): Pathways for sustainable housing transformations: An international comparison of retrofitting strategies for (social) housing. In Proceedings of the 3rd CIB International Conference on Smart and Sustainable Built Environment: SASBE09, 15-19 June 2009, Netherlands, Delft, Aula Congress Centre.
- Vestergaard, H. and Scanlon, K. (2014): Social Housing in Denmark. - In Scanlon, K., Whitehead, C., Fernández Arrigoitia, M. (2014): Social Housing in Europe. - Oxford; United Kingdom.
- Vincent, K. (2007): Uncertainty in adaptive capacity and the importance of scale. *Global Environmental Change. Vol. (17)*. 12-24. DOI: 10.1016/j.gloenvcha.2006.11.009
- Wiener Stadtentwicklungs-, Stadtplanungs- und Baugesetzbuch (Bauordnung für Wien – BO für Wien) (2021): GBl. Nr. 11/1930. Gesamte Rechtsvorschrift für Bauordnung für Wien, Fassung vom 24.06.2021; online <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrW&Gesetzesnummer=20000006> (27.10.2021)
- Wohnfonds\_Wien, fonds für wohnbau und stadterneuerung (Hrsg.) (2018): The developers’ competition, an instrument in the construction of new subsidised housing; online 10.08.2021, [http://www.wohnfonds.wien.at/media/Website%20PDF-INFO%20Downloads/English%20Information/developers\\_competition\\_web\\_2018.pdf](http://www.wohnfonds.wien.at/media/Website%20PDF-INFO%20Downloads/English%20Information/developers_competition_web_2018.pdf)
- Wohnfonds\_Wien fonds für wohnbau und stadterneuerung (Hrsg.) (2020): Tätigkeitsbericht; online 10.08.2021, [http://www.wohnfonds.wien.at/media/Website%20PDF-INFO%20Downloads/%C3%BCber%20uns/Ta%CC%88tigkeitsbericht\\_2020.pdf](http://www.wohnfonds.wien.at/media/Website%20PDF-INFO%20Downloads/%C3%BCber%20uns/Ta%CC%88tigkeitsbericht_2020.pdf)

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## APPENDIX

### a. Interview Guideline Viennese SHIs

#### Interview Guideline

Esteemed Lady /Esteemed Gentleman

Many thanks in advance for taking the time to contribute to the research. The following interview intends to elaborate a detailed qualitative study as part of the final thesis of the master's degree in spatial research and spatial planning at the University of Vienna. Core narrative seeks to address the issue of climate change adaptation within the field of social housing, drawing in the role that housing institutions play. Approximate completion time is between 45-60 minutes.

#### Important definitions

- Social housing institutions (SHI): draws on the institutional aspect which involves the system of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of relevant roles (GUPTA et al. 2010).
- Adaptation/Adaptive capacity: “The process of /capacity to adjust to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustments to expected climate and its effects” (IPCC, 2014:5).

#### Introductory part

1. Please introduce yourself and the institution in the context of housing development/provision in Vienna.
2. What is your role in the decision-making, design, production, construction, management, renewal, administration within the institution?

#### A) Policy Landscape

3. Could you describe in your own words the risks and chances of climate change that you perceive in housing for the next 10 years
  - a. Which relevance does adaptation to climate change currently have in the institution?
  - b. How important is to encourage individual measures of adaptation within housing?
4. When we think about the development of housing projects (new construction, renewal or management) in Vienna, could you illustrate...
  - a. How do you integrate different adaptation measures and strategies, whether it's a new project or an already inhabited one?
  - b. Does the institution seek for any form of cooperation? For instance, involvement of different actors, levels or sectors along the decision-making process.
    - a) What benefits come from such practice?

5. Looking back at housing projects in Vienna and comparing them to your current ones, such as **XXX, XXX and XXX**: How has the growing demand for adaptation measures impacted the way the institution operates?
  - a. What challenges did arise? How have you overcome those challenges?
  - b. How well has your institution been able to self-adapt to current needs?
6. Today, SHIs in Vienna have a privilege status. They have evolved towards becoming a highly specialized stakeholder, characterized by high knowledge expertise and by a high sense of social responsibility. SHIs are considered as major providers for adaptation measures within dwellings.
  - a. Based on your experience, how much freedom and flexibility do institutions have to introduce and implement adaptation measures in housing projects? Whether new, already built or in refurbishment
7. Viennese political decision-making processes are known to be vertically structured, leaving little opportunity for the involvement and participation of non-public actors. How do you think this characteristic, reflects on the adaptation motivation of institutions like yours and of tenants?
8. Adaptation policies in Vienna present a model that often links environmental and social aspects with economic development. On your opinion, are adaptation policies legitimate, in a way that they aim for risk reduction, coping with climate change and respond to the needs of society??
9. In your opinion, how and where might be room for improvement in the Viennese policy landscape with regard to formulation, dissemination and implementation of strategies for adaptation to climate change?

