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Towards Energy Sufficiency in the Residential Housing Sector?:

Evaluating the design and implementation of policies for living space reduction in Göttingen

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Abstract

Energy sufficiency has been recognised as a strategy to promote sustainable energy use and achieve climate neutrality. It aims to reduce energy demand in absolute terms. 'Living Space Reduction' (LSR) is one way to achieve energy sufficiency in the housing sector. However, existing studies highlight significant barriers to its materialisation, including the lack of funding and expert knowledge of municipalities to design and implement sufficiency policy measures. The objective of this research was to better understand the design and implementation elements of LSR policy measures that have the potential to advance LSR manifestation, taking the city of Göttingen (Germany) as a case study. Applying a conceptual framework drawing from realist evaluation and using data from semi-structured interviews with practitioners and a supporting literature review, the design and implementation of LSR policy measures were evaluated and complementing policies that can facilitate LSR manifestation were found. Results show that the 'Living Space Agency' (LSA), a new institution promoting LSR, is the central policy measure aiming at behaviour changes towards LSR manifestation. Key issues hindering the effective implementation of LSR policy measures are difficulties reaching the target group, unclear roles of implementing institutions, lack of monitoring data, and constrained financial and human resources. The findings suggest several avenues to overcome barriers, including channelling resources to the LSA, promoting LSR through a stronger link with social policy, and incorporating sufficiency in training for energy advisors. Further policy changes and efforts should be focused not only on informing but actually enabling behaviour change towards LSR manifestation by reducing policy incoherence (e.g. inhibiting housing law) and providing alternative accessible housing for people > 50 years. The study concludes that practitioners should focus efforts on generating openness and intention for LSR while policymakers should concentrate efforts on increasing options and funding for LSR living and reducing legal barriers that prevent behaviour intentions for LSR from turning into action.

Keywords: *energy sufficiency, living space reduction, realist evaluation, policy implementation, Göttingen*

Executive Summary

The war in Ukraine and the exposed dependency of Germany on fossil fuel imports from Russia have brought fresh attention to the crucial role that energy plays for the economy and society. It has led to renewed policy and political efforts to transform our relationship to and with energy. For example, changes in the energy landscape towards more liquefied natural gas (LNG) terminals, renewable energy and heat pumps are emerging. Furthermore, the German government's new working plan ("Arbeitsplan Energieeffizienz") from May 2022 provides a roadmap to push for increased energy efficiency and thus energy independence. However, previous policy efforts also show a lack of ambition, speed, and volume of the required low-carbon energy transition to meet the Paris Agreement targets. Given the challenges of achieving climate neutrality and the energy crisis bought up by the Russian invasion, more political perspectives on achieving absolute energy savings need to be sought.

Energy sufficiency has long been recognised in interdisciplinary sustainability science as a concept to complement energy efficiency (achieving the same with less, i.e. housing insulation) and consistency strategies (achieving the same but different, i.e. shifting from oil to district heating). Energy sufficiency has been defined as "*a strategy aiming at limiting and reducing the input of technically supplied energy towards a sustainable level" (*Thomas et al., 2019, p. 1). It is a concept and principle through which the relationship between energy and well-being can or should be re-evaluated. It aims at adjusting our energy behaviours in line with absolute environmental limits, making the use or demand of energy services (e.g. heating, lighting) to a level that is sustainable.

Within the energy sufficiency policy discourse, 'living space reduction' (LSR), hence the absolute reduction of living space per capita, is promoted as one way to achieve energy sufficiency in the residential housing sector. Some studies (cf. Fischer et al., 2016; Kenkmann et al., 2019) estimate the potential energy savings from reduced living space per capita in Germany. Energy savings from LSR are due to the reduced area needed to be heated. Furthermore, increased density in existing housing stocks requires fewer new houses. By preventing or reducing the need for new housing, less energy-intensive infrastructure to complement housing development is needed. Large amounts of energy are saved from avoided construction materials and additional environmental impacts from new housing development and land use conflict are also avoided.

Despite significant policy challenges and potential benefits, the materialisation of LSR remains limited and confined to a handful of proactive local governments. In addition, many German cities that did set early LSR targets have not even reached their goals. Simultaneously, living space per capita increases on a national level. A review of multiple municipalities reveals that municipalities do not have the necessary funding and information to design and implement sufficiency policy measures (Bongers-Römer et al., 2018). This seems problematic for different reasons. Firstly, it can hinder the process of institutionalising LSR. Institutionalisation as used in this paper refers to: the process of LSR being integrated across scales and levels of organisations and government, hereby creating an institutional environment that channels efforts towards LSR manifestation. It is thus an intermediate step and a requirement for structural LSR manifestation. Various studies highlight the need for a change of *Rahemenbedingungen* [framework conditions], given the normative challenges around LSR that hinder behaviour change (cf. Bohnenberger & Leuser, 2020; Brischke et al., 2016; Linz &

Scherhorn, 2011) and many policy instruments have been proposed (GermanZero, 2021; Thema et al., 2017; Thomas et al., 2019). Poor design or implementation of LSR policies and thus lack of LSR institutionalisation misses the opportunity from LSR energy saving potential and to tackle the trend towards increased living space per capita and in turn likely increases in absolute energy use.

Based on the above, the aim of this research was thus to better understand and advance the design and implementation elements of policy measures that have the potential to reduce living space per capita. I have explored this topic using Göttingen as a case study, given the city has started the LSR institutionalisation process through the setup of a 'Living Space Agency' (LSA) in the context of OptiWohn, a federally funded research project to pilot the institutionalisation of LSR (including other German cities: Cologne and Tübingen). The following research questions (RQs) have guided my work:

> RQ1: How does the LSR policy mix design contribute to the institutionalisation of LSR in Göttingen?
>
> > SRQ1a: Which contextual factors shaped the current design of the LSR policy mix in Göttingen?
> >
> > SRQ1b: What are the current policy measures in place to achieve absolute reduction of living space per capita in Göttingen?
>
> RQ2: How can the implementation of policy measures targeting absolute living space reduction per capita be advanced in the city of Göttingen?
>
> > SRQ2: What are the barriers for existing policy measures to achieve an absolute reduction of living space per capita in the city of Göttingen?
>
> RQ3: What kind of policy adjustments or further policy measures are needed to advance the absolute reduction of living space per capita implementation in Göttingen?

The methodology of this thesis is shaped by my approach to investigating LSR policy measure mix design and implementation in Göttingen through the lens of realist evaluation (RE). The logic can be summed up as follows: policy programmes such as the LSR policy mix in Göttingen provide resources, opportunities, and constraints to a target audience, here called 'mechanism agents', and thereby aim to change or enable their existing reasoning (i.e. the accumulation of thoughts, values and beliefs resulting in a decision to act). Contextual factors, be they political or social or institutional, etc., influence this process and are decisive over whether this results in the triggering of mechanisms that will lead to the desired outcome of LSR manifestation. In a first step, I evaluated how Göttingen's LSR policy design aims to provide resources, opportunities, and constraints. In a second step, the process of how they change or enable change of reasoning was assessed. For this, I used the Policy Implementation Assessment Framework (PIAF) developed by the Urban Institute in DC Washington which considers five overarching contextual factors (Eldridge et al., 2020): resources, planning and coordination, leadership and ownership, measurement and accountability, and political economy. In the last step, I took a closer look at the barriers that impede the triggering of mechanisms despite changed or enabled reasoning and thus, derived recommendations for additional policies.

The method for data collection for gathering insights into all questions was primarily to conduct semi-structured interviews with practitioners in Göttingen. Additionally, I conducted a supporting literature review with policy documents from the municipality of Göttingen provided via their website, which I scanned for keywords around LSR. I gathered additional information about Göttingen through grey literature. For the data analysis, I conducted a thematic analysis using *NVivo 12 Plus*. I took a deductive approach with the top categories design, implementation, context, and recommendation and the sub-categories from the PIAF. Subthemes emerged inductively.

The main findings can be summarised as follows. The LSR policy design was embedded in an environment favourable to LSR institutionalisation given that increased densification was recognised already in Göttingen's land use plan and housing policy concept and that the *LSA* was established initially through funding by OptiWohn. The *LSA* was found to be the main driver of the institutionalisation process (also one of the only implemented measures so far) leading to the emergence of a network of actors dealing with LSR. This provides grounds for continued and amplified institutionalisation given this network is maintained and exploited. Like most other policy measures, it aims at information provision, while regulation or funding is only marginally or not at all part of the policy. While the focus on awareness raising seemed appropriate to the context, the current lack of especially financial resources but also reluctance for hard regulation could impede the institutionalisation process, hindering people to realise LSR behaviour. However, financial and regulatory measures were found to be more tasks of higher levels of government. Left to notice is that the *LSA* works with a neighbourhood approach, reaching people via non-climate-related communication channels (.e.g church). The affinity to this approach is reflected in the policy design with three main measures focusing on general housing/energy pilot projects in which LSR is integrated as a sub-goal.

For the policy implementation, the identification of key barriers allowed for some conclusions on how to advance the LSR institutionalisation process. For the *LSA* to work better, more guidelines would be needed, which is difficult given the lack of similar examples. Furthermore, lack of data availability and experience make it difficult to reach the right target group of 50–60-year-olds. Given their central role and that much of the success of LSR in Göttingen seemed to depend on the *LSA,* more staff positions could allow them to not only cover incoming requests better but also take a more proactive role. This could for example help to improve currently poor coordination and management with other actors such as the *Energieagentur e.V.* (advises on energy matters, i.e. renovations) or the *Freie Altenarbeit Göttingen. e.V.* (advises older people about housing matters, i.e. increased accessibility). Given the low awareness of LSR, an important step was to change the narrative away from sufficiency and frame LSR not as an energy issue but a strategy to improve life quality. Connecting messaging of LSR with other social issues was recommended.

Recommendations for other policies mostly concerned the change of regulation. On a local level it was suggested to change local *Bebauungspläne* [development plans] which regulate for example the number of housing units which are often outdated. This could enable more vertical densification. On a state level it was found that the fire protection law inhibits reconstruction such as building an additional storey. However, I discussed that the law has been changed with effect beginning 2022 and a new evaluation can be made in some year. On a federal level, §36

3a the *Baugesetzbuch* [building code] could be extended with reference to ecological criteria. This would mean that exceptions or deviations from the law for LSR (ad thus energy saving reasons) could be approved quicker. However, a key find is that instead of reconstruction, focus should be put on managing moving to reduce the need for building new family homes. Generally, my findings suggest policy focus to be put on the creation of alternative housing, mostly affordable and especially accessible housing for older people. However, other findings show that older people would often prefer to move back into some sort of community (Thomas et al., 2019).

Concluding, Göttingen is in the middle of an emerging institutionalisation process pushed through the *LSA* and potentially limited by lack of funding in the policy mix itself as well as barriers inhibiting LSR behaviour. Efforts of local actors should go into improving the implementation process of the *LSA* and its capacity and ability to target the right people and create a willingness for behaviour change. Additional policy efforts should come from all levels of government to realise alternatives for accessible affordable, potentially communal, living spaces for older people.

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Abbreviations

AR6	Sixth Assessment Report
BMU	*Bundesministerium für Umwelt* [Federal Ministry for Environment, Nature Protection and Nuclear Safety]
BL&H	Bankert, Linker & Hupfeld Architekts
BUND	*Bund für Umwelt und Naturschutz Deutschland* [German Federation fort he Environment and Nature Conservation] (Friends of the Earth in Germany)
CMO	Context-Mechanism-Outcome
CP2030	Climate Plan 2030
EARG	Energieagentur Region Göttingen e.V.
ECEEE	European Council for an Energy Efficient Economy
EQ	Europaquartier (neighbourhood in Göttingen)
EU	European Union
FAG	Freie Altenarbeit Göttingen e.V.
GHG	Greenhouse Gas
GHN	Green House Number
IAM	Integrated Assessment Models
IFEU	*Institute für Energie und Umweltforschung Heidelberg GmbH* [German Wuppertal Institute and the Institute for energy and environmental research Heidelberg]
Int	Interviewee
IPCC	Intergovernmental Panel on Climate Change
LNG	Liquefied natural gas
LSA	*Wohnraumagentur* [Living space agency]
LSR	Living space reduction
MGö	Municipality of Göttingen
PA	Paris Agreement
PIAF	Policy Implementation Assessment Framework
SRQ	Sub Research Question
SWG	Städtische Wohnugnsbaugesellschaft Göttingen
TBE	Theory-based Evaluation
RE	Realist Evaluation
RQ	Research Question
Vhs	Volkheimstädte Göttingen
WgG	Wohnungsbaugesellschaft Göttingen

1 Introduction

1.1 Energy sufficiency and its relevance

The increasing uncertainty and instability of this world in which I am trying to develop my vision for our societal but also my own future brings up the question: what do we need to change to effectively reduce greenhouse gas (GHG) emissions while promoting prosperity, democracy, and peace? And my answer would be: Our relationship to and with energy. The war in Ukraine has brought new attention to the relevance of energy not only for mitigating climate change but also for peace. European Union (EU) states currently pay around €370 million a day to Russia for natural gas alone (Balser, 2022). Germany as the worldwide largest buyer of Russian gas and second-largest buyer of Russian oil will likely pay a record sum of more than €30bn to Russia in 2022 (Vargas, 2022), which relates to more than half of the 2020 budget of the Russian military (cf. SIPRI, 2021). However, the war in Ukraine also brought other energy-related issues on top of the agenda; the suddenly growing threat of energy security and energy poverty has been a reminder of the direct connection between energy and well-being. Since February 2022, a major movement in the energy policy landscape in Europe can be observed. The fifth sanction package of the EU bans coal from Russia, Nord Stream 2 was stopped, and Germany signed first contracts to build new LNG terminals (Kurmayer, 2022). Usual calls for diversification of energy supplies and massive energy efficiency increasingly have become louder (IEA, 2022). The newly published Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) from April 2022 clearly outlines the need for demand-side measures to achieve the 1.5° Paris Agreement (PA) target (IPCC, 2022a). Simultaneously, rising energy prices have brought the conversation on the need for absolute energy savings automatically very close to consumers (ZDF, 2022). Greenpeace Germany, for example, released a report with ten measures for becoming independent of Russian oil. One of them suggests that a reduction of one degree Celsius in room temperature could already save 6% of Germany's heating oil consumption (Gehrs et al., 2022), considering that 25.6% of German of flats uses oil heating systems (BDEW, 2019). The current situation thus discloses new relevance for the concept of energy sufficiency as a strategy to, short-term, deal with the intensifying energy crisis and, long-term, transforming our relationship to and with energy. But what is energy sufficiency and why is it relevant?

The importance of a discourse on sufficiency in the debate around transforming how society produces and uses energy is given by scrutinising the three strategies for sustainability transformations suggested in interdisciplinary sustainability science: efficiency, consistency and sufficiency (Linz, 2004). These strategies complement and reinforce each other. Efficiency refers to improving input-output relations and aims to minimise the use of energy and materials used for economic output. It thus refers to the reduction of relative resource consumption, which is often induced by setting minimum efficiency standards (Brischke et al., 2016). Consistency strategies aim to qualitatively transform the industrial metabolism more in line with nature. It describes a much more systemic change through technologies and reorganisation in the design, production, distribution and disposal of products (Huber, 2000). It is a more holistic and integrated approach linking production and natural cycles (Behrendt et al., 2018). Besides efficiency (better) and consistency (different), a third sustainability pillar was suggested:

sufficiency (less) (Linz, 2004). The term sufficiency originates from Latin 'sufficere' meaning *"to be enough"*. Sufficiency questions the kind and extent of consumption with the goal of achieving an absolute reduction of the related resources and environmental impacts. Unlike efficiency and consistency strategies, it relies less on technological and more on socio-cultural change and innovation (Brischke & Thomas, 2014). While the two former strategies are commonly established in the current system, sufficiency challenges dominant cultural norms on economic growth and technological optimism (Stengel, 2011). It is thus not yet a mainstream strategy. However, sufficiency strategies increasingly start to be recognised in industrialised countries, for it is argued to be vital to complement consistency and efficiency strategies (e.g. Schneidewind et al., 2013; Stengel, 2011).

In the 'Summary for Policymakers' of the AR6 of Working Group III of the IPCC, a definition of sufficiency is provided for the first time (IPCC, 2022b, p. 41). The recognition of a sufficiency approach to energy as an effective strategy to achieve absolute energy use reduction and reduce dependency on fossil fuel abundance marks a sharp change in the narrative to previous IPCC reports with little mention of demand-side measures for climate mitigation. This is especially relevant given current trends of renewable energy transitions that show a lack of speed to reach PA targets (Hickel & Kallis, 2020; Cherp et al., 2021). Lovins et al. (2019) state that global mitigation efforts for fossil fuels rose at a pace that would lead to a 2° warming since 2010. Furthermore, an extensive assessment by Brockway et al. (2021) shows that energy efficiency gains are largely offset by rebound effects. Clearly, there is an urgent need to find (policy) ideas beyond energy efficiency and renewable transitions. This is essential also from a distributional equity perspective, where the remaining carbon budget can be seen as an upper limit for sufficiency (IPCC, 2022a)

The concept of energy sufficiency has been around since the oil crisis in the 1970s but was only introduced as a sustainability strategy later; it can be defined as "*a strategy aiming at limiting and reducing the input of technically supplied energy towards a sustainable level"* (Thomas et al., 2019, p. 1). As understood in sustainability science, sufficiency aims at an overall 'reduction' and is therefore often associated with 'renouncement' and a cap on maximal consumption. Given this normative component, a policy aiming at energy sufficiency, hence reducing absolute energy use, might appear politically unfeasible and unattractive. However, Kleinhückelkotten (2005, p. 74) highlights: *"In its broader meaning, the sufficiency strategy goes beyond the abandonment of individual particularly material and energy-intensive products or services and calls for a change towards a culture of sustainability in which personal development, social justice and interpersonal relationships replace material values such as status and property."*. This illustrates that sufficiency goes beyond a limited understanding of reducing consumption. Energy sufficiency strategies thus have the potential to initiate a total change of our relationship to and with energy if applied more broadly in society. Burke (2020), who investigated the relationship between energy use and human well-being, argues for a re-evaluation of the need for modern forms of energy. His findings show that reducing energy use does not need to mean a loss of well-being. Thus, energy sufficiency policies should not be merely seen as a crisis management strategy to ensure energy security of supply but as a long-term path which offers a complementary strategy to consistency and efficiency efforts.