## **B) Transition: Institution-tenant relation**

10. In order to get to know the dynamic between SHIs and tenants could you elaborate on the frequency, form and most common topics of exchange between the institution and tenants?
  - a. Do you recall any exchange between both that touched on adaptation related topics?
  - b. Does this communication or mutual exchange tend to evolve into any form of cooperation?
11. How does the institution enable access to information for the tenants?
  - a. How could this access be enhanced?
  - b. Do you believe that an easier access to information could result in more interest of implementing individual adaptation measures?
12. In which way does the institution support the emergence of private actors promoting the implementation of adaptation measures? For instance, tenants organizing common-gardening groups, greening projects, etc.
13. Do you recall a time where the institution got involved in the organization of tenants to carry adaptation measures?

14. What role does the SHI/institution perform when it comes to the availability of financial resources for the implementation of adaptation measures?
15. How is the institution involved in?
  - a. the mediation and obtainment of financial resources to support tenants?
  - b. the mediation and process approval of adaptation measures implementation?
16. Looking at individual adaptation measures like the application of lighter colors, shading sunscreens, paneling, greening, transitioning to renewable energy sources. Do you believe tenants have the resources and capabilities to implement such adaptation measures?
  - a. What are the most common barriers?
  - b. How could one overcome them?

**C) Future challenges and outlook**

17. In your own words, what do you think that the future will bring for your institution. In terms of housing production, sustainable transition and adaptation?
18. What practices do you think will be key to succeed in sustainable transition within housing?

## b. Interview Guideline, Comparative Cases: NT and DK

### Interview Guideline

Esteemed Lady /Esteemed Gentleman

Many thanks in advance for taking the time to contribute to this research. The following interview intends to carry a comparative analysis as part of the final thesis of the master's degree in spatial research and spatial planning at the University of Vienna. The first qualitative stage of the research focused on analyzing the capacity of social housing institutions (SHIs) to: (1) Adapt to climate change, (2) Foster climate change adaptation of their tenants. The methodology is based on the Adaptive Capacity Wheel by Gupta et al., 2010, and complemented by the extension from Grothmann et al., 2013.

During this second phase, a comparison is pursued, drawing on interim results obtained from SHIs in Vienna. In order to test the assumptions on every dimension of the Adaptive Capacity Wheel framework the following interview guideline was developed

Approximate completion time: 45-60 minutes.

#### Important definitions

- Social housing institutions (SHI): draws on the institutional aspect which involves the system of rules, decision-making procedures, and programs that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of relevant roles (GUPTA et al. 2010). Internationally also referred as Housing corporations or Housing Associations.
- Adaptation/Adaptive capacity: “The process of /capacity to adjust to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustments to expected climate and its effects” (IPCC, 2014:5).

#### 1) Introductory part

19. Please introduce yourself
20. As an expert in the “Housing” topic in **DK/NT**, what kind of risks and opportunities does climate change adaptation represent for Social Housing Institutions (**also referred as Housing Corporations and Housing associations**)?
21. What adaptation practices and behaviors have you observed in housing institutions in the last 5 years?

#### 2) Adaptive Capacity Wheel Dimensions

22. Looking at present behaviors and practices characteristic of social housing institutions in **DK/NT**
  - a. how relevant is "climate change adaptation" for them?
  - b. How important is to encourage individual adaptation measures (tenants)?

23. Social Housing Institutions in Vienna profit from the exchange platform that the housing funds scheme offer, the “Wohnfonds Wien”<sup>7</sup>. Under the developer competitions framework, SHIs are encouraged to work jointly with other experts, to actively listen and adopt new discourses, solutions and perspectives to achieve adaptation to climate change. Looking at the **Dutch/Danish** context, specifically **DK/NT**, what kind of dynamics are enabling or hampering the emergence of **variety** (variety of solutions, perspectives, systems or policies)?
- a. What types of partnerships (e.g. SHIs and technical experts) can be observed in housing development processes?
  - b. Is there any point of conflict, limitation or tension that could be hindering the emergence and use of “variety”?
24. Achieving adaptation to climate change requires learning capacity from both, Housing institutions (SHIs or HCs) and tenants. Viennese housing institutions showed high level of preparation and motivation to implement new adaptation measures in housing projects. Diverse benefits from experimentation were mentioned as part of the learning and improving process.
- a. How do institutions in **DK/NT** integrate learning from experimentation in processes, experiences and practices?
  - b. What level of freedom do they have to experiment, implement new practices and measures?
  - c. What level of trust is there between tenants and institutions in order to create feedback loops?
25. In Vienna SHIs in their role as owners/developers have the ability to allow autonomous adaptation measures, whether they are physical or behavioral. Observing practices and attitudes of SHIs in **DK/NT**, how does SHIs allow or support autonomous adaptation actions?
- a. Do they present any “particular” attitudes towards individual adaptation measures/actions?
  - b. When we reckon that more and more people are showing interest in implementing individual adaptation measures, what level of "belief" do SHIs have towards the effectiveness, realization and implementation of individual adaptation measures?
26. In Vienna, there is a growing interest in society to contribute environmentally. SHIs outlined an increasing willingness of tenants to implement adaptation measures. Such willingness is often reflected in the emergence of leaders, people in charge of mobilizing resources or organizing movements to implement, demand or propose adaptation measures.
- a. How does SHIs in **DK/NT** support the emergence of leaders that demand, propose or pursue the implementation of adaptation measures?

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<sup>7</sup> The organization is responsible for the provision and development of land and manages quality instruments such as "developer competitions" where prospect housing projects aspiring for funding are assessed. <https://www.wohnfonds.wien.at/>

27. Adaptation to climate change needs human, financial, political, legal and technological resources. How are SHIs in **DK/NT** able to generate such resources?
28. Adaptation policies in Vienna present a model that often links environmental and social aspects with economic development. On your opinion are climate change adaptation policies in **DK/NT** legitimate, in a way that they aim for risk reduction, coping with climate change and respond to the needs of society?

### **3) Future challenges and outlook**

29. In your own words, what do you think that the future will bring for Housing in **DK/NT** in terms of housing production, sustainable transition and adaptation?
30. What practices do you think will be key to succeed in sustainable transition within housing?

### c. List of Interview Partners

#### Interviews for Comparative Analysis on Social Housing Institutions in Vienna

- **Mr. DI Gerald Parzer.** Head of Department, Project Development. **ÖSW** - Österreichisches Siedlungswerk Gemeinnützige Wohnungsaktiengesellschaft
  - Online Interview: 20.08.2021, 10:30
- **Mr. DI Julian Junker.** Project Development. **EGW** - Erste gemeinnützige Wohnungsgesellschaft mbH
  - Online Interview: 06.09.2021, 15:30
- **Mr. KommR Mag. Michael Gehbauer.** Managing Director. **WBV-GPA** - Wohnbauvereinigung für Privatangestellte Gemeinnützige Gesellschaft mit beschränkter Haftung.
  - Online Interview: 06.09.2021, 13:30
- **Mr. DI Christopher Beigl.** Project Development team. **ARWAG** Holding – Aktiengesellschaft
  - Online Interview: 08.09.2021, 15:00
- **Mr. Ing. Danijel Vukovic.** Director of Department: Neubau-Technik. Gemeinnützige Siedlungs-Genossenschaft **Altmannsdorf und Hetzendorf**
  - Online Interview: 08.09.2021, 13:30
- **Mr. Prok. Bmstr. Ing. Herwig Koppitz.** CEO / Direction of New Projects. **NEUES LEBEN** - Gemeinnützige Bau-, Wohn- und Siedlungsgenossenschaft "Neues Leben" registrierte Genossenschaft mit beschränkter Haftung
  - Online Interview: 15.09.2021, 15:30

#### Interviews for Comparative Analysis (DK/NT)

- **Professor Martin Zerlang.** Department of Arts and Cultural Studies, **University of Copenhagen**. zerlang@hum.ku.dk
  - Online Interview: 06.10.2021, 14:30
- **Professor Claus Bech-Danielsen.** Department of the Built Environment, Division for Town, Housing and Property (THP). **Aalborg University**. cbd@build.aau.dk
  - Online Interview: 15.10.2021, 15:00
- **Professor Ad Straub.** Associate Professor of Public organizations and Public Procurement in construction, Department Management in the Built Environment (MBE) at the Faculty Architecture and the Built Environment from the **TU Delft, Netherlands**. a.straub@tudelft.nl
  - Online Interview: 12.10.2021, 15:00

d. Operationalization Grid

MAIN RQ	To what extent are social housing institutions fostering climate change adaptive capacity of tenants?
Sub-questions	In what manner does the intrinsic characteristics* of social housing institutions influence adaptive capacity of tenants?
	In what way does social housing institutions regulations shape tenants adaptation capacity?
	What role do institutional actors within social housing institutions play in the improvement or limitation of tenant's adaptive capacity?
	How can social housing institutions improve the adaptation capacity of tenants?