The implementation of energy sufficiency as a way to change the relationship to and with energy, particularly in industrialised countries, depends much on the local political context. As most

energy is consumed locally, for example in the housing sector, several scholars concluded that the local level is the perfect intervention point for energy sufficiency and the application of its politics (cf. Gröne, 2016; Leuser & Brischke, 2018; Schneidewind & Zahrnt, 2014a). In this thesis, I will focus on the German context, investigating the city of Göttingen as a case study which is further justified in chapters 1.4 and 3.1. Besides France and Switzerland, much of the literature on sufficiency has been developed in Germany by scholars at the German Wuppertal Institute and the Institute for energy and environmental research Heidelberg (IFEU). The concept was introduced to the German sustainability debate by Wolfgang Sachs, who worked at the Wuppertal Institute himself (cf. Sachs, 1993). This led to many empirical studies focusing on the German context (e.g. Gröne, 2016; Leuser et al., 2016; Schopp, 2017). An increasing body of research focuses on the housing sector and the potential of living space reduction (LSR) in residential housing for absolute energy savings, emphasising the potential that urban planning and design choices can have (Brischke et al., 2016; Jenny, 2014; Bierwirth, 2015). Germany, and in particular German cities, therefore, poses an exciting stage for investigating energy sufficiency developments further and zooming in on how it can become a reality in the housing sector.

1.2 Problem definition

To understand problems around the exploitation of the large potential for energy savings in the housing sector, it is essential to grasp this potential first. LSR is a specific energy sufficiency measure that has caught interest in literature in the past ten years for the large role it could play in saving energy and related GHG emissions. Globally, scenarios used in the recent IPCC report show a cap on floor area per capita growth in developed countries could reduce GHG emission by 5 % (IPCC, 2022a, p. 1525). An extensive study by Fischer et al. (2016) calculated the potential of LSR under an ageing population in Germany and found major energy saving through heat saving. Kenkmann et al. (2019) calculated energy saving from different behaviour changes towards LSR such as moving to a smaller flat or sub-renting and also found overwhelming energy saving potential. This is because more living (floor) space leads to more lighting, cooling, and heating energy as well as more or bigger appliances (Bierwirth & Thomas, 2015). Furthermore, energy saving potential also comes from reduced need for new buildings and avoided GHG emissions from embodied energy (i.e. construction materials, land conversation).

The strong notion of LSR potential is against a trend towards more living space per capita. According to data of the *Statisches Bundesamt* [Federal Statistics Agency], living space per person has been rising from 46.1 to 47.4 sqm between 2011 and 2020, not including (changes in) vacancies (Umweltbundesamt, 2021). This is projected to grow to 51.5 sqm in 2050 (Deschermeier & Henger, 2015). The average living space per person in the city of Göttingen has increased from 22.8 sqm in 1968 to 36.9 sqm in 2019 (Stadt Göttingen, 2020b). In the case of Göttingen, around two-thirds of residential buildings are single or two-family houses (Stadt Göttingen, 2020b). These trends can be explained by that more people live in their own homes and that the size of households has shrunk (Umweltbundesamt, 2021). Another explanation is the increasing ageing population and increase of people living on their own property (Fischer et al., 2016).

The problem definition starts by acknowledging the currently, in broader politics, underestimated potential of LSR to reshape our *relationship to and with energy*. While it could help fulfil Germany's obligation to meet the 1.5° PA goal., the trends above show that living-space increase could in turn also impede GHG emission reduction efforts. The German government has committed itself to a 65 % GHG emission reduction until 2030 and aims to be climate neutral by 2045 (Bundesumweltministeriums, n.d.). According to the Climate Action Tracker, Germany's climate targets, policies, and finances are insufficient to meet the Paris Agreement target of 1.5° (Climate Action Tracker, 2021). While carbon budget calculations are always approximations, calculations of Tech for Future based on data of the IPCC AR6 Working Group I and the *Umweltbundesamt* [German Federal Environment Agency] even show that Germany already used its share of the remaining carbon budget for 1.5° in 2021[1]. To reach 1.7°C global warming, CO_2 emissions would need to be reduced by around 140 million tonnes per year, about twelve times the current reductions. The 1.7°C target only leaves a CO_2 budget of 29.5 tonne per capita from 1 January 2022. Levels of GHG emissions were at 8.5t CO_2/person/year in 2019 (BMU, 2021), not even considering emissions embodied in trade. Germany's high GHG emissions are despite early commitments to an energy transition with the adaptation of the famous renewable energy law in the 2000s. Dominant national sustainability strategies pursued have been consistency (e.g. Coal Exit 2038, Initiative for an acceleration of renewable energy expansion), and efficiency (e.g. energy efficiency strategy 2050, working paper on 'energy-saving for more independence'). LSR policy as an energy sufficiency strategy could complement these efforts. However, it needs to be well designed and implemented to capture the right target groups and provide the means necessary to act towards LSR.

In 2015, Schmitt et al. (2015) conducted a comprehensive review of the extent to which sufficiency is already part of German municipal policies and found that sufficiency measures for building and living were only marginally represented. Göttingen set LSR as a target in the context of developing a 'Masterplan 100% Climate Protection', a federally funded pilot project for local climate strategies. Around five years later, little to no success in reducing living space in Göttingen was recorded, as indicated in the evaluation report of Göttingen on the Masterplan from 2020 (Stadt Göttingen, 2020a). Other cities among those that set LSR targets in their Masterplan failed to reach their goals, too (cf, Hannover, Heidelberg). A study by Bongers-Römer et al. (2018) found that municipalities lack information and funding to not only design sufficiency strategies for LSR and similar but also to implement them:

Lack of capacity of municipalities to design of LSR policies is problematic as they impede the institutionalisation of LSR. The Cambridge Dictionary defines institutionalising as *"to make something become a permanent or respected part of a society, system, or organization"* (Cambridge Dictionary, n.d.). I here use the term institutionalisation as: the state in which LSR has become integrated across scales and levels of organisations and government creating an institutional environment which channels efforts towards LSR manifestation. It is thus an intermediate step and a requirement for structural LSR manifestation. Given the potential of LSR, its institutionalisation

[1] The CO2 budget to stay below 1.5°C global warming with a probability of 83% was about 444 gigatonnes for the whole world on 1 January 2016 (IPCC, 2021). Considering an equal share for each world citizen, Germany's population at that time of 82 million people was entitled to 4.9 gigatonnes of this given world population at that time of 7,464 billion people. This is not even considering Germany's disproportional contribution to global GHG emissions.

is desirable, however, the central question is, how can LSR institutionalisation be achieved? Various scholars have mentioned the need for *Rahmenbedingungen* [framework conditions[2]] provided through policy to enable sufficiency behaviour (cf. Bohnenberger & Leuser, 2020; Brischke et al., 2016; Linz & Scherhorn, 2011). There have been different studies proposing policy instruments that aim at the creation of framework conditions for LSR, most of them exploring the potential benefits and barriers for an LSA (cf. Bierwirth, 2015; Kenkmann et al., 2019; Lorek & Spangenberg, 2019b; Thema et al., 2017). However, so far many of these studies have been hypothetical given the lack of empirical cases with LSR policies. Göttingen has been a pioneer case which joined OptiWohn, a LSR pilot project financed by the Federal Ministry for Environment, Nature Protection and Nuclear Safety (BMU) from 2020 to 2022 focusing on Göttingen, Tübingen and Cologne. It is the first city to pilot a *Wohnraumagentur* [living-space agency (LSA)] and thereby started a visible institutionalisation process of LSR. It provides the ideal scene for extending scientific understanding of how a LSR policy measures mix could be designed. Evaluating the design of the mix of LSR policy measures in Göttingen allows for conclusions on how to institutionalise LSR better across municipalities. By examining the institutionalisation of LSR in this thesis, I also contribute to the merely emerging discussion on how energy sufficiency can complement existing GHG emission reduction strategies in Germany.

Lack of capacity of municipalities to implement LSR policies is problematic because, as briefly mentioned before, it will not drive an absolute reduction of living space per capita and thus not lead to absolute energy savings. On the contrary, the increasing average living space per person in all of Germany but also in Göttingen increases overall energy demand. A vast body of literature was dedicated to finding scientific explanations for how to aid the gap between policy intention and implementation (cf. Gunn, 1978; Hudson et al., 2019; McLaughlin, 1987). However, literature on policy implementation for LSR is lacking due to the early stage of LSR institutionalisation. In this thesis, I therefore also aim to pursue questions around how the implementation of policy measures targeting absolute living space reduction can be advanced, given the case of Göttingen.

1.3 Aim and RQ

The aim of this research is thus to better understand and advance the *design* and *implementation* elements of policy measures that have the potential to reduce living space per capita in Göttingen. Given the lack of empirical studies in this area, I identify the barriers that prevent progress and propose a series of policy measures that can help bridge the gap between the theory of sufficiency and its implementation in practice. To guide this work, define the following research questions:

[2] Note by author: There is no 100% fitting translation of the German word *Rahmenbedingungen*. To paraphrase: It refers to the conditions that are given outside of the system of interest. Synonyms might be 'external factors' or 'preconditions'. For LSR for example, it refers to the conditions under which people would take the decision to make a change that results in them living on less space. A change in *Rahmenbedingungen* could for example be a change in regulation, financial incentives or provision of information that increase people's capacity to take certain decisions. 'Framework conditions' which, according to English native speakers in my surrounding, is not entirely correct has previously been previously used in English literature by German scholars so I will use it here too.

RQ1: How does the LSR policy mix design contribute to the institutionalisation of LSR in Göttingen?

This question can be split into two sub-research questions (SRQs), also given policy measures are not designed in a vacuum:

SRQ1a: Which contextual factors shaped the current design of the LSR policy mix in Göttingen?

SRQ1b: What are the current policy measures in place to achieve absolute reduction of living space per capita in Göttingen?

RQ2: How can the implementation of policy measures targeting absolute living space reduction per capita be advanced in the city of Göttingen?

SRQ2: What are the barriers for existing policy measures to achieve an absolute reduction of living space per capita in the city of Göttingen?

RQ3: What kind of policy adjustments or further policy measures are needed to advance the absolute reduction of living space per capita implementation in Göttingen?

1.4 Scope and Delimitations

The scope of this thesis is limited by the geographical boundaries of the city of Göttingen (see Figure 1-1). While the selection for the city of Göttingen specifically is justified in more detail in chapter 3.1, the choice to focus on a city rather than more rural areas is rooted in the acknowledgement of the role cities play in achieving climate neutrality and tackling the housing crisis. As worldwide 65% of the energy consumed and 70% of CO2 emissions originate from cities (European Commission, n.d.), the city level is increasingly recognised as an implementation stage for sustainability transformations necessary to achieve ambitious climate targets. The role of cities is further stressed by the megatrend of urbanisation which predicts that the number of currently more than half of the population living in cities will increase to 68% by 2050 (United Nations, Department of Economic and Social Affairs, 2019). This puts increased pressure on cities, which thus provide a stage for promoting LSR institutionalisation. Therefore, the wider county of Göttingen was not included. However, as some of the stakeholders relevant for LSR implementation in the city also function in the wider Göttingen area (e.g. *Energieagentur e.V.* [energy agency[3] (EARG)], *Freie Altenarbeite Göttingen e.V.* [independent elderly work (FAG)]), insights from the study can also shape conversations of how to extend LSR efforts into the wider Göttingen county.

Within the city, 10 local practitioners were interviewed, given their involvement in LSR or the relevance of LSR for their work. This counted experts on policies related to LSR, housing associations and companies who bridge policy intentions and practice, actors in advisory roles to urban planning, and groups of influence on policy. A delimitation is that no political parties

[3] Not a formal state agency. The energy agency is a mediation body for energy advise and funding fort he city and district of Göttingen.

were chosen to be interviewed, given time constraints. To have a fair representation various parties would have needed to be considered. Furthermore, the perspective of the citizens of the city of Göttingen was not directly considered. Initially, neighbourhood centres were supposed to fill this gap; however, it was later explained that neighbourhood centres operate in Göttingen in areas with a low living space area per capita compared to the rest of the city (cf. living space per capita per district, Stadt Göttingen, 2020b, p.41) and thus would be less relevant.

Social housing usually requires a limit for living space per capita which highlights the interconnectedness of LSR with other social policies. For this thesis, LSR was considered only as described and designed in the Climate Plan 2030 (CP2030; Stadt Göttingen, 2021a) rather than also including social policy for housing. This is because the angle of this thesis is the contribution LSR can make to energy sufficiency and climate neutrality.

The analytical framework used for this research draws from RE, a concept which will be elaborately explained in 2.2.2. However, for the evaluation, it is important to draw a boundary between what is included and what might be subject to future research. RE, as I present and conceptualise it, assumes that a policy programme will provide resources, opportunities, and constraints that will either change reasoning or enable existing reasoning, which then leads to a behaviour change that triggers a mechanism that generates outcomes (cf. 2.2.2). It takes interest in the context in which a policy programme is introduced and how that influences various parts of the process. What is important to understand at this stage is that data can be collected for different processes to make conclusions about what works, for whom, in what circumstances and to what extent (Pawson & Tilley, 1997). In this thesis, I am gathering data on three stages: the policy itself and how it intends to achieve changes or enabling of reasoning, how well it does in doing so and what contextual factors might hinder the triggering of mechanisms. As this study can be argued to be an *ex-ante* evaluation given the only recent establishment of the LSA and adaptation of the CP2030, data on whether mechanisms were successfully triggered and if outcomes were achieved are excluded from the investigation. This is because these data do not exist yet or only sparsely and require a different research design with more quantitative methods.

To set a focus for the evaluation, it is helpful to consider what the results might be used for (more details on this are provided in the analytical framework in 3.2). In this context, the answers can be used for policymakers new to LSR and its institutionalisation (RQ 1), for practitioners who implement policies (RQ2), and for the wider research community interested in what LSR policies are believed to be needed to achieve LSR manifestation (RQ3). As part of the analytical framework, I present the PIAF which guides the priorities for where to put focus for RQ2. It defines five dimensions of focus for policy assessments that hold several subcategories (cf. 3.2): resources, planning and coordination, measurement and accountability, leadership and ownership, and political economy (Eldridge et al., 2020). According to one of the authors, they were defined after an extensive review of policy implementation literature (L. Williams, personal communication, March 25, 2022). Nevertheless, further categories could be derived from policy implementation science which provides a large body of literature and from integrating it into the RE approach. However, the scope of the policy implementation that I conducted as part of the evaluation is limited by the five categories proposed in the PIAF by Eldridge et al. (2020), given it provides an accessible tool leading to clear conclusions on shortcomings of the LSR policy mix.

Figure 1-1 Göttingen geographical location in Lower Saxony, Germany (TUBS via Wikipedia commons)

1.5 Audience

The findings of this study can be of use by research bodies such as the Wuppertal Institute, the ifeu and the European Council for an Energy Efficient Economy (ECEEE) which are the main platforms for academic actors researching this field and who might be able to duplicate the study for other cities. This is especially interesting as the FULFILL project is starting now in partnership with the Wuppertal Institute which aims to inquire about energy sufficiency in cities all over Europe. Other actors who might benefit from the outcomes of this study are governmental institutions such as German city councils and regional governments. Finally, it could be useful for EU policymakers. A recent systematic analysis of sufficiency elements in long- and short-term strategy across member states has revealed that sufficiency is hardly in focus (Zell-Ziegler et al., 2021), thus, conclusions from this thesis can serve as an inspiration for a political framework to direct EU funding towards pioneer projects in urban energy sufficiency and specifically LSR.

1.6 Ethical considerations

I intend to quote and reference in line with research ethics, avoiding any form of plagiarism through text, ideas or figures. To minimise risk, I am using *Zotero* as a referencing tool. Social science research guides (e.g. Bryman, 2012) often acknowledge the risk of leading interviews, for example, framing questions in a biased or presumptuous way. Given my worldview and my background in ecological economics and energy and environmental policy, I acknowledge my own very supportive standing towards energy sufficiency and actively tried to leave room for

critical and sceptical voices. To minimise bias, I let peers review my interview question with a more neutral standing towards my research topic.

For this research, I conducted expert interviews. Participants agreed to be interviewed via a consent form (see appendix 7.2). The form includes information about the purpose of the research, the handling of data, and the option to choose whether the interviewee's name and/or position and/or organisation can be disclosed or kept anonymous. Chosen anonymity was ensured by letting participants validate and approve direct quotes. Interviews were recorded with the interviewees' consent. Any findings of the research, e.g. comments of an interviewee whose publication might harm their relationships, were not used.

Interviews were recorded and stored on One Drive, which is password protected and can only be accessed by myself. Following the research standards of Lund University, recording files are kept for ten years.

1.7 Disposition

The thesis is structured as follows: Chapter 1 highlights the relevance of energy sufficiency for complementing currently dominant efficiency and consistency sustainability strategies for GHG emission reduction from energy usage. It identifies the housing sector and, more specifically, the reduction of living space per capita as an energy sufficiency measure with a high potential for absolute energy savings and provides a problem analysis for its design and implementation. Chapter 2 serves two purposes: (1) it provides an a more in-depth overview of current knowledge on (energy) sufficiency and research gaps to show where the debate on LSR is embedded in academic research and thus how the results can address the existing gaps; (2) it elaborates on the concept of theory-based evaluation (TBE), and more specifically realist evaluation, which frames the logic and analytical framework of the research project. Chapter 3 presents the research design and methods employed for data collection and analysis to answer the research questions outlined in 1.3. Chapter 4 presents the results, structured according to the research questions. The first section presents the design of policy measures in Göttingen and contextual characteristics influencing the design. In the second section, the implementation of LSR policy measures in Göttingen is assessed. Finally, recommendations for further policy focus was derived from the data. Chapter 5 discusses the implications and limitations of the results. Chapter 6 presents the main conclusions of the thesis research, provides some recommendations, and an outlook for further research.

2 Literature Review

2.1 Current Knowledge related to sufficiency

LSR has been introduced in literature as a sufficiency measure to achieve energy savings. Thus, the first section of this literature review will explore the concept of sufficiency more as well as provide an in-depth overview of current energy sufficiency literature in which the application of LSR is discussed.

2.1.1 Sufficiency

The concept of sufficiency as complementation of consistency and efficiency was first introduced by Wolfgang Sachs in Germany in the beginning of the 1990s. Sachs conceptualised the four D's; Decelerate (eluding from constant pressure to progress and rediscover equanimity), Decentralise (focus more on the local and regional level), Decommercialise (focus on wealth also outside of the market) and De-clutter (towards politics of less). In a later publication, he points to the "blind spots of eco-efficiency", the dominant strategy for energy use reduction, such as the rebound effect as well as the path dependency on economic growth (Linz et al., 2002). Fischer et al. (2013) elaborate on the rebound effect in various aspects: efficiency measures can lead to spending savings which are then spent again on services or goods that require energy. They also highlight that absolute resource saving requires the efficiency increase to be as high as the economic growth. The reduction of consumerism would have significant consequences for the current economic system which relies on the expansion of the economy to offset productivity gains and avoid unemployment waves and resulting social stability. However, the current focus on the production side changes allows for consumption patterns to stay the same (Sandberg, 2021). Consequently, much of the literature on sufficiency has focused on the consumption side. Sufficiency raises the question of "how much is enough?". Sufficiency as a minimum is explained to be a distributive justice approach that considers, having a minimum threshold (Spengler, 2016). Thus, sufficiency can be used in global conversations around decent living standards.

Placing an upper threshold is, however, due to its normative and moral drive, more difficult (e.g. Stengel, 2011). Fischer et al. (2013, p.10) tried to find a more neutral definition of sufficiency that takes into account the various approaches and their difficulties while still defining it in a way that sharply distinguishes it from consistency and efficiency. They understand sufficiency "*as modification of consumption patterns that help to respect the Earth's ecological boundaries while aspects of consumer benefit change*".

Criticism for sufficiency as a sustainability strategy comes from consistency and efficiency advocates. While sufficiency advocates might speak about 'liberation from excess' (Paech, 2012) and 'freedom for less' (Bohnenberger & Leuser, 2020), various fears are centred around the notions of renouncement, eco-dictatorship, technological pessimism, and return to more primitive times (Paech, 2019). This criticism is rooted in notions of individual freedom. However, von Winterfeld (2007, p. 51) poses the question: *"But is it not just as normative to assume that everything would be for the best if only each and every everyone is allowed to pursue their own advantage, their own profit, their own greed as undisturbed as possible?"*. She highlights that sufficiency was originally introduced as a concept targeted more at consumption and thus individual behaviour. However, it has long evolved into a matter of wider politics and institutions as seen from the literature

cited here. Whether sufficiency is seen as a threat thus, seems much to do with one's understanding of sufficiency and stems from a lack of clarity of what it actually means. Sufficiency is challenged for being seen as anti-liberal, ideological or fundamentalist (Muller, 2008). And Linz et al. (2002) acknowledge that sufficiency indeed requires a (new) set of values rooted in material modesty and a different type of wealth, and it thus should be seen more as a task rather than a state. However, showing that sufficiency is not about consumer choices only, Schneidewind and Zahrnt (2014), for example, argue that policies should aim at changes in framework conditions and the introduction of other legislative measures to enable and facilitate sufficient lifestyles.

Schneidewind et al. (2013) pointed out that the highest barrier towards the adoption of sufficiency measures is the resistance against new regulations, although, as they highlight, people accept or are unaware of the magnitude of regulations in their daily lives. Similar arguments were made by Stengel (2011) who also mentioned other barriers, namely materialistic world views, the tendency to conform with the majority (who liked to consume), and the reluctance to take on responsibility. Bohnenberger and Leuser (2020) introduce a more optimistic idea of humans, where conducive conditions and infrastructure changes lead to behaviour change and where many people will actually enjoy living a more minimalist lifestyle.

While many narratives in favour of sufficiency sharply criticise efficiency and consistency strategies and vice versa, it needs to be considered that original Sachs said that they should go hand in hand. *"While efficiency is about doing things right, sufficiency is about doing the right things"*(Sachs, 1999, p. xix). One that note and linking this to energy, (Thomas et al., 2019) *"argue that policy will need to promote efficiency and sufficiency in an* ***integrated way*** [own emphasis] *to achieve absolute energy savings targets. This includes avoiding that energy efficiency measures may run counter to goals of energy sufficiency."*. According to Fischer et al. (2013), it should not be the last thing done as it can often be more cost-efficient. This would be the case for example now with the Ukraine-Russia war-induced energy price rises.

2.1.2 Energy sufficiency

Energy sufficiency is a strategy focusing on absolute energy demand reduction. The urgency to place it in the centre of political debate becomes clear when examining the current state of play:

Besides current urgent pressure from energy security threats, the availability of renewable energy is often overestimated. Recent analyses show that renewable energy sources are not expanding at the speed that has been modelled, nor at the pace expected and needed to cover growing energy demands (Hickel & Kallis, 2020; Cherp et al., 2021). On a positive note, Lovins et al. (2019) argue that the potential of demand-side measures for climate mitigation, such as energy efficiency, is underestimated. However, so far, Brockway et al. (2021) show that there is little evidence for a global energy demand reduction. A global decoupling of energy from economic growth was not yet achieved (cf. Haberl et al., 2020; Hickel & Kallis, 2020). The Special Report on 1.5° by the IPCC (2018) assumed that absolute decoupling of GDP growth and energy consumption could be achieved; however, it assumes declining demand for primary energy (IPCC, 2018). Often the rebound effect is left out of discussions on decoupling; the rebound effect has been discussed in literature as a phenomenon where a change in behaviour offsets relative efficiency gains (e.g. driving more when having a more efficient car) (Gillingham et al.,

2016; Rocha & Almeida, 2021; Sorrell, 2018). Capellán-Pérez et al. (2020) explain that Integrated Assessment Models (IAMs) are built with limited feedbacks among the subsystems. This means the rebound effect might not be fully considered in conventional models (Nieto et al., 2020). Brockway et al. (2021) found that roughly half of the energy and GHG emission gains from energy efficiency improvements were erased by an economy-wide rebound. Additionally, they state that the lack of consideration of rebound mechanisms in global energy scenarios leads to an underestimation of the rate of expansion of the world's energy demand in the future. Brischke (2013) thus states, that sustainable energy systems can only be achieved through a **global limit on absolute energy demand** as all technologies used today for energy provision have environmental impacts and involve high demand for resources. This has, for the first time, been echoed by the recent IPCC report (IPCC, 2022a). This is worth mentioning as demand-side option were said to be neglected in the IAMs used by institutions such as the IPCC which tend to focus more on supply-side technologies and reduction of GHG emissions through removal technologies (Mundaca et al., 2019).

The above discussion highlights the need for a more steered and guided concept to address a potential energy availability gap for growing demand. Thus, there is an urgent need to find (policy) ideas beyond energy efficiency and renewable transitions.

The concept of energy sufficiency has been present since the oil crisis in the 1970s, even if not always known under with this term. Nevertheless, it has not been defined in a unanimous way. The ECEEE has taken a serious interest in the topic of energy sufficiency in recent years and much literature was produced as a result of their projects. So did Darby and Fawcett (2018), for example, develop the following definition: *Energy sufficiency is a state in which people's basic needs for energy services are met equitably and ecological limits are respected (p.2).* Brischke et al. (2016) distinguish three approaches to energy sufficiency:

> (1) Reduction: Quantitative reduction of usage of a utility or technical service (e.g. reducing the number of lights or room temperature);
> (2) Substitution: Qualitative change of needs, such as changes in lifestyle such as diet change towards a vegan diet or buying more fresh food instead of storing frozen products.
> (3) Adaptation: Adaptation of technical services to actual needs to avoid energy waste. Usage stays the same, but the utility or service itself changes, aiming to avoid unnecessary abundance (e.g. change towards a smaller fridge, refrain from heating unused living areas).

Energy sufficiency differs fundamentally from approaches and proposed measures for so-called energy-saving behaviour, which focus solely on reducing energy consumption through changes in specific technological use and are not always designed from the perspective of long-term sustainability (Brischke et al., 2016). Thomas et al. (2019) explain how energy sufficiency literature might focus more either on energy sufficiency as an outcome, that is the sufficient provision of energy as a utility while staying within planetary boundaries, or on energy sufficiency actions, that is for example changes in lifestyles. Either way, a central question that emerges is, what does energy sufficient exactly mean and how much is enough?

The debate ranges from discussing the difference between wants and needs (e.g. Fawcett & Darby, 2019) to ideas about the appropriate dwelling size per person (Lorek & Spangenberg, 2019a). Lower limits have been defined for example in terms of energy poverty, however, Germany, the context for this thesis, has no energy poverty threshold. The development of upper thresholds can be seen critical as they are very normative, however, this should not distract from that policies for sufficiency are not limited to hard regulations such as a threshold.

Nevertheless, energy sufficiency has not become a central part of sustainability policies in either form. Zell-Ziegler et al. (2021) researched sufficiency policies in the EU and found only very few related to buildings. Therefore, investigating current barriers to energy sufficiency poses an exciting research field. Toulouse et al. (2017) found for example difficulties of changing behaviour patterns and people's attitude to energy use. They further expand on how sufficiency goes against traditional social paradigms and is therefore nothing that could be implemented top down. However, they also show that for a region in France the potential to cut energy use is 21% for the residential building sector and 55% for passenger transport by 2050 compared to a business-as-usual scenario. This potential indicates the relevance to explore the role of government institutions and other actors to institutionalise LSR to make it a reality.

2.1.3 Energy sufficiency in the housing sector

Obviously, the research community interested in absolute energy demand reduction has investigated in which contexts behaviour connected to high energy use takes place (Leuser et al., 2014). Understanding the (unused) potential of energy sufficiency in the housing sector, and more specifically, absolute energy savings through reducing the living space per capita, provides a critical departure point to explore LSR. The new AR6 of the IPCC notes*: "implementing sufficiency measures that limit growth in floor area per capita, particularly in developed regions, reduces the dependence of climate mitigation on technological solutions"* (IPCC, 2022a, p. 142). Bilharz (2008) explains the distinction between big points and key points of sustainability. While big points are in areas with the highest saving potentials, key points have the potential to promote structural change and transformation. LSR can be seen as a measure that is both, a big and a key point.

Firstly, reducing dwelling size decreases the direct use of energy for lightening and especially the per capita heat energy. In Germany, about 73.8 % of houses still heat their homes with oil or natural gas heating systems (BDEW, 2019), meaning 68 % of household CO_2 emissions originate from heating. In Göttingen, 75 % of energy use in households was attributed to *Raumwärme* [room heat] (Stadt Göttingen, 2014). Fischer et al. (2016) conducted a thorough potential analysis for various sufficiency measures that could save energy and contribute to GHG emission saving in 2016 in Germany. They address the reduction of living space per person, showing its potential for heat savings. They project an average increase of living space per person from 39,3 sqm in 2010 to 42 sqm in 2020 and 45,1 sqm in 2030, assuming constant vacancies of 8 %[4]. Their scenarios show a 13,3 to 37,7 TWh/a saving potential depending on whether living space per capita reduces after 2020.

[4]Their scenario is considering the following parameters: aging population, increase of per capita income by 1.2 %, increase of ownership of housing by 4 %, and remaining of couples, parents with grown up children and widows and widowers in the same place.

Secondly, LSR in the form of vertical densification (increasing the number of housing units in existing buildings) reduces pressure to build new houses, reducing grey energy, hence the embodied energy in the building materials needed for each additional square metre of space (cf. Architects for Future, n.d.). Furthermore, each additional building occupies areas outside the house for (e.g. traffic/sewage) infrastructure that has its own energy footprint and contributes to land conversion, associated with biodiversity loss (Lorek & Spangenberg, 2019a; Umweltbundesamt, 2021). This highlights that LSR has environmental benefits beyond reduced energy use from lightning or heating. Vertical densification generally holds benefits beyond energy sufficiency and savings; it could address a whole multitude of urban challenges, most prominently housing shortage, conflicts of areas, and climate protection.

Much potential seems to lie among older people who stay in their private property after children have moved out - a group that is expected to grow with Germany's demographic changes. The average living space per capita for people over 65 was 62.0 sqm (if they had owned the place even 70.6 sqm) in Germany in 2014. This compares to the German average of 43.8 sqm (Stadt Göttingen, 2020b). Kenkmann et al. (2019) define especially people expecting a transition phase as a target group, i.e. from entering pension age, people with children moving, or those in need of care. In a study by Thomas et al. (2019), the authors found that 10 % of their interviewees said their living space was 'too big' (more than half of them were older than 60 years). In a study among people above 55 around Steinfurt, almost 50 % of interviewees perceived their living space as too big. Of those, 10 % indicated to perceive this as a burden (Stadt Göttingen, 2020b). In a potential analysis by Brischke et al. (2016), it was found that 10-15 % of the whole population would consider moving, given certain conditions such as that the new place is in the same neighbourhood or that it is not more expensive than the current place. While not everyone living on much space might want to move, there is a potential that could be mobilised.

The central question is now, how can this potential be mobilised? Fuhrhop (2020) provided a list of 100 measures in his book ranging from communal living, to reconstruction, and general avoidance of new housing. Increasing interest was taken by the energy sufficiency research community in policy instruments making these LSR ideas a reality, as mentioned in 1.2. The notion accompanying these studies is that human behaviour and thus also its change is defined by contextual factors – framework conditions. Michael Kopatz from the Wuppertal Institute eloquently said: "*Änderung der Verhältnisse schafft Änderung des Verhaltens"* [change of external conditions creates change of behaviour] (Kopatz, 2019). More specifically, Walker, Thomas and Verplanken (2014) noted that change in framework conditions leads to a disruption of unconscious routines and to a conscious decision to act in a certain way.

Some scholars have started to explore how polices would need to look like. GermanZero (2021) provides a whole collection of measures for reaching 1.5° in Germany, many of them suggest changes in regulation. Kenkmann et al. (2019) investigated potential of an LSA and a funding programme to support division of single-family homes. They highlighted the importance for a policy mix of financial and information instruments. Bierwirth and Thomas (2019) also investigate an LSA and find that it would need to provide a combination of advice, support for moving, as well as financial support. Also Thema et al. (2017) examined the potential of an LSA and under which conditions it would work well. However, these studies remained hypothetical as no LSA was set up. This has changed now with the establishment of the *LSA* in Göttingen.

2.2 Conceptual Framework

This research's logic is built on RE[5], a subbranch of TBE. RE was first conceptualised by Pawson and Tilley (1997) and has been grown in application since. To understand the general logic of evaluation, I first present TBE, followed by a section on RE follow. The application of RE for the context of the thesis specifically can be found in the analytical framework under 3.2.

2.2.1 Theory-based evaluation

TBE refers to the evaluation of a programme based on a theory of how this programme works. The idea of defining and testing a programme theory is as old as the 1930s, but the TBE only gained broader scientific interest in the 1980s and '90s, most notably through the work of Weiss (1997) and Chen and Rossi (1980, 1987). TBE has been used interchangeably with theory-driven or theory-guided evaluation, though nuances exist, and developed into refined approaches such as RE. What is common to all TBEs, is that it is an approach rather than a technique built on a programme theory (theory of change). It outlines how an intervention will arrive at a certain outcome. TBEs will be subject to a programme which envisions a particular change and is centred around a programme theory (unit of analysis) that outlines how this change will happen through the programme (Pawson & Tilley, 2004). This theory can be based on previous research, knowledge, or experience. TBE aims to open what has been termed the 'back box', which refers to the space between input and the expected outcome of the programme (Stame, 2004). Rather than just looking at the effectiveness or efficiency of programmes, TBE acknowledges the importance of what Blamey and Mackenzie (2007, p. 440) call 'heterogenous contextual settings' (meaning political, social, organisational and individual contextual characteristics). These drive the behaviour of those affected by the programme and thereby influence programme outcomes. The programme around which an evaluation is centred can be anything from a small project to a strategy covering several years or a more extensive government process (Rogers, 2007).

TBE was argued to consist of three components (Coryn et al., 2011): firstly, the development and examination of a theory of change[6] which specifies inputs, processes and outcomes of a programme; secondly, the collection of data of different elements of the theory of change to assess whether the outcome has occurred; and thirdly, analysing data to conclude how true the theory was. A theory of change might be evaluated on different levels, for example, individual, organisational or community levels.

In a reflection of TBE implementations, Rogers (2007) emphasises the need to pay attention to three challenges of TBE: They describe how evaluations were often not based on programme theories that define the mechanisms for change. Instead, they would focus on an implementation theory that highlights activities and intermediate outcomes. According to Coryn et al. (2011), the value of TBE is thus to not only show a causal relationship between elements but also explain how they cause each other. They argue that a programme theory is more than

[5] In their first book, Pawson and Tilley used the term 'Realistic Evaluation'. In their later work they explain the change in terminology to 'Realist Evaluation' based on the preferences of other authors (Pawson & Tilley, 2004, p.3).

[6] Theory of change and programme theory have been used inconsistently in literature. I am following the authors language but use programme theory in my own argumentations.

a logic model with a linear description of inputs, activities, outputs and outcomes, which would fall short of considering the causal mechanism underlying this linear chain. A second challenge mentioned is the quality of the programme theory. It was said that assumptions about how a programme is intended to work should not just be assumed by practitioners but founded in existing research theories and alternative perspectives (e.g. from those affected by the programme). Thirdly, the evaluation should go beyond just finding whether an intervention worked but use the programme theory to identify casual attributions, hence what outcomes are caused by the programme and what by contextual factors (Rogers, 2007). In the analytical framework, I concretise how this thesis addresses these challenges. However, my reflection on the limitations of my approach can be found in 5.2.

2.2.2 Realist evaluation

RE distinguishes itself from other TBEs in that it is rooted in realism, hence the idea that observations are not enough to conclude causal relationships between variables as they are strongly dependent on the given context and settings (Dalkin et al., 2015). RE refers to a logic of inquiry in which the programme theory is developed, tested, and evaluated through examining contextual factors that cause or influence change. It is thus interested in causation, meaning how change is caused, as well as attribution, meaning whether it was indeed the programme that caused the change (Westhorp, 2014). RE, rather than answering whether a programme works or not, it provides insight about *"what works, for whom, in what circumstances and to what extent"* (Pawson & Tilley, 1997). Westhorp (2014) outlines the philosophical assumptions that RE is based on: (1) as realism assumes that the social and material world has a real effect, RE assumes that a programme can have real effect and that the context it is embedded in will in return impact how the programme works. (2) Furthermore, as realism assumes that there is no final truth, meaning that even though an evaluation might advance understanding of a programme's workings, no certain or final conclusion can be drawn. (3) As realism assumes social systems to be open, it is necessary to choose the boundaries of the system RE aims to investigate and acknowledge that the system is dynamic and changes. (4) In a realist understanding underlying causal processes are called 'mechanisms'. Mechanisms will only function under the right circumstances. They are a central element in the RE understanding of how change happens.

At the core of RE lies the programme theory, sometimes used interchangeably with intervention theory or theory of change. Pawson and Tilley (1997) propose different components of the programme theory that are then tested. They propose the formula: outcome (O) = mechanisms (M) + context (C). The authors explain the formula as: *"programs work (have successful outcomes) only in so far as they introduce the appropriate ideas and opportunities (mechanisms) to groups in the appropriate social and cultural conditions (contexts)"* (Pawson & Tilley, 1997, p. 57). This means that causal links are triggered by context and mechanisms rather than interventions themselves (Pedersen et al., 2012). The outcome is defined by the programme evaluated.

Context (C) refers more concretely to the features of an environment or locality (Stame, 2004). It can also be defined as *"spatial and institutional locations of social situations together, crucially, with the norms, values, and interrelationships found in them"* (Pawson & Tilley, 1997, p. 216). Four contextual factors are highlighted for affecting programme implementation (Lacouture et al., 2015; Macfarlane et al., 2011): (1) the individual level, hence people's motivation, roles and knowledge,

(2) an interpersonal level, hence individual's relationships and network, (3) the organisational level, hence institutional settings such as organisational culture, informal rules, norms, and priorities, and (4) an external levels meaning political infra-structure such as legislation and other policies.

Mechanisms (M) refer to the changes that induce the outcome intended by the programme, given the right conditions. In their later paper, Pawson and Tilley (2004) also introduce the concept of measures more explicitly. Measures can be specific policy instruments through which resources[7] (e.g. funding), opportunities (e.g. information), or constraints (e.g. regulation) are provided that influence the target group's decision-making. The target group, subject of mechanisms, are individuals who are outside decision-making authorities (Pedersen et al., 2012). Pawson and Tilley (2004, p.6) explain it as, the "*process of how subjects interpret and act upon the intervention stratagem is known as the programme 'mechanism'*". However, understanding the exact process requires some elaboration which is illustrated in a simplified way in Figure 2-1 Logic of programme theory in RE (own graphic). The chain of causation is as follows: A policy programme provides resources, opportunities, and constraints through policy measures, creating a situation in which a subject takes a decision to act. Westhorp (2014) explains that it might do so by changing reasoning, which could mean for example, changing a person's understanding of changes necessary/the importance of the outcome of the policy programme. But the policy programme could also enable an already existing reasoning, for example, by providing financial resources to enable a specific behaviour. The logic is that this behaviour change then triggers (a) mechanism(s) that can cause outcomes. Thus, "*the evaluator needs to identify what resources, opportunities or constraints were in fact provided, and to whom; and what 'reasoning' was prompted in response, generating what changes in behaviour, which in turn generate what outcomes.*" (Westhorp, 2014, p. 5). Considering the importance of context (see green arrows in Figure *2-1*), RE also aims at disclosing what influences whether mechanisms are triggered. I explain how this logic is applied in the context of this thesis in the analytical framework in 3.2.

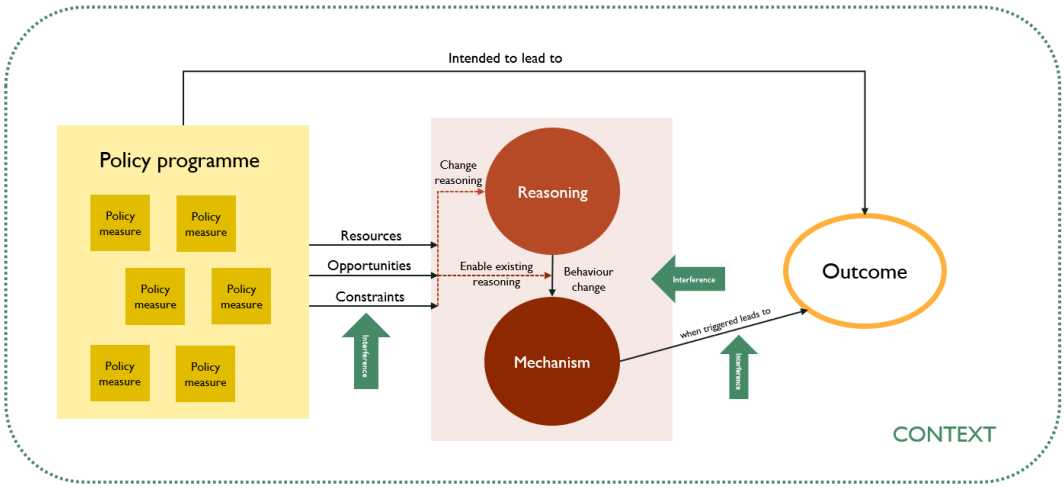

Figure 2-1 Logic of programme theory in RE (own graphic)

[7] The notion of resources can be confusing as RE literature often just mentions 'resources and reasoning', where opportunity and information are presented as a resource (cf. Dankers et al., 2021; Salter & Kothari, 2014). However, others mention resources, constraints, and opportunity, with the latter being isolated from resources (Westhorp, 2014). To avoid confusion, I will use the terminology as follows: resources relate to the financial or physical means a policy can provide, constraints related to the regulations imposed, and opportunity relates to information and knowledge that is provided though a policy.

3 Methods and Research Design

3.1 Research Approach and Design

The research design is what Creswell (2009, p. 23) calls the plan to conduct research which presents the "intersection of philosophy, strategies of inquiry, and specific methods". The authors formulate four philosophical worldviews, each of which holds certain assumptions that influence the choice of research design. My research design is informed by what they call a *post-positive worldview* (Creswell & Creswell, 2018). Post-positivists assume that effects or outcomes are likely determined by causes, which often translates into research that identifies and examines factors that impact outcomes – in this context, the desired outcome is the manifestation of LSR. Post-positivists also condense concepts into small, testable ideas. This is precisely how I approach the disentwining of Göttingen's LSR policy measures and the causal chain towards LSR manifestation as outlined in 3.2 just below. But firstly, the worldview translates into scientific methods. The process starts with developing a theory and ends with an evaluation and adjustment of this theory through insights gathered through data collection (Creswell & Creswell, 2018). As explained in more detail in the analytical framework (3.2), I formed my research design around a programme theory, drawing from ideas of RE theory introduced in chapter 2.2.2. It is often argued that using a theory deductively is mostly used in quantitative studies and that qualitative research generates theories inductively. However, RE does not demand a particular set of methods. It was said that *"if a concept or phenomenon needs to be explored and understood because little research has been done on it or because it involves an understudied sample, then it merits a qualitative approach"* (Creswell & Creswell, 2018, p. 57). As empirical research on LSR policy measure design and implementation is still scarce given the lack of institutionalisation of the topic, I thus decided to take a qualitative approach of inquiry and data collection.

Methods were chosen considering they were to be embedded in a case study research design. I decided to do a case study to build on the work of OptiWohn, which focused on LSR in three German cities, Göttingen being one of them. LSR is especially relevant for urban areas where pressure on the housing market often leads to expansion. Furthermore, case studies are often used in RE, as they provide a space where the initial program theory can be tested. Case studies can be defined as *"an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident."* (Yin, 2009, p. 18). Given that qualitative research aims to generate a contextual understanding rather than a generalisation (Bryman, 2012), qualitative methods fit the case study design. However, it has to be noted that case studies are only generalisable to a certain extent, thus, results cannot simply be generalised to other German cities. However, by disclosing the inner workings of policy measures design and implementation process, conclusions can be drawn that can be relevant for municipalities that find themselves in a similar context as Göttingen.

It can be distinguished between different types of case studies, such as extreme, typical, revelatory, critical and longitudinal case (Yin, 2009). The case of Göttingen can be categorised as a *critical case,* as it used to test and develop the programme theory. Göttingen represents a unique case for LSR manifestation research as one of the few places where the topic has taken off and started to be institutionalised. Therefore, it poses an accessible and interesting environment to conduct RE. The criteria for the choice can be summarised as follows:

(1) the city has proved to be a pioneer city for their ambitions towards climate neutrality in Germany. They were chosen as one of 19 cities to receive funding to develop a 'Masterplan for 100% climate protection' in 2012. In 2021, they applied to be one of the 100 Climate Smart and neutral cities under the EU mission.
(2) the city shows awareness of the potential and need for LSR. Göttingen city joined the OptiWohn project as a pilot to promote space sufficient living.
(3) the in-depth analysis of a case study requires data availability. Göttingen has a very comprehensive website with information about their climate and sufficiency policies under which LSR stands. In an initial contact with the municipal administration, the staff was very responsive.

Creswell and Creswell (2018) highlight the importance of addressing the role of the researcher, hence how their past experiences, history, and culture can influence data interpretation. This aligns with the post-positivist idea, centred between positivism and interpretivism, that objectivity is desirable but cannot always be achieved (Danermark et al., 1997). Given my academic background in ecological economics and energy and environmental policy, as well as a strong personal interest in sufficiency, I am likely to personally empathise more with the perspective of those involved in policy formation and interested in its optimal implementation compared to practitioners who are potentially more sceptical towards LSR policy. I reflect on the implications of this subjective bias during the selection of relevance of data in the analysis in 5.2. There, I also discuss limitations from my lack of specific knowledge to fully grasp regulatory barriers to LSR that are brought up, given that I am not an expert on housing policy and regulation in Germany, Niedersachsen or Göttingen.

3.2 Analytical Framework

While the exact methods and procedure for data analysis are outlined in 3.5, the presented research design is underpinned by an analytical framework. The purpose of the analytical framework is to embed the analysis and interpretation of data on LSR policy in a scientific approach towards policy evaluation. It thus connects the logic of sufficiency policy and RE.

I am approaching the investigation of LSR policy measure design and implementation in Göttingen through the lens of RE, which was introduced in 2.2.2. RE is a branch of TBE which examines, *"the ideas and assumptions underlying how, why and in what circumstances complex social interventions work"* (Lacouture et al., 2015). RE thus aims to understand what are the mechanisms that can trigger a certain outcome in a given context, through measures provided by a program (Pawson & Tilley, 2004). Rather than giving a clear set of rules to follow, RE is more of a guiding concept (Pedersen et al., 2012). Thus, in the following, I am outlining how I use RE to shape my quest for answers to the RQ posed in chapter 1.3 by zooming in on the 'context-mechanism-outcome' (CMO) elements of the LSR policy design and implementation process in Göttingen.

3.2.1 CMO for LSR in Göttingen

To allow for the concretisation of my program theory, I first need to clarify what the different components of CMO are in the scope of this research. The ultimate outcome (O) that this thesis is geared towards is the manifestation of LSR, hence the absolute reduction of living space per capita. Chapter 1 has outlined extensively why and how this is desirable and relevant.

Mechanisms (M) in this context would be the changes of behaviour that will reduce one's absolute living space. While it might be intuitive to provide examples such as 'moving into a smaller flat', these mechanisms require a more detailed look to provide for a sound evaluation of policy measure design and implementation:

By investigating the energy sufficiency policy database by Best et al. (2022) and grouping policy measures by the change of behaviour they aim to achieve (see overview Appendix 7.1), six overarching mechanisms were determined: Moving, reconstruction, sub renting, communal living, reintroduction of vacancies, and LSR housing creation. These can be distinguished as follows.

(1) LSR is undoubtedly relying on behaviour change of (organised) individuals.[8] The database revealed five mechanisms that depend on citizen's decisions to take action: Subrenting, moving, reconstruction, communal living, and making vacancies available again. These were also found in a not yet officially published dissertation written in the OptiWohn project context (D. Fuhrhop, personal communication, 4 March 2022). It is said to introduce the '3U&VW' formula, which captures the mechanisms that could mobilise living space currently not used. The formula is short for '**U**ntermiete, **U**mzug, **U**mbau, **V**ermietung, **W**ohnen gemeinschaftlich', which translates to 'Subrenting, Moving, Reconstruction, Renting (vacancies) and living communally'. It is novel in that it aims to capture what the author calls invisible living space (Fuhrhop, 2020). This refers to the living space potentially available yet not statistically recorded, such as extra space in people's homes once children move out or freed space from various people moving into a cooperative housing project.

One additional mechanism that policy measures proposed by Best et al. (2022) could trigger concerns the new LSR housing creation. Given 400.000 new buildings promised in the coalition contract of Germany's current government (SDP et al., 2021), and 5.000 alone in Göttingen under the new mayor (Carle, 2021), new building play a central role in addressing housing shortage. Thus, the mechanisms leading to LSR in new buildings need to be addressed:

(2) Another overarching mechanism concerns the decision of investors, public institutions, housing companies and associations, and private individuals to consider LSR when building new dwellings. Under this, I also consider retrofitting an entire building (which could be seen as reconstruction, but I will treat it here as part of new building creation if it concerns a whole building). Specific sub-mechanisms mentioned in a catalogue of policy measures by GermanZero (2021) are (a) building smaller rooms/more compact, (b) design floor plans, water and electricity pipes to be more flexible so that walls can be moved/apartments can be separated, (c) build several entrances for later reconstruction.

These insights advance the understanding of how LSR policy measures need to be designed and implemented to effectively reach O. Stakeholders covered under (1) and (2), that is (organised) individuals (such as households, housing initiatives, couples, individuals) as well as (private)

[8] Note by author: this does not imply that all people have to live on less space, but as the analysis provided in 1.3 showed, much of the potential lies in current vacancies or among people living in dwellings with sizes high above national average who are open towards reducing the area on which they live.

investors, public institutions, housing companies or associations, are called *mechanism agents* for the purpose of this thesis. They are the target group of any LSR policy.

Moreover, another essential component of RE is the context (C). As explained in chapter 2.2.2 this covers the broader prevailing beliefs, values and interrelationships in which an intervention is introduced. Context, as defined in TBE, is extensive and includes all social, political, organisational and individual dimensions. It is captured at various stages in the process will be illustrated in 3.2.2 below. I did not capture the individual level, hence, citizens' attitudes and thoughts due to the scope of this thesis, however, their views are integrated through comments from interviewees.

3.2.2 Theory of change

According to Pawson and Tilley (2004, p.6) *"realist evaluation begins with the researcher positing the potential processes through which a programme may work as a prelude to testing them".* It thus starts with a programme theory. This might have the format *"If we do 'x', 'y' will happen, because…"* (Westhorp, 2014, p.10). The logic applied to LSR leads to the overarching programme theory: **if LSR is institutionalised in a given *context (C)* through the successful design and implementation of a policy package with different LSR measures, hence informative, fiscal and regulative policy instruments, it will lead to the desirable *outcome (O)* of reduction of living space per capital because it triggers a set of *mechanisms (M)* that lead to *O*.** According to Westhorp (2014), 'context-mechanism-outcome' (CMO) hypotheses are developed next which provide more a testable format.

In 2.2.2, I introduced the programme theory of RE and illustrated its logic in a graphic. How can this now be insightful for answering the RQs? I am starting to answer this by clarifying that the assumption that I am basing the evaluation on is that institutionalisation of LSR, hence the design and implementation of LSR policy measures, will lead to O. This means institutionalisation of LSR is hypothesised to promote LSR. This is hypothesis is rooted in findings from previous studies that highlighted the need for framework conditions that enable LSR manifestation (see 2.1). However, as outlined in the scope and delimitations (1.4), this evaluation did not stretch towards evaluating outcomes, hence whether mechanisms were triggered and an LSR manifestation was achieved, due to data availability. This means my evaluation misses a crucial part and the above programme theory could not be fully tested. Adjusting to the scope of this thesis, more testable hypotheses of intermediary steps in the causation chain are needed that fit the ex-ante[9] leaning evaluation design:

As can be seen in Figure 3-1, the first step of the evaluation is to look at the causal chain between policy programme and reasoning. The hypothesis is that LSR institutionalisation in the form of LSR policy measure design shaped by the Göttingen context will lead to the resources, opportunities, and constraints provision targeted at changing reasoning or enabling existing reasoning of mechanism agents. To test this hypothesis, I investigated how Göttingen's LSR policy mix provides resources, opportunities, and constraints and aims to change or enable existing reasoning in the target groups. The context in which the policy was designed was

[9] The evaluation captures an ex-post view for example on the work of the LSA which is already an implemented policy measure, however the ultimate outcome of LSR cannot be evaluated, therefore, the evaluation is biased towards ex-ante.

included as well to make better conclusions about the institutionalisation process as a whole which might not be obvious only from policy documents. Through this process, I answer RQ1. It needs to be noted that TBE is often applied ex-post, however, there are some examples of ex-ante intervention evaluation (cf. Janssens & de Wolf, 2009). This is relevant because this case is ex-ante and ex-post as some policy measures in the CP2030 are not yet implemented while some already are. In their study, Janssens and de Wolf (2009) identify central assumptions underlying the policy, assess these assumptions for their feasibility and the validity of their logic, and evaluate whether the policy programme will work given these assumptions. Taking this as inspiration and considering that an evaluation of measures cannot provide an analysis of causation, existing policy measure design in Göttingen presented in chapter 4 also includes an analysis of underlying assumptions.

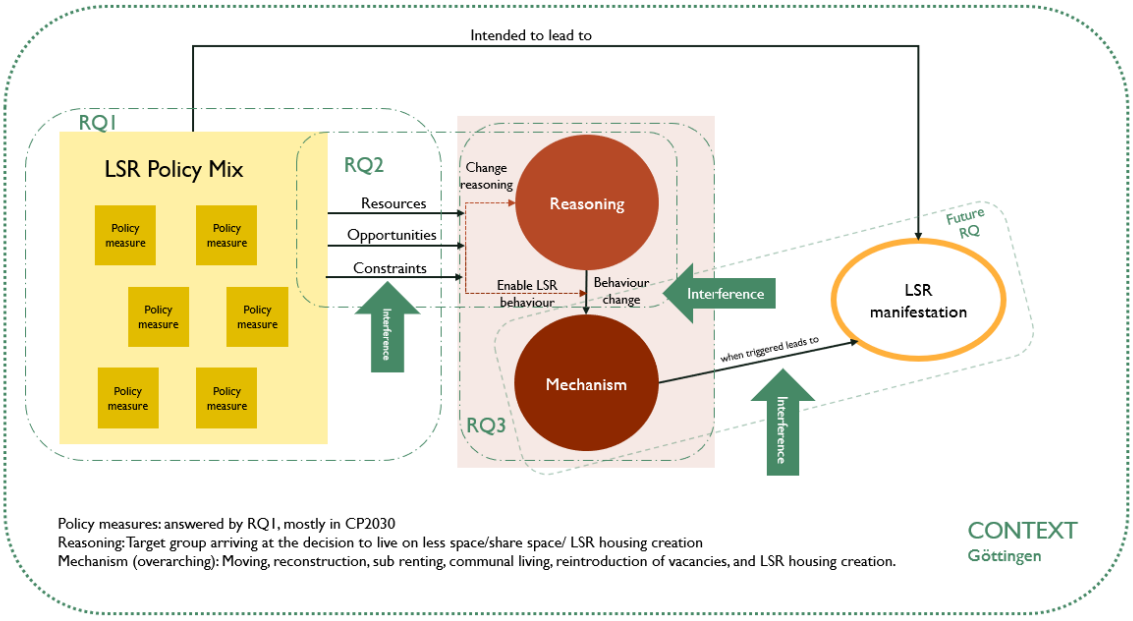

Figure 3-1 Logic of programme theory for LSR in Göttingen (own graphic)

Following the RE logic, I defined a hypothesis for the second step: the implementation of LSR policy measures hence the successful provision of resources, opportunities, and constraints to change in reasoning or enabled reasons of mechanism agents within the Göttingen is likely to be impeded by contextual factors. This hypothesis is rooted in the persistent notion of the 'policy implementation gap' with a long research history, formally starting with Pressman and Wildavsky (1984). They, for example, noted that only because actors agree on a policy goal does not mean that they agree on the means for its achievement. Numerous scholars have identified contextual factors influencing policy implementation. Therefore, to test this hypothesis a policy implementation assessment was conducted which in turn allowed to answer RQ2. For that, the PIAF was used with which the policy itself can be assessed by capturing contextual factors. Context has been explained to be limited by the boundaries of the city of Göttingen. However, comments on the wider German context were included where they were noted as influential to the Göttingen context. As outlined in 1.4 the scope for contextual factors considered was also limited by the dimensions proposed by the PIAF: The PIAF was developed by the Urban Institute in Washington DC with the intention to be used for agricultural policy and for understanding implementation challenges better but also to demonstrate possible avenues for improving implementability (Eldridge et al., 2020). While it was developed for a different

context, a conversation with one of its developers clarified that it could provide valuable insights also in the context of LSR (L. Williams, personal communication, 18 March 2022). Its novelty lies in that it can be applied during the stages of policy design, planning and implementation, hence, ex-ante and ex-post. This broader application scope in time fits the LSR context perfectly as it also highlights anticipated implementation challenges. It was emphasised that the PIAF does not provide a blueprint for single courses of action or for fixing implementation issues. The PIAF was said to be *"designed to improve implementation success, not ensure policy* outcomes*"* (original emphasis) (Eldridge et al., 2020, p. 14). It is therefore not an evaluation framework in itself and was treated here as a tool in one step of the evaluation process.

The framework works in five dimensions with subcategories as seen in appendix III (7.3). The subcategory 'infrastructure and physical resources' was taken out. It is meant as tangible assets. The framework was originally developed for agricultural policy whose implementation requires physical infrastructure. However, no physical resources are required for the provision of resources, opportunities, and constraints through LSR policy. The section 'policy alignment and sequencing' was also taken out but just moved towards the next section 4.3. This is because it refers to alternative policies that hinder the implementation process, however, it was found that the barriers mentioned did not impede the process of providing resources, opportunities, and constraints and thus change or enable existing reasoning. Instead, they hamper the triggering of mechanisms even when reasoning changed or was enabled which is the focus of 4.3 that deals with RQ 3.

In the third step, I investigated the policy implementation process based on the hypothesis: the triggering of mechanisms independently of whether reasoning was changed or enabled is likely to be impeded by contextual factors. The result section 4.3 will make this more tangible; for example, a person might have the financial means (enabled reasoning) and the motivation (changed reasoning), provided through a policy, to reconstruct towards LSR but face regulatory barriers to do so. This would mean the mechanism 'reconstruction' is not triggered and the outcome of LSR manifestation is not achieved. As this sub-section of the evaluation is still part of the policy implementation gap, the hypothesis is justified by the same literature mentioned before. While contextual factors impacting policy implementation were defined by the PIAF in the previous section; they here include policies that impede mechanism triggering on local, state, and federal government levels. This scope deviation from the boundaries of Göttingen was chosen after reviewing the data, which contain many references to levels of government higher than Göttingen, most relevantly, higher-level housing regulations. Other contextual factors were included inductively, as they emerged from the data, but mainly covered social and political contextual dimensions.

What is excluded from the evaluation as mentioned earlier is the evaluation of whether mechanisms were triggered and whether that led to outcomes. As seen in Figure 3-1 this could be a starting point for further research, building on my findings.

3.3 Methods used to collect data

Following the qualitative research design, data were collected by conducting semi-structured interviews and insights from a literature review.

For the interviews, the sample was a *typical case* sampling (Bryman, 2012), meaning participants were chosen based on their relevance to the LSR policy process from policy design to implementation. Given the focus of this research on Göttingen city, it was a requirement that participants were from an institution or organisation explicitly active in the city itself. There were no requirements in terms of demographics. Participants were ideally in a leading position (in their subfield) in the organisation or to best represent the organisation's position.

Interviews lasted between 45 minutes and 2 hours, mostly taking around 1 hour. They were conducted via Zoom. Interviewees were provided initial brief background information and reasons for the relevance of their perspective through the outreach email. Interviewees were asked to sign a consent form in which they could also indicate whether they agree to be cited fully with name and roles, or only as part of their organisation (see appendix II, 7.279). The conversations themselves were guided by interview questions. Questions were prepared in line with the RQs (see appendix IV, 7.4), however, compared to structured interviews, this approach is more flexible; participants have room to elaborate more freely, and the researcher can ask follow-up questions on interesting points that come up spontaneously (Bryman, 2012).

Participants were contacted via email based on the email addresses available on the websites and the relevance of people's position to the topic of LSR. The online tool *Calendly* was used to reduce email traffic and allow people to book a meeting time to their liking immediately. In some cases, people forwarded me to their board or staff in higher management positions. *Snowball sampling* was also used to find relevant people to speak to; the contact of a public housing group was found via another interviewee.

For the literature review, policy documents were used found by using a combination of keywords (see Table 3-1). To answer SRQ1a, background information in grey literature and previous policy documents (climate and housing-related) on Göttingen were searched through a combination of keywords. For policy implementation (SRQ2), topics emerging from interviews were picked up on (data triangulation).

Table 3-1 Key words used for document

RQ	Type of document/source	Keywords (used also in combination)
SRQ1a: Context Göttingen policy design	News articles, press release, policy documents, website VIA Google, Göttingen website	Wohnraumagentur, suffizientes Wohnen, Göttingen, OptiWohn, Wohnpolitik, Kommunalwahl
SRQ1b: Policy Measures Göttingen	policy documents VIA municipality website	Göttingen, Wohnen, Bauen, Suffizienz, flächensparen, flächensparendes Wohnen, suffizientes Wohnen, Politikinstrumente, Wohnraumagentur, Wohnraum
SRQ2: Göttingen policy implementation	Municipal documents VIA Google, Göttingen website	Akteure, Bügerbeteiligung Klimaplan

3.4 Materials collected

Material collected from the interviews was used to inform answers to all RQs. Relevant stakeholders to speak to were identified in an initial stakeholder mapping exercise. Four categories of stakeholders were found to be relevant: (1) Experts on policies related to LSR, such as representatives from the city administration, as well as the NGO *FAG* which work towards the very specific LSR policy measure *Wohnen für Hilfe* [residing for help]; (2) Housing associations and companies who bridge policy intentions and practice, such as the two large housing cooperatives of Göttingen as well as the public housing company; (3) Advisory roles for housing development, such as experts on urban development and planning; and (4) Groups of influence on policy, such as the local section of BUND Germany (Friends of the Earth) (see Table 3-2).

Table 3-2 Interviewees List

Key Stakeholder	Organisation	Interviewee (Int)
Local Authority	Municipality of Göttingen	Int. 1 (MGö)
Local Authority	Municipality of Göttingen	Int. 2 (MGö)
Local Authority	Municipality of Göttingen	Int. 3 (MGö)
NGO	BUND Göttingen	Int 4, BUND
Housing	Volksheimstätte eG	Int 5 Vhs
Housing	Wohnungsgenossenschaft eG	Int 6 WgG
Housing	Städtische Wohnungsbau GmbH Göttingen,	Int 7 SWB
Non-profit organization	Energieagentur Region Göttingen e.V.,	Int 8 EA
NGO	Freie Altenarbeit Göttingen e.V.	Int 9, FAG
Urban Planners	Bankert, Linkert & Hupfeld Architekten	Int 10, BL&H

Of the various local climate groups which exert influence on politics and are formally involved through the *Klimabeirat* [climate council], I chose to interview the local branch of the BUND (Friends of the Earth Germany) because of the strong interest in LSR of the BUND on a national level. People from different departments in the city administration were interviewed who were chosen based on their apparent involvement with various aspects of LSR, given information from the Göttingen municipality website. Göttingen has two big existing housing cooperatives which were included. A more extensive overview of all interviewees can be found in Appendix V (7.5).

Interview questions varied depending on the stakeholder group. City officials were specifically asked to provide insights on the development and state of implementation of found existing policy measures. Questions to actors from the housing sector were structured according to the mechanisms outlined in 3.2 to identify barriers potentially hindering them from supporting LSR policy measures implementation. The PIAF introduced earlier was used primarily to structured data analysis (cf. chapter 3.5) and provided structure for (the rest of the) questions in all

interviews (see Appendix III, 7.3). Depending on the interviewee's expertise and role for LSR, questions were adapted. City officials and housing sector were for example more knowledgeable on housing law and potential conflicting policies while the urban planning office has more experience and overview of stakeholder engagement and general coordination of the process.

To address RQ3 each interviewee was asked the following question: Where would funding, information, or regulation be most urgently needed to make LSR a reality? Materials collected for the literature review (mostly RQ1) came mostly from policy documents of the city of Göttingen. For context questions previous climate strategy and housing documents were reviewed, as well as grey literature from websites of climate and housing groups and news articles.

3.5 Methods for Data Analysis

As suggested by Creswell & Creswell (2018, pp. 193–194), the analysis process involves the following steps: preparing data for analysis; reading through all data; coding the data; generating and interrelating descriptions and themes; and interpreting the meanings of themes and descriptions.

For the analysis of policy documents, all policy measures related to LSR were gathered and summarised. Then they were sorted for direct and indirect relevance for LSR and presented accordingly in the findings. Any other documents used for context were included as supplementary literature references. Interview data were transcribed with the help of the software tint. Transcripts were corrected by listening back to the recordings. Then, the software Nvivo 12 Plus was used to code the data. Direct quotes used from the transcripts were translated from German to English using DeepL[10].

Firstly, I familiarised myself with the data. In many interviews, people elaborated on connected, relevant issues or inquired about the research process, so I determined the parts of the interview that were most relevant to answer the RQs. Secondly, I analysed the data using thematic analysis. It is a method widely used to categorise qualitative data; interview data are reviewed for themes, hence a pattern, and coded accordingly (Alhojailan, 2012). Two approaches in thematic analysis are inductive, meaning without any preconceptions, or deductive, meaning with the anticipation of certain themes to emerge. Given the research design, a deductive approach was taken for SRQ1b and 2. Before the coding process, I created a codebook with the dimensions and subcategories of the PIAF (SRQ2) and different policy measures (SRQ1b). Additional code categories were created for 'Context' (SRQ1a) and 'Recommendations' (SRQ2, RQ3). Within these broader categories, a more inductive approach was taken to emerging themes determining more subcategories. Other categories that emerged for RQ3 were the mechanisms described in 3.2. Comments on the different types of mechanisms (e.g. reconstruction, communal living, etc) were integrated in 4.3. Then, codes for each category were reviewed and corrected. In the last step, they were paraphrased and summarise in the findings section.

[10] DeepL was chosen as it shows higher accuracy in translation than more commonly used applications such as Google Translate.

4 Findings

The objective of this research was to evaluate the design and implementation of an LSR policy measure mix in Göttingen and thus generate insights on how to advance LSR manifestation. Insights were generated through 10 interviews with local practitioners and a literature review.

The first section outlines the current LSR policy mix in Göttingen and how LSR has been institutionalised in Göttingen. It identifies if and how it intends to provide resources, opportunities, and constraints (4.1). The next section follows the logic that the provision of resources, opportunities, and constraints to a target audience through a policy programme can be impeded by contextual factors. The PIAF is used to identify the contextual barriers to policy planning and implementation and provide suggestions if mentioned by interviewees how to mitigate them (4.2). Finally, the last section summarises contextual factors impeding the triggering of mechanisms independently of whether reasoning was changed or enabled and provides policy recommendations (4.3).

4.1 Evaluation Design LSR policy measures

For the overall evaluation of Göttingen's mix of LSR policy measures, the first step is to zoom in on the first phase of the policy process: the policy formulation and design. It aims to answer the question, how the policy mix design contributes to institutionalisation of LSR in Göttingen. This is done by investigating how it provides resources, opportunities, and constraints and thus how it aims to change reasoning and enable existing reasoning. This step will also help to better interpret results from the assessment of implementation of LSR policies in step 2.

4.1.1 Context

I argued earlier that to understand the LSR institutionalisation process, the context in which the LSR policy mix was designed needs to be examined. Göttingen is a city in the South of Lower Saxony, one of the biggest federal states of Germany. It is internationally known for its university, one of the largest in Germany. Numbers cited in 2014 but also 2019 state that about 2.000 students were on the waiting list for housing, highlighting the pressure on the housing market (Henkel, 2019; Munzinger, 2014).

To address the housing situation, the new head mayor Petra Broistedt (Social Democratic Party) pledged to build 5.000 affordable flats by 2030 (Carle, 2021). The 5.000 flat goal was already part of the municipal action plan for affordable housing from 2018, which states that the new creation of housing is necessary to ensure affordable housing long-term (Stadt Göttingen, 2018). Simultaneously, given the ageing population, it stresses that especially accessible housing is needed. Broistedt's ambitious plans are impeded by the scarcity of new land for housing, given many landscapes under federal protection in and around the city (Int 3, MGö). In 2017, the *Flächennutzungsplan* [land use plan][11] was rewritten, including a vision towards space saving settlement development (pesch partner architekten stadtplaner, 2017). For example, it says to

[11] This is developed by the municipality and shows the general use of area. It is a planning instrument meaning it has no regulatory impact but informs decision for the legally binding plans specifying use of space in more detail. It is a tool for spatial and urban planning.

prioritise *Geschowsswohnungsbau* [multiple-storey housing] and condensed single-family homes. It also highlights the potential for vertical densification and horizontal densification (i.e. built in gaps between houses) and set goals to realise potential for 405 housing units. However, it mentions that regulatory and financial means are necessary to realise this potential.

However, the land use plan also identifies areas for new housing. It states that the municipality should use its *Bauplanungsrecht* [building planning right][12]. According to Int 3 (MGö) this is already happening. In outer areas, they were said to develop *Bebauungspläne (B-Plans)* [building plans][13] only if the municipality owns at least 50 % of the property or more. This allows them to set criteria such as building social housing (sqm in social housing is regulated in federal law and generally very compact). It is also used to keep prices low for purchasing new land, keeping overall construction costs and thus the rent of new housing low. However, Int 6 (WgG) shared that the new available areas are often not so attractive to them for new development projects as they might be more in the outskirts. In turn, this means they might have to turn towards their existing housing stock. Int 7 (SWG) and Int 5 (Vhs) also said that the construction costs have increased, making it less economically viable to build new. To conclude, wider contextual trends have led to the municipality recognising the potential of vertical and horizontal densification while still expecting new housing development to play a major role. Housing actors indicated more careful consideration of new building projects due to rising construction prices.

I highlighted the potential of LSR to reduce GHG emissions and thus address climate challenges in chapter 1. The city of Göttingen has a history of setting early climate ambitions; since 1995 Göttingen has been part of the climate alliance *Alianza del Clima e.V*. through which GHG emission reduction of 10 % every five years was aspired already in the 1990s (Stadt Göttingen, 2020a). In 2010, a goal was set to reduce carbon emissions between 2008 and 2020 by 40 % compared to 1990 levels through the *integriertes Klimaschutzkonzept* [integrated climate protection concept] (Stadt Göttingen, 2010). In 2011, the city council set the target of becoming climate neutral[14] by 2050, which in national comparison was quite early. Göttingen was then chosen as one of 19 pilot cities in Germany to be funded by the BMU to develop scenarios, projects and measures, accumulating in a *Masterplan 100% Klimaschutz* [masterplan 100% climate protection] (Stadt Göttingen, 2015). Sufficiency was a central strategic pillar, and LSR was mentioned as a performance indicator. The evaluation in 2020 however, showed that the goals of the Masterplan largely failed. By 2018, GHG emission were only reduced by 29 % (Stadt Göttingen, 2020a). Households contributed with 27 % to the CO_2eq of 874.139 tons in 2018. Living space per person rose to 37sqm/capita and has thus grown 18 % since 1990 despite a tight housing market and population growth. In 2021, Göttingen published the CP2030 which is accompanied by a catalogue of measures. In January 2022, Broistedt introduced a climate budget of € 13.6

[12] This means the municipality can decide whether housing can be developed on a certain area within its boundaries. This gives it power to tie sale of land to fulfilment of certain conditions in exchange for the permit to build.

[13] *B-Plans* regulate what is allowed to be built in certain areas or properties. Municipalities define a *Flächennutzungsplan* [land use plan], a graphical illustration of how the total area is used (also green or industrial areas). It is not legally binding but a preparatory tool for the development of B-Plans. B-Plans are only valid for certain areas of the municipality. They have to be in line with urban development objectives. The exact details that the B-Plan provides concerns the green spaces that need to be kept, how many storeys are allowed, and they can also regulate the colour of roofs or type of facade design.

[14] Climate neutrality is not used as a term; however, the goal is to reduce GHG emission almost to zero and reduce energy use by half and produce the rest energy only through renewable sources from the region.

million to finance policy measures from the CP2030. In the CP2030, it is highlighted that for conformity with the PA target an 80% of GHG emissions need to be saved in the residential housing sector by 2030, with much potential lying in reducing energy used for heating (which can be addressed by LSR). It explicitly mentions an acceleration for energy savings through energetic renovation and sufficiency. More detail specifically on LSR measures in the CP2030 is presented in section 4.1.

In line with strategic efforts for sufficiency, Göttingen joined the OptiWohn project in 2019, an interdisciplinary research project focusing on sufficiency in the residential housing sector. It runs in cooperation with the Wuppertal Institute, the architecture office werk.um, University of Oldenburg, and the city of Cologne and Tübingen and funding is provided until summer 2022. The objective of the project was to (1) develop and test strategies for better use of living space to reduce new construction and the associated consumption of resources, (2) analysis of the housing situation in selected quarters (cf. Stadt Göttingen, 2020b), (3) provide advice for tenants, owners, construction companies and civil society actors on space-saving living, and (4) implement pilot projects in certain districts. According to Int 1 (MGö), the project and its contribution to establishing the *LSA* have been a main driver for the institutionalisation of LSR in Göttingen and created networks and channels to increase visibility of the topic. For example, the city of Göttingen also has a *Klimaschutz-Beirat* [climate protection advisory board][15] in which the role of housing is considered through representatives in the board from housing associations and a relatively new working group on Wohnen und Bauen [living and building]. While they do not exclusively focus on LSR, they were said to contribute to creating structure (Int 1, MGö), meaning a platform to amplify LSR and carry it into politics and work of housing actors.

The *LSA* is one of the main actors working towards LSR by providing free advice to interested households. The *LSA* works with 2.5 positions; 1 position focusing on promotion of housing space and misappropriation, 0.5 positions on housing initiatives, and 1 position funded by OptiWohn on *flächenoptimiertes Wohnen* [space-optimised living]. Another actor involved in LSR activities is the *FAG*, a small non-profit organisation working towards new living forms for older people[16]. They advise people for example on dwelling adjustments for increased accessibility or communal living (Freie Altenarbeit Göttingen e.V., n.d.). They thus are in direct contact with the one of the main target groups of LSR – older people potentially interested in reducing living space. The *FAG* also initiated a local section of the project *Wohnen für Hilfe* [residing for help] which operates all over Germany and connects students looking for a space to live and offering support and older people who sub rent space and receive support needed.

Another actor directly relevant to LSR in the context of energy sufficiency is the *EARG*. It is active in the city but also Göttingen county. It connects citizens with energy advisors and advise on funding options for matters of energy savings, energy efficiency, renewable energy, sufficiency and climate change (Energieagentur e.V., 2022).

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[15] The Klimaschutz-Beirat in Göttingen supports the municipality to achieve climate goals. It is composed of 27 local actors such as public utilities, Scientists/Health/Parents/Fridays For Futures, BUND, cultural associations, business, Energieagentur e.V. etc.

[16] Note by author: no age was clearly indicated, but according to the website of the FAG, their target group are people who start to think about how they want to live as they grow older and are more physically restricted.

4.1.2 LSR policy measures

Göttingen's policy ideas for achieving LSR manifestation were accumulated in the CP2030. It sets a target to keep living space at the current value of 36 m_2 per capita and reverse this trend long-term. The CP2030 consists of a catalogue of measures and a conceptual note. While the measures are the main focus of the sub-evaluation, the conceptual note provides general insight into how the topic is placed within the broader strategy. In the conceptual note (Stadt Göttingen, 2021c), LSR is mentioned as seen in Table 4-1:

Table 4-1 Overarching Policy Measures affecting LSR in the CP2030 (concept note)

Mentioned	Explanation
5.2.2 *Neubauenticklung Wohnen* [new housing development for residing]	space-saving new construction is mentioned in the context of future-fit soil politics
5.2.4. *Gute Rahmenbedingungen für nachhaltige integrierte Quartiersentwicklung* [good external circumstances for sustainable integrated district development]	focus is put on innovation space to test and develop ideas and contribute to space-saving new housing
5.6.2 *Nachhaltiges und energiesparendes Wohnen* [sustainable and energy saving residing]	one subcategory is space-saving and communal living, aiming to ensure equal living quality while reversing the trend towards more living space.

This shows how LSR has been integrated into other different scales: 5.2.2 shows an integration of LSR in new housing development (building level), 5.2.4 integrates it into urban development (neighbourhood level), and 5.6.2 in sustainable and energy-saving living (person/household level). Furthermore, sufficiency is no longer included as a separate topic but instead integrated into various other issues such as housing or mobility, different from the previous Masterplan. What is also seen very strongly in the CP2030 is Göttingen's approach to approach any housing or energy-related issues through a *Quartiersmanagement Ansatz* [neighbourhood management approach]. The integration of LSR on different levels of policy focus is reflected in the catalogue of measures outlining how these broader visions are aimed to be achieved. It outlines various measures in more detail, some of them *Sofortmaßnahme*n [immediate measures (IM)] to be implemented immediately (see table Table 4-2).

What can be seen is that many of the policy measures directly related to LSR provide opportunity (see Table 4-3). This makes sense given there is still low awareness of the topic (Int 4, BUND; Int 7, SWG; Int 8, EARG). Except for the 'Green house number' (GHN), they are not implemented yet. The network of building owners and GHN target changing reasoning by providing a platform for information and exchange and creating visibility of best cases, respectively. The other measures target enabling of reasoning; the digital platform 'housing' does so by aiming to provide a space where those already interested in LSR can easier find options for living that allow them to change their behaviour and reduce living space (trigger mechanism and reach outcome LSR). The two other measures aim to develop support that increases the capacity of housing initiatives to realise their project and allows the easier realisation of LSR if needed (increased flexibility), respectively.

Many IMs also target opportunity. Constraint was only mentioned in the form of a climate protection standard which could include LSR standards, but this is not yet fully politically approved (Int 1, MGö). The success of this measure will, either way, be built on the assumption that actors will comply with standards. Any hard constraint such as a cap for maximal living space was believed to be completely infeasible due to its normative aspect (Int 8, EARG).

For resources, it was said that Göttingen does not have any funding programme to provide financial resources to realise LSR behaviour and that there are generally no funding programmes on higher levels that directly support LSR (Int 2&3, MGö). Instead, part of the opportunity provision is to advise on other existing funding programmes through which LSR can indirectly be supported (e.g. KfW[17] funding for energy-efficient buildings, or care funds for older people to get financial moving support (Int 2, MGö)). Int 3 (MGö) explained that they have some smaller funding programmes for example for some solar panels, but nothing targeted at LSR which is indirectly funded through providing information. Generally, it was said that direct financial resources are not things that municipalities can do (Int 3, MGö).

Three of the IMs target the development of model neighbourhoods, partially around energy topics, which shows that the connection between LSR and energy was made and the assumption is that LSR will lead to energy savings. The IM on new housing aims to answer the question, *"how the new neighbourhood can be designed in such a way that it promotes a sufficiency-oriented development of living space for the entire neighbourhood"* (Int 2, MGö). At the Lange Rekesweg, there was said to be a new model neighbourhood where LSR is considered, thus, opportunity is provided to enable existing reasoning (Int 1, MGö), but it is unclear how this is done. In IM 1.1.1.1, LSR was indirectly considered long-term (Int 1, MGö) by changing reasoning through general energy-saving advice and approach development. For IM 1.4.1.1, reasoning aims to be enabled through testing LSR. From the CP2030, it seems to be an underlying assumption generally for the model neighbourhoods that mechanism agents will change their reasoning. This suggests that other measures rely on the work of the *LSA* to do that work (even explicitly mentioned for measure 1.4.1.2).

Opportunity is also provided through the IM, ensuring the continuation of the *LSA* after OptiWohn funding ends[18]. The *LSA* is the central organ to advise mechanism agents on various options as they provide information and consultation. The continuation of the *LSA* is built on the assumption that interest to change reasoning can be activated within the population of Göttingen. The *EARG* is listed above as they have a similar target group and form of practice as the LSA and were found to be important in step 2 of the findings (4.2).

Generally, the CP2030 always mentions 'communal and space-saving living', overall focusing much of the measures directly or indirectly specifically on the mechanism **communal living**. What also shows in the CP2030 is that it is not entirely clear what LSR mechanisms are aimed to be triggered.

[17] KfW is a German national development bank.

[18] During the research process, the city council approved the continuation of the LSA with 2 staff positions (only 0.5 positions from the 1 OptiWohn position was continued) according to interviewees, as presented in chapter 4.2.

Table 4-2 Policy measures indirectly related to LSR in the Göttingen City CP2030 (measurement catalogue)

Measure	Explanation	Type	Actors	Target group	Provides	Comment
1.1.1.1 Modellquartier energetische Bestandssanierung KfW432 [Model district energetic restauration in existing housing KfW432]	This IM is mostly concerned with restauration using a district approach. The CP2030 specifies 5.5 positions needed. This staff would then work towards developing cost effective and efficient solutions to reduce energy costs in buildings.	financial	Municipality of Göttingen, *Stadtwerke Göttingen AG* (SGAG, public utility)	Building owners (private, commercial), tenants	Opportunity, change reasoning	Only indirectly aiming at LSR through opportunity for restauration. Long term consideration of LSR as part of solutions
1.1.4.1. Kampagnen und Beratungen der Energieagentur [campaign and consultancy oft he Energieagentur e.V.]	The goal of this IM is to provide easily accessible consultation on energy matter and construction investments. Furthermore, it aims to ensure financial means for campaigns on different topics. 'Living-space optimisation' is mentioned as a topic for consultation. While this shows the relevance of this IM for LSR, LSR is not yet part of the consultation offer of the EAGR (Int 9, EAGR).	Information	Energieagentur Region Göttingen e.V. (EAGR), municiplaity of Göttingen	Building owners, flat owners, building owner associations, landlords/ladies, tenants, housing cooporation	Opportunity, change reasoning	
1.2.1.1 Modellquartiere im Neubau [pilot districts newly built]	This IM provides space for a pilot of a climate neutral district with new buildings. The IM does not mention LSR. But a pilot project that also aims to consider communal and space-saving living has already started at the Lange Rekesweg in Göttingen (Int 1, MGö).	Pilot	Municipality of Göttingen, *Stadtwerke Göttingen AG* (SGAG, public utility)	Architect, living groups, investors	Opportunity, enable reasoning	It is not entirely clear how LSR has been considered

1.2.2.1 Göttinger Klimaschutz-Standards im Neubau [Göttingen climate protection standards for new buildings]	The goal of this IM ist to set minimal standards for all new buildings to reduce climate impacts. 'Living-space sufficiency' such as flexible floor plans is considered as a criterion under this IM. If this will be a priority along other criteria mentioned is subject to political decisions not yet predictable (Int 1, MGö).	Regulation	Municipality of Göttingen, SGAG	Investors, housing associations, *Bauherr*innen* [house owners]	Constraint, change reasoning	
1.4.1.1 Modellquartiere integrierte Quartiersentwicklung [pilot districts integreated district development]	This IM aims at defining one district as a pilot energy-saving living and working strategies are tested which promote space-saving and communal living and working forms. The pilot is expected to take 3 years. Part of the project will be to get people together who are interested.	N/A: Pilot	Municipality of Göttingen	Building owners, tenants, building owner associations, housing cooperation, housing initiatives, housing group, foundations, social sponsors	Opportunity, change reasoning, enable reasoning	It is unclear whether those interested would also receive funding to realise LSR mechanisms (enable reasoning)
1.4.2.2 Konzept zur flächensparenden Siedlungspolitik [concept for space-saving settlement politics]	The goal of this IM is set targets for becoming a 'space-saving municiplaity' and examining instruments to achieve these targets. It is for example proposed to use the checklist for institutionalising general area management by Ferber et al. (2015). One goal of the project is to increase awareness about space-saving settlement development	N/A: Internal strategy	Municipality of Göttingen	N/A	Opportunity, change reasoning	
5.2.1.1 Beratungsangebot der Wohnraumagentur [consultation offer by the LSA]	This IM defines the continuation of the LSA with 0.5 positions. The purpose of the LSA is initial consultation for people interested LSR. This includes but is not limited to advise on communal housing, reconstruction, moving and sub renting. The LSA also provides advise for funding programmes that indirectly make behaviour change towards LSR possible	Information	Municipality of Göttingen, external experts from the *Architektenkammer* [chamber of architects]	Housing initiatives, couples and single in the second half of their lives, people with high demand for space, building and apartment businesses, civil society or public actors	Opportunity, change reasoning	

Table 4-3 Policy measures directly related to LSR in the Göttingen City CP2030 (measurement catalogue)

Measure	Explanation	Type of instrument	Provides
1.1.3.2 *Eigentümer*innen Netzwerk* [Network of building owners]	The goal is to develop a network which can provide advice and exchange of knowledge about topics such as space-saving and communal living.	information	Opportunity, change current reasoning
1.1.4.2 *„Göttinger Hausnummern werden grün" – Verstetigung* [green house number - continutation]	Since 2018, building owners who fulfil certain energy standards can get a "green house number" in form of a plate that is attached on the house wall. Since 2021, space-saving living is considered as a criterion. They are being awarded at the annual climate protection days in June.	information	Opportunity, change current reasoning
1.4.1.2 *Stärkung von Nutzungsflexibilität auf Quartiersebene* [strenghtening of user flexibility on all neighbourhood levels]	This measure aims to develop models to adjust to the needs for living space area across ages to optimise comfort while also reducing living-space. It mentions the intention to continue the LSA, given one of its goals is to develop such models.	Information	Opportunity, resources, enabling reasoning
5.2.2.1 *Digital Platform "Wohnen"* [digital platform "housing"]	The goal of the platform is the facilitation of options for space-saving and communal living. Interested people can upload requests and offers. This is aimed to be an instrument to facilitate moving, shared renting, offer of vacancies, and flat swap	Information	Opportunity, enable reasoning
5.2.2.2 *Förderung von Wohninitiativen* [promotion of housing initiatives]	This instrument builds on the assumption that communal living will lead to more space reduction, besides contributing to other resource savings through shared use. There is an ambition to develop further instruments to support housing initiatives for example during development of new buildings	Information	Opportunity, enable reasoning

4.1.3 Intermediate conclusion

The above data were summarised to test the hypothesis that LSR institutionalisation in the form of LSR policy measure design shaped by the Göttingen context will lead to the resources, opportunities, and constraints provision targeted at changing reasoning or enabling existing reasoning of mechanism agents.

What was seen from the context analysis is that the LSR policy measures are embedded into broader politics of vertical and horizontal densification and social and economic incentives to build space-saving. While new housing will continue to play a central role, rising building costs will automatically force housing actors to densify existing building stock or build compact. These factors and the history of Göttingen's climate ambitions have provided a favourable environment for an LSR policy mix to emerge. It is shaped by already existing LSR institutionalisation that was advanced through the OptiWohn project and the establishment of the *LSA;* effects seen were for example the emerging network of actors sensible to LSR such as the climate protection advisory council or the *FAG*.

This institutionalisation process is continued by adopting *LSA* into the policy mix as a central policy measure. The *LSA* provides opportunity as a platform for LSR that channels information specifically towards changing reasoning in preparation for LSR mechanism triggering. Other policy measures aim primarily at opportunity with a mix of changing and enabling reasoning. They contribute to institutionalisation through being designed to amplify LSR through pilot neighbourhoods, increasing exposure and visibility directly among mechanism agents. Another driver of institutionalisation is the integration of LSR in housing and energy development across scales (household, building, neighbourhood; as seen in the CP2030 catalogue) rather than through an isolated sufficiency approach only aiming at households.

The underlying assumption of all policy measures is that the interest of mechanism agents can be activated, which increases the importance of the *LSA*'s work. Resources and constraints are only marginally part of the policy mix design as of now, mainly limiting more focus on enabling reasoning. Thus, the hypothesis could partly be confirmed – the Göttingen context provided favourable conditions for LSR institutionalisation, which was continued in the LSR policy mix, however, the process has mainly been promoted through opportunity (via the *LSA)* while constraints and resources are not in the centre of activities, thereby posing a limitation to the extent of the institutionalisation the policy mix can provide.

4.2 Evaluation Implementation LSR policy measures

The purpose of this second step is to assess how well policy measures are or are anticipated to be implemented and how that can be improved, meaning how well they (will) do at providing resources, opportunity, and constraints aimed at the change or enabling of reasoning of mechanism agents. This is following the logic outlined in 3.2 that mechanisms are less likely to be triggered if resources, opportunities, and constraint provision through a policy are impeded by contextual factors. For the first dimension of the PIAF (Resources) which structures this

analysis, the sub-categories are combined as they turned out to be very interlinked. For all other dimensions, subcategories were kept apart.

4.2.1 Resources: Budget and human resources

Mechanisms leading to LSR are more likely to be triggered when financial means and human staff are available to implement policy measures that aim at providing resources, opportunities, and constraints to the target audience.

It was said that Göttingen, like many other municipalities, is struggling financially since the COVID-19 pandemic, meaning that climate spendings compete with other costs (Int 1-3, MGö). This results in political decisions for climate action giving priority to the most effective emissions-saving measures (Int 1&3, MGö), prioritising energetic renovation or district heating over LSR measures. Different interviewees mentioned that the issue is less only budget itself but having staff who can spend the money (Int 2&3, MGö). This is because capacity is still needed to supervise externalised projects or funding schemes (Int 2&3). Additional funding was therefore said to be especially useful if it is directly funding staff positions (Int. 3, MGö). Acting on this issue, the municipality applied to the KfW 432 for two of the 5.5 positions mentioned in the CP2030 (cf. IM 1.1.1.1). Their focus would be on urban planning and energy with the option to also work implicitly on LSR alongside the *LSA*. The long-term vision is to set up a project team approaching districts from various perspectives, one being LSR (Int 1, MGö).

The central institution for LSR is the *LSA* for which funding via the OptiWohn project by the federal government is ending in June 2022. Currently, the *LSA* has 2 ½ positions, divided over 3 people. In spring 2022, the council approved the continuation of the *LSA* with 2 positions after June. The application for extending all positions by the Green Party was rejected by the Germany-coalition[19] (Int 2, MGö). The cut 0.5 position is from the OptiWohn position on space-optimised living. Thus, fewer resources will be available to provide reasoning for households interested in LSR. With more staff resources it was said that the work of the *LSA* could be extended to replicate their work in the OptiWohn focused neighbourhood Nikolaus Berg in other neighbourhoods and answer more of the incoming requests for advice (Int 2, MGö).

The *EARG* was said to have just received more funding to accommodate for increasing demand for energy advice but they are also funded by both, the municipality of Göttingen as well as the wider district (Int 8, EARG) which is outside the scope of this research. It was said that financial means are not bound to certain topics but can be used for advice in general, however, current demand concerns advice on **reconstruction** but for heating systems and energetic renovations rather than LSR.

[19] It is common in Germany to use flag names to describe governments, in line with the colour of the according flag. Germany coalition is the name for a government constellation of black (Christian Democratic Union), red (Social Democratic Party), and yellow (Free Democratic Party).

The *FAG* indicated that the funding from the student union to connect students with elderly people through the project *Wohnen für Hilfe* [residing for help] stopped with the COVID-19 pandemic, as the student union wants to first fill up their own dorms (Int 9, FAG). They said there are missing around a quarter of a position to continue the initiative which specifically engages with LSR main target audience and provides reasoning for **sub renting**. Also beyond, the FAG advises on potentially **moving** or **reconstruction**, however, Int 9 (FAG) commented*:*

"The former social head of department said, the FAG is something like an innovation engine. But such an engine only runs if it is cared for. […] And we need a bit of fuel […] otherwise we can't work."

A concern that representatives from the municipality (Int 3, MGö) as well as the *BUND* (Int 4) shared, was the lack of expertise and knowledge on architecture and engineers etc. despite Göttingen being a big university city. In the municipality, this was especially a concern as many civil engineers will retire in the next five years. Qualified staff was said to be especially missing for management positions (Int 3, MGö). They said the experts in structural and civil engineering[20] are especially relevant for any building matters such as **reconstruction** and **LSR smart building**.

As most challenges come down to lack of public funding, solutions would need to address the municipal budget. It was said that it would be easier for the municipality to allocate money to climate protection measures such as LSR if climate protection was not a voluntary task. The proposal was to set targets for LSR on higher levels of government coupled with financial and human resources to for example extend the provision of advice in neighbourhoods for LSR (Int 1, MGö). This way resources and reasoning could be provided to address **all** mechanisms.

To conclude, given LSR's perceived little contribution to GHG emission savings (addressed under 4.2.4.1) and resulting lower political priority (addressed under 4.2.5.2) only limited financial resources are provided for LSR policy measures. Additional funding could be useful especially for more staff working on LSR, for example by increasing *LSA* positions even more after OptiWohn ends in summer 2022. It could also be used to empower other actors working on LSR topic such as the *FAG*, for example by filling the financial gap to continue the 'residing for help' project. Besides, additional expertise is needed in subjects related to LSR such as construction engineering within the municipality.

4.2.2 Planning and coordination

4.2.2.1 Targeting

Mechanisms leading to LSR can be triggered most effectively when policy measures provide the right resources, opportunities, and constraints to address the right target audience.

Since there is only limited to no experience of similar institutions, the *LSA* is still in the phase of learning which approach works for who and how to divide resources effectively to

[20] Note by author: The words originally used were *Hochbau* and *Tiefbau* which cannot be translated to English literally.

determine where capacity can be invested to achieve the most effect (Int 2, MGö). Int 9 (FAG) observed this process in an event where only people above 70 years attended:

> *"There was just an OptiWohn [by the LCA] event in a neighbourhood in Göttingen in Nikolausberg. And there, too, it was about space-saving living, sufficient living and so on, and the presentation was great. And the target group was also very nice, but it didn't fit together!"*

They said that much of the narrative to change reasoning might be more interesting for people between 40 and 60. So the challenge is that *"people really need something that speaks directly to them, that picks them up where they are." (Int 9, FAG).* The central question for the *LSA* was said to be how to reach people between 50 and 60 (Int 2, MGö). This is also because it becomes increasingly difficult to get a loan from the bank to for example reconstruct with increasing age. However, this younger target group seems tricky as this group of people is still working and might have children that frequently come to stay.

> *"And I think people often only start dealing with it [LSR] when they retire. And that's often a bit late for* ***reconstruction*** [own emphasis]*." (Int 2, MGö).*

In Göttingen, the main target group for LSR was identified to be owners of single-family houses which have the largest living area per capita, however, they were said to be very difficult to reach as they are not organised in any institutionalised form (Int 2, MGö). Attempts to reach the target group are made via cooperation with the property owners' association *Haus und Grund (H&G) e.V.* [house and ground], however, the effectiveness of the strategy is unclear as no one indicated to have learned about the *LSA* via *H&G* (Int 2, MGö).

The question of how and where to promote LSR mechanisms and change reasoning was suggested to be overcome through a *quartiersbezogener Ansatz* [neighbourhood approach] to LSR. This approach is facilitated by the OptiWohn project as it was believed to be more effective in activating households towards LSR (Int 2, MGö). This means that people are reached more via neighbourhood networks that are not necessarily directly connected to housing such as sports associations, church communities or informal friend networks. In Nikolausberg specifically, people were also targeted via a privately organised interest group of **communal living** (Int 2, MGö). Within the city administration, an interdisciplinary cross-project group is now aimed to be installed (through the new staff positions mentioned under 4.2.1 Resources) which can extend energy advice for renovations towards **reconstruction** for LSR. Int 1 (MGö) noticed that this neighbourhood approach where people are introduced to the topic of LSR not explicitly via the climate narrative, but other platforms (e.g. church) seemed to work well.

It was not entirely clear how much the *LSA* should target other actors explicitly in practice: The *EARG* was noticed as an actor potentially advising on LSR as part of their work on energy consultation. However, they did not yet target mechanisms for LSR with the energy consultations they mediate because the demand is not yet there:

> *"We have not geared our offer so much to the fact that we immediately say during a consultation […] you want to renovate the roof, change the heating system, don't you*

want to reduce your living space as well? That's simply not the issue for us, people don't call us about that." (Int 8, EARG)

Housing associations were despite their easy access to lots of tenants and flats said to not be a main partner for the *LSA* as they have a relatively high share of price-maintained flats and a relatively low living space consumption per capita is assumed (Int 2, MGö). This was confirmed by all three housing actors (Int 5, Vhs, Int 6, WgG, Int 7, SWG). Especially the *WgG* has a very old housing stock with compact floor plans, where the issue is often more, how to reconstruct to increase flat size and create more space for families to live (Int 6, WgG). The municipal housing association *(SWG)* has a lot of social housing in which LSR is not relevant as people generally live on less than average living space (Int 7, SWG). Enabling flat swapping (one goal under the digital platform 'housing' in the CP2030), was also said to be rather difficult due to internal regulations on how housing is disseminated. This means key housing actors will likely not promote the digital platform 'housing' once it is ready. Within their own housing stock, Int (VhS) from the other housing cooperative said that they have previously done it but only in special cases as it also clashes with internal regulations. Nevertheless, there is still potential assumed to be within the housing stock of the housing associations where for example young people live on large areas after flatmates moved out and could be motivated more actively to **move** or **sub rent** (Int 2, MGö).

To conclude, reaching the target group with the right age that has the potential to be interested in LSR proves difficult, however, the neighbourhood approach was found to be working well to channel provision of opportunity and generate openness to change reasoning through non-climate related networks or avenues. The role and potential of the *EARG* (more on this under 4.2.2.3) and housing associations to support the municipality in policy implementation is not entirely clear.

4.2.2.2 Guidelines and documentation

Mechanisms leading to LSR can be triggered most effectively when the agents who provide resources, opportunities, and constraints to inform and enable people's reasoning have clear guidelines to lead their activities.

The topic of LSR only started to be institutionalised since OptiWohn and the establishment of a position focusing on this topic in the *LSA* (Int 1, MGö). There has not been a clear role, responsibility and procedure definition for the *LSA* as it is a completely new institutional entity in the municipality of Göttingen. This also means, there have not been any guidelines or blueprints for the LSA to know how to structure the work and best: Especially questions around role definition of the municipality for example in distinction with the *EARG* and seem still in process of being answered.

The *FAG*, as an actor not targeted under the LSR policy mix directly but independently contributing towards LSR, did not mention specific guidelines, but as the association is advising elderly since more than 30 years, with around 3 years of experience specifically on facilitating **sub renting** through 'residing for help', they seemed to have clear procedures on how to deliver their advice. The FAG is also hired by the LSA to provide advice for example on specific topics, such as tiny houses.

4.2.2.3 Management and coordination

Mechanisms leading to LSR can be triggered most effectively when the agents providing resources, opportunities, and constraints to inform people's reasoning coordinate mong each other to avoid duplication, unintended consequences and address problems adequately.

The central point for providing information and advice for people to take decision towards LSR is the *LSA*. Their role is to inform about various mechanisms leading to LSR (mostly for changes in existing buildings, e.g. reconstruction). They thus provide a platform of competence. The existence of the *LSA* was found to be very positive and necessary to provide designated space for LSR activities (Int 1-3, MGö; Int 9, FAG; Int 8, EARG). However, the lack of clarity on responsibilities and roles outlined under guidelines and documentation might impede their ability operate and thus provide. There seems to be a confusion about the role of the *EARG* and the *LSA* from both sides as the *EARG* is traditionally giving out advise on energy matters (Int2, MGö; Int 8, EARG). However, Int 8 (EARG) highlighted that it makes more sense to place LSR topics in an agency carrying the name 'living space' rather than 'energy' as it is more obvious to people that where the work of that agency is focused. At the same time, the *EARG* is not restricted in the content of their advice. As outlined in 4.2.2.1, Int 8 (EARG) reflected that communication on resources, opportunities and constraints of LSR is not yet part of their advice portfolio given lack of demand. However, they would be open to supporting the *LSA* for example by promoting them with flyers at their own events. It was mentioned that the contact person in the *EGRG* to the *LSA* changed during the project (Int 2, MGö), which made it harder to have a continuous conversation about role division between both entities. Potential for this collaboration was highlighted by Int 1 (MGö) who said:

> *And you can already see that through this institutionalisation, through the funding programme [OptiWohn], a great deal of structure is slowly being created, so that we [LSA, EARG and wider MGö] are now using similar public relations channels for climate protection and that we are spreading the word about each other's events."*

It was also said that a more structural inclusion of the *FAG* into the work of the *LSA* did not yet happen (Int 6, FAG). The *FAG* seem to see much potential in their role and network for the topic. This is given their decade long experience in communicating and advising on opportunities of and for living space changes for older people (e.g. **reconstruction,** or **moving**) in which the topic of LSR could be embedded potentially even more. They emphasised openness to take an active role in the process leading to people reasoning making a change towards mechanisms such as **reconstruction, moving,** or **sub renting** more likely. Int 6 (FAG) also shared that they got to know a lot of vacancies in Göttingen which could be valuable to the work of the *LSA* given limitations for data availability of vacancies described in 4.2.4.1. To overcome confusion from unclarity of roles and improve coordination, Int 6 (FAG) also shared that it is their primary goal for 2022 to identify more clearly what are the roles of the *LSA* and the *FAG,* as well as what is done by the city, what by the wider district.

Currently, there is little contact between the *LSA* and housing associations (Int 5, Vhs, Int 6, WgG, Int 7, SWB). They indicated the reason for this to be that they do not see themselves as

key actors in the process leading up to a LSR manifestation given that much of their housing stock is buildings with comparatively compact floor plans. However, to increase the network of actors which embed efforts for LSR manifestation in their activities, it was said that the role of housing associations could be to promote a more active moving management by highlighting to members more possibilities for smaller flats that might not cost more (Int 2, MGö).

Within the municipal administration, the *LSA* seems to work well with many other organisational entities. With some it was observed to be more difficult mostly because they might deal with more work overloaded (Int 2, MGö). There were also some entities with which the *LSA* could collaborate mores such as the more social departments, but a more common language and communication on working methods might be beneficial to ensure smooth collaboration (Int 2, MGö). No direct recommendation was made as it seems to be a process which will naturally grow as LSR institutionalisation develops.

To conclude, the *LSA* is a central actor but the coordination with other actors, such as the *EARG* and *FAG*, (potentially) working towards LSR and changing mechanism agent's reasoning needs to be clearer. Consistent contact points could benefit this process. The role of housing associations was said to not be significant, however, they could promote specifically **moving** more actively.

4.2.3 Leadership and ownership

4.2.3.1 Public sector champions

Mechanisms leading to LSR can be triggered potentially quicker when policy measures provide the resources, opportunities, and constraints are pushed by policy champions from the public sector who support the provisioning of changing and enabling reasoning.

As the authors of the PIAF argue, policy champions on different levels can drive the implementation of a policy (Eldridge et al., 2020). This was also the perception of Int 1 (MGö) for LSR specifically who emphasised the role of several individuals in the municipal administration for promoting LSR. Dinah Epperlein, head of the department of sustainable urban planning, was mentioned twice as a key figure in not only pushing sufficiency in the masterplan 100% climate protection but also for getting OptiWohn to Göttingen (Int 1&3, MGö). The head of the department for planning, building regulation and surveying, Maik Lindemann was also perceived to be publicly very font of LSR and promote the topic (Int 1&2, MGö; Int 9, FAG).

To conclude, there seem to be at least two advocates of LSR in the municipality which hold powerful positions to not only shape policy design but also work towards its implementation.

4.2.3.2 Education, messaging and awareness

Mechanisms leading to LSR can be triggered most effectively when mechanism agents change their reasoning, meaning they become aware of the importance of LSR and are confronted

with the topic in an accessible way that provides space to learn more and potentially clear doubts or prejudice.

The LSR policy mix essential puts a major focus on education, the changing of people's reasoning, at this moment where the *LSA* is one of the only implemented measures. This focus can be deemed senseful given that several interviewees stressed the need for more societal awareness for the relevance of the topic, not only in civil society but also among political decision-makers (Int 1 &2, MGö; Int 4, BUND; Int 7, SWG). Int 8 (EARG) said that people increasingly realise that their heating costs might go up, but do not conclude that LSR could aid costs. On a more organisational level, it was also said that the topic of LSR and housing in general is rarely a topic among civil society groups in the climate field and that even for the climate protection advisory council the topic was more pushed by the city administration (Int 1, MGö). This matches what Int 4 (BUND) said about that the topic of sufficiency in the housing sector not yet really being on their agenda, neither in wider city politics under the name 'sufficiency'. Reasons for that were explained to be that it is less obvious compared to topics like transport and mobility and potentially a little bit more emotional (Int 1, MGö). Reflecting learning also in the policy design (cf. Masterplan compared to CP2030), messaging has now moved away from 'sufficiency' as it was found to not be accessible (Int 1, MGö) and thus impede engagement with mechanism agents.

Int 2 (MGö) shared that they believed that that there is not only need for information and counselling but also for accompaniment, meaning to guide people through the whole process of reflecting on their existing reasoning and willingness to change. This could answer questions like "*when do I turn to whom? Where can I get the information? Where do I still need information? What are my personal concerns? How could I perhaps dispel these concerns?" (Int 2, MGö).* This matches what Int 8 (EARG) mentioned; they believed that uncertainty about legal consequences (e.g. tax declaration) from for example **sub renting.** Other legal questions that the LSA could try to address through their offer might be heritage law (Int 2, MGö)[21] where people might need advice on financial benefits if they live in buildings that they inherited. It was also said that more guidance is needed on social questions around **communal living**, especially since there are few organisations in Göttingen supporting communal living projects (Int 2, MGö).

One key solution to overcome barriers from lack of awareness was found to be sufficiency education for energy advisors. Energy advisors traditionally advise mostly on **reconstruction** for energy efficiency (e.g. insulation). Int 8 (EARG) said that all the mechanisms such as reduction of living space or conversion of living space (e.g. reconstructing for house division) are not yet part of the consultations at all. They designed a training event on sufficiency together with the *LSA* but only 2/30 of their advisor pool showed interest in the area and Germany-wide only 15-20 attended in the end (Int 8, EARG). They suggest that sufficiency is

[21] One example: §13 (1) no. 4b of the German *Erbschaftsteuer- und Schenkungsteuergesetz* [Inheritance Tax and Gift Tax Act] states that if a deceased used a family home for themselves the inheriting spouse or civil partner lives in this property, they are exempted from heritage taxes given they live there for at least 10 years (exception if there are valid reasons that hinder the self-use of the property).

not part of their training and that they do not perceive themselves to be in the role to promote energy sufficiency in housing such as LSR.

To conclude, the lack of awareness of LSR will make it necessary for all policy measures, like those creating pilot neighbourhoods, to start by aiming at change of reasoning. This means, before any of the measure aimed at enabling LSR are implemented (e.g. digital platform 'Wohnen'), there is a need to ensure that change of reasoning was achieved at least to some degree. This highlights the relevance and importance of the *LSA* who could indeed accompany mechanism agents more than just inform them which might be difficult with just 0.5 position for this topic, linking this section to the issue around resources in 4.2.1. Other avenues taken were already the change of the messaging away from 'sufficiency', and avenues yet to explore is the incorporation of energy sufficiency for energy advisors.

4.2.3.3 Inclusive stakeholder engagement

Mechanisms leading to LSR can be triggered most effectively when those affected by them (e.g. neighbours of a vertical densification reconstruction project) but also those for example part of pilot neighbourhoods are adequately included in the process and potentially clear doubts or prejudice can be captured but also. Inclusive stakeholder engagement is a main point in Göttingen's CP2030 (section 4; Stadt Göttingen, 2021c).

It was said that LSR topics were only very marginally part of the civil society consultation process for the CP2030 (1-2 submissions; Int 1, MGö). In the contributions to the CP2030, every 10th contribution concerned *Bauen und Wohnen* [Building and Living] (Stadt Göttingen, 2021b), however, LSR is only mentioned in the context of avoidance of new buildings for minimisation of ground sealing, preservation of natural environmental and land. They suggest promotion of sufficiency living forms in existing housing stocks such as communal living. They furthermore suggest mobilising existing vacancies. Given this little Also the application for OptiWohn was not supported by the civil society but an internal municipal decision.

It seems stakeholder inclusion is more important currently when a mechanism is triggered, especially things like external **reconstruction** (e.g. adding another storey) and **new LSR housing creation** within the built city (e.g. in a gap between houses), where neighbours often oppose these sorts of developments (Int 6, WgG):

> *"There are people around. When you build on an open field, there's usually no one there to say, 'You're blocking my view. You're disturbing my peace here'. Suddenly they have a construction site next to their flat. That's a big issue with vertical densification".*

They highlighted the paradox that people would like to live in an urban setting, but they "*don't want the city right in front of them"* (Int 6, WgG). Usually, stakeholders are included formally through an official consultation as these undertaking require a change of the B-Plan (stakeholder consultation legally required). These are often mediated by a planning office and have positive turn outs (Int 6, WgG). Positive change as result of stakeholder engagement was seen in the *Europaquartier* is a recent development area. More housing units than originally intended are planned there now and the plan to build single-family homes was overturned

towards multiple-storey houses, compact houses and communal living. It was said the citizen initiative originally very critical of the project has changed their attitude (Int 10, BL&H). Furthermore, the wish for more communal living came from the citizens themselves who already live in the area. And this is likely to be considered meaning that it will be easier for groups to apply for housing areas. This needs to be confirmed in the B-Plan which is a political decision (Int 10, BL&H).

It was said that one of the doubts from citizens in the *Europaquartier* about increased densification was increased traffic which was said to only increase marginally (Int 10, BL&H). This shows that there is a need but also an opportunity to communicate impact from *doppelte Innenentwicklung* [double interior development], which means that if density in existing housing increases it also puts pressure on exterior areas. However, a barrier was that it seems to very difficult to reach people and engage citizen and motivate them to join the dialogue. Int 1 (MGö) explained that they tried to invite people via letter (1000 sent) to a consultation on a mobility concept but only 30 people came to the consultation workshop of which about 5 came through the campaign. In the end, people were said to have blocked the construction side who indicated they never heard of the invitation for consultation. This calls for new ideas of reaching citizens, given that the municipality set a goal for 400 new housing units within the city by 2030 in the land use plan (cf. pesch partner architekten stadtplaner, 2017).

To conclude, stakeholder engagement is crucial for avoiding interference with mechanism agents who want to enable their reasoning in particular if it concerns new **LSR housing creation** of visible **reconstruction**. Examples with Göttingen's civil society so far have been positive. However, to reach more, and more than just those who might have strong opinions, new strategies are needed as there were seen to be difficulties with reaching people.

4.2.4 Measurement and accountability

4.2.4.1 Monitoring

Mechanisms leading to LSR can be triggered most effectively when the resources, opportunities and constraints that a policy provides and how that might lead to a change or enabling of reasoning can be tracked.

The municipality is doing a standard monitoring or area per capita per year but it was said that it is extremely difficult to determine and untangle what drivers for a change of numbers are (Int 1, MGö). They are using three levels; the broadest level is the general energy and GHG balance which was said to not give direct insights about the role of LSR. The second level is living space per capita. The neighbourhood approach of the *LSA* might allow to evaluate progress in 5 years in the neighbourhoods in which the *LSA* has targeted their efforts to changing reasoning for more LSR compared to neighbourhood which were not targeted (Int 1, MGö). This might still be overshaded by underlying trends in different neighbourhoods from price-effects and displacement. The third layer is the project layer. This means looking at the number of consultations made and which of those resulted in an actual trigger of one of the mechanisms (Int 1). However, it was also said that the LSA often does not know precisely

whether consultations have led to action, also because not everyone gave their consent to be contacted by email (Int 2, MGö).

Difficulties with data also originate from simply monitoring of the status quo and where the potential for LSR lies and where measures can thus be placed to reach the right audience. The *LSA* was said to work very well with the municipal statistics department, but certain data are not available (Int 2, MGö). The first problem is that many people in Göttingen are not registered in the city as it has a large student population. Just from resident registration data it is also difficult to determine whether people live in their primary or secondary residence. Secondly, data on the housing stock are very outdated; the plan from 1972 was continued but some important information is missing; the plan do not give any information about the number of storeys in each building. It furthermore does provide the total number of flats but not per building. Thirdly, it is often unclear who owns the building and where does this person live which makes it difficult to reach them (Int 2, MGö).

Another unreported number is the number of vacancies. Int 9 (FAG) mentioned to have witnessed a lot of vacancies and unused living space over the years. The exact data are very difficult to know (Int 2, MGö). An option that was explored is to count electricity or water meters. But public utilities said that the data are too faulty to make conclusions about vacancies. For manual inspection, there are not human resources. This might change as the *Leerstandsmelder* [vacancy reporter] will come to Göttingen (Int 2, MGö, update: the *Leerstandsmelder* went online in Göttingen on 27 March 2022; Leerstandsmelder, 2022).

A barrier for receiving funding for LSR activities from higher levels of government was suspected to be that much of current funding for climate matters requires an indication of the CO_2 emissions saved by the suggested measure. This can be very difficult to determine for measures that aim at education. If financial means are limited, this means that often other measures are prioritised such as district heating (Int 8, EARG).

To conclude, there is poor data that could direct the energy of the *LSA* towards those mechanism agents with highest potential to change or enable reasoning. Data is also missing on how well the *LSA* did in changing reasoning and whether that led to triggering of mechanism.

4.2.4.2 Institutional accountability, transparency, and public access

Mechanisms leading to LSR are less likely to be triggered if there are no consequences to the faulty provision of resources, opportunities, and constraints that change and enable reasoning.

It became very clear however, that there are no consequences if living space is not reduced (Int 2&3, MGö). While there is a political interest in reaching climate targets, there are no accountability mechanisms for LSR. It remained unclear how the compliance with the climate check list (IM 1.2.2.1) will be ensured.

Public access to information and transparency are important enablers of accountability (Eldridge et al., 2020). However, in this early stage of LSR institutionalisation, there are no

governmental decision made that would require transparency. The *LSA* has a website on the municipal side with information on events, documents, and purpose are given. It was said that there are efforts to communicate the goals of the *LSA* alongside with local climate goals to people in conversations (Int 2, MGö).

4.2.5 Political economy

4.2.5.1 Power, incentives, and institutional norms

Mechanisms leading to LSR are less likely to be triggered if the process of resource, opportunity, and constraint provision is not inhibited by unfavourable power dynamics, institutional norms and conflicting motivation by other actors.

All representatives from the city administration signalled very clear ambition to continue working towards LSR (Int 1-3, MGö). The goal is to suggest implementation of IMs defined in the CP2030 to the parliament every year with indication of budget and staff needed to implement them so they can be considered in the household budget (Int 1, MGö). It was said that also actors directly in touch with mechanism agents such as *H&G* and the *FAG* were very positive and open about the topic. It was especially welcomed that the *FAG* adopted LSR into their activities on more **communal living** (Int 2, MGö). It was said that those institutions representing tenants might be more wary of the LSR concept because effort to change LSR reasoning could make older people feel guilty if they have an additional room (Int 6, FAG). At the same time, it was said that there are not really any actors that inhibit the process (Int 2, MGö).

A clear challenge to changing reasoning that is rooted in the motivations of mechanism agents. Int 6, WgG shared that they rarely saw people getting involved in alternative living forms (e.g. **communal living**) in Göttingen given a *"my home is my castle"*-mentality that they believe to be *"psychologically and logically strongly anchored in Germans"* (Int 6, WgG). Int 7 (SWG) told about a communal washing machine room they built with a little patio and a green area. However, it was said to not be in use. They believed the problem to be: "*there's the problem of hygiene because the Germans love to wash in their own washing machines."* (Int 7, SWG). According to these voices, a change in external conditions does not necessarily lead to a shift in behaviour. The reason, in this case, appears to be cultural: German's relationship with their own living space. This shows that the *LSA* in Göttingen, aiming to create a platform for information about LSR and to actively approach neighbourhoods about this topic tackles a key issue: existing reasoning around living space.

A general issue was seen to be that municipalities are very slow and take a long time to adopt household plan. This clashes with ambitions internally to have a fast process of recruiting new staff to implement measures of the CP2030 such as LSR (Int 1). There seems to be a general mismatch between different actors; the municipal administration was hesitant to set 2030 as a date for climate neutrality as they said to be extremely unlikely to realistically met, while the target was pushed to be approved by the political bodies and climate initiatives such as GöttingenZero. Int 1 (MGö) said: "*The feeling is that we don't necessarily have an ambition problem but a total implementation problem".* They added that the political pressure is welcome but can move

the debate in an unhelpful direction, as they found the question of the target year irrelevant because it is more about the budget available and the measures actually implemented (Int 1, MGö). Their impression was that the implementation of pilot projects and other elements of the CP2030 requires fundamental decisions which are based in a holistic long-term vision and that resources or capacity is missing to talk about fundamental questions of direction (Int 1, MGö). Concerns about implementation of LSR and the CP2030 were also voices by Int 3 (MGö). They said that it's not possible to implement climate protection as well as interior development *"without hurting anyone"*. They also suspected that the parts of administration more concerned with details of the building sector might have thwarted the CP2030 a bit but maybe were not able to communicate doubts well (Int 3, MGö). However, it was also said that a good condition for the CP2030 implementation is the good relationship between the managers of the department for sustainable urban planning and the department for planning, building regulation and surveying (Int 3, MGö).

To conclude, no actors were found to inhibit the process of changing and enabling reasoning through various LSR measures, rather the opposite. Barriers could be the slowness of municipality and policies might be designed too quickly without considering the details of their implementation.

4.2.5.2 Political priority

Mechanisms leading to LSR are less likely to be triggered if the process of resource, opportunity, and constraint provision is impeded by a lack of political will to enable the capacity needed and create accountability. It has to be noted that political priority for topics can also shift quickly through unforeseen crises.

It was said that there is a political priority for the higher idea of climate neutrality, but less for LSR as its relevance to climate targets is not yet commonly understood (see 4.2.3.2; Int 1, MGö). It was shared that even the OptiWohn project was believed to be accepted less because of political approval but more because it was not really given much attention at the time (Int 1, MGö). The threshold was low because the city initially did no need to pay anything as the *LSA* staff and public relations work was covered by OptiWohn (Int 1, MGö). Int 2 (MGö) believed that there is more openness to change and enable reasoning specifically for **communal living** (e.g. by giving priority in allocation for housing initiatives as planned in the *Europaquartier).*

Most interviewees believed that the government would be extremely cautious and hesitant to force the topic of LSR and intervene in private housing for example by setting maximal area limits (Int 1, MGö; Int 7, SWG; Int 8, EARg; Int 10, BL&H). Anything around regulations was said to be very politically contested. Int 8 (EARG) sums up:

> *"I get the impression that the topic of housing, personal living space and personal property is so sacred to many that they don't even try to tackle it".*

They were particularly sceptical that sufficiency will gain full political support and assumed political support to focus on energy efficiency measures such as energetic renovations.

Also in local environmental NGOs, such as the *BUND,* LSR is not yet explicitly target of their campaigns, even though they mentioned several times *"maybe the topic of LSR should be pushed more"* (Int 4, BUND). They suggested that the topic could be pushed through their newsletter that has 2000 members. However, their active members are often young students for who the topic of LSR is not very obvious and interesting. They mentioned that they often get suggestions for campaigns by the federal or state level organisational entities but that nothing yet came on LSR even though higher levels of the *BUND* are very actively working on LSR. They currently target LSR through the working group *Wohnen und Bauen* [living and building] of the climate protection advisory board. Their main narrative is around questioning the demand for new housing and shifting the conversation towards conversion of existing building stock about which they hope to release a statement soon.

Multiple interviewees stressed the need to shift political focus from a narrative of fixing housing shortages with new housing instead of using potential in existing housing stocks. Interviewees agreed that there needs to be a change of focus (Int 1-3, MGö; Int 4, BUND; Int 10, BL&H):

> *"This [focus on new building] is problematic because not only do financial resources flow into new constructions, but we also have a total shortage of craftsmen and the construction industry is generally very limited in terms of capacity." (Int 2, MGö).*

They worry that capacities bound by focus on new construction takes away capacity left for existing buildings. They highlighted that a "*change of mindset"* is needed of all those involved in new and old construction but that requires clear political signals at all levels and scales, especially on a federal level. They also emphasised to consider the "*social aspect of housing and not just the purely structural aspect*" (Int 2 MGö). The absence of explicit LSR topics in environmental NGOs such as the *BUND* was also suggested to be overcome by connecting the topic of LSR more with *social* aspects and this making it more interesting for other civil society actors as well. Int 8 (EARG) highlighted the possibility to use empty houses in the Ostviertel (Göttingen neighbourhood with larger villas) to be used for example for fled families, for example given the current situation of Ukrainian refugees. Instead of a funding programme for LSR, there could be a social funding programme that benefits the housing owner, providing an incentive to make living-space available (**mobilising vacancy**).

The question of how to mobilise more areas and space for living is a political one. This tied into a comment made by Int 1 (MGö) that **vacancy mobilisation** seems to be not a trigger that is politically prioritised, even though spaces might be fairly easy to acquire in comparison to **creation of LSR housing**. Int 10 (BL&H) was sceptical that there is in fact structural vacancies for example due to speculations.

To conclude, while political priority for climate neutrality is high, LSR is not prioritised because living space is seen as such a sensitive topic and because its relevance is still not commonly

accepted. Local NGOs do not prioritise the topic either. To overcome this barrier, a paradigm shift towards focus on existing buildings rather than new ones across levels and scales was demanded. A chance was also seen in framing LSR more as a social issue.

4.2.6 Intermediate conclusions

The second RQ was, how can the implementation of policy measures targeting absolute living space reduction per capita be advanced in the city of Göttingen? A policy implementation assessment was conducted, building on the hypothesis that the implementation of LSR policy measures hence the successful provision of resources, opportunities, and constraints to change in reasoning or enabled reasons of mechanism agents within the Göttingen is likely to impeded by contextual factors.
What was found is that in every dimension of the PIAF, contextual factors pose serious barriers to the successful change or enabling of reasoning through the LSR policy mix. The hypothesis was thus confirmed. The barriers found provide answers to how LSR can be advanced.

For the *LSA* to work better, more guidelines would be needed which is difficult given the lack of similar examples. More access to data could allow the *LSA* to better target certain mechanism agents