Targeted Findings				Dimension	Criteria	Definition	Policy Analysis correlation
			Which adaptation policies, perspectives, measures were involved in the design, construction, renewal of XprojectX?	Variety	Variety of problem frames	Room for multiple frames of references, opinions and problem definitions	In your opinion, does the Viennese policy landscape present concise, varied, clear and achievable measures and strategies for adaptation to climate change?
			Do you support involvement of varied perspectives, actors and solutions within adaptation strategies?		Multi-actor, multi-level, multi-sector	<b>Involvement of different actors</b> , levels and sectors in the governance process	
			How do you integrate the different adaptation policy frames into your decision-making along design, construction, maintenance renewal?		Diverse solutions	<b>Availability of a wide range of different policy options</b> to tackle a problem	
					Redundancy	Presence of overlapping measures and back-up systems; not cost-effective	Are the varied policies for adaptation at the City level overlapping?
			Is there a high level of exchange between SHI and the tenant? Which form of communication is there? Is there any form of cooperation between both?	Learning Capacity	Trust	Presence of institutional patterns that promote mutual respect and trust	
			How is the learning obtained from users identified and integrated into decision-making processes or management, design and construction practices? Is there any learning experience you could draw on? What did the institution learned?		Single loop learning	Ability of institutional patterns <b>to learn from past experiences and improve</b> their routines	
					Double loop learning	<b>Evidence of changes</b> in assumptions underlying institutional patterns	
					Discuss doubts	Institutional openness towards uncertainties	
					Institutional memory	Institutional provision of monitoring and evaluation processes of policy experiences	
			How/which measures are implemented to enable the tenant access to information on internal policies, resources, funding, adaptation measures? Looking back at housing developments and comparing them to your current ones: How well has your institution implemented adaptation strategies, programs, plans? How well have you been able to self-adapt to current needs?	Room for autonomous change	Continues access to information	Accessibility of data within institutional memory and early warning systems to individuals	
			How could this access be enhanced? Do you believe that an easier access to information could result in more interest of implementing individual adaptation measures?		Act according to plan	Increasing the ability of individuals to act by providing plans and scripts for action, especially in case of disasters	Based on your experience, how much freedom and flexibility do the institutions have to introduce and implement adaptation measures in housing projects? Whether new, already built or in refurbishment
			is there a way for the SHI to get involved in the organization of users and motivate them to carry out adaptation measures?		Capacity to improvise	Increasing the capacity of individuals to self-organize and innovate; foster social capital	
			In which was does the Shi support the emergence of actors promoting the implementation of adaptation measures?	Leadership	Visionary	Room for long-term visions and reformist leaders	
					Entrepreneurial	Room for leaders that stimulate actions and undertakings; leadership by example	
					Collaborative	Room for leaders who encourage collaborations between different actors; adaptive co-management	
			What role does the SHI/institution perform when it comes to the availability of resources? How is the institution involved in: a) the mediation and obtainment of financial resources to support tenants b) the mediation and process approval of adaptation measures implementation?	Resources	Authority	Provision of accepted or legitimate forms of power; whether or not institutional rules are embedded in constitutional laws.	Viennese political decision-making processes are vertically structures, leaving little opportunity for the involvement and participation of non-public actors. <b>How do you think this characteristic, reflects on the adaptation motivation of institutions like yours and among tenants?</b>
					Human Resources	Availability of expertise, knowledge and human labour	
					106 Financial resources	Availability of financial resources to support policy measures and financial incentives.	



Targeted Findings				Dimension	Criteria	Definition	Policy Analysis correlation
			Assessing the: Legitimacy, equity, responsiveness and accountability of the institution (resources, norms, rules, and overall attitude towards adaptation and fostering adaptation)	<b>Fair governance</b>	Legitimacy	Whether there is public support for a specific institution	Adaptation policies in Vienna present a model that often links environmental and social aspects with economic development. On your opinion are adaptation policies legitimate, in a way that they aim for risk reduction, coping with climate change and respond to the needs of society?
					Equity	Whether or not institutional rules are fair	
					Responsiveness	Whether or not institutional patterns show response to society	
					Accountability	Whether or not institutional patterns provide accountability procedures	
			Describe the risk and chances of climate change that you perceive in housing for the next 10 years? How important is to encourage individual measures of adaptation within housing? How important is to implement measures within housing? Which relevance does adaptation to climate change currently have in the institution?	<b>Adaptation motivation</b>		Motivation of decision makers and other actors to realize, support and promote adaptation; Motivation of actors to implement, support, promote measures for adaptation to climate change; Determinants are risk perception, changes and potential impacts.	
			Do you believe tenants have the resources and capabilities to adapt to climate change? Describe examples of tenant adaptation measures and ask if that is feasible. BARRIERS?	<b>Adaptation belief</b>		Belief of actors to be capable of successfully adapt to climate change; belief of actors over the existence of adaptation measures available(effective or feasible believe); Ability to adapt to climate change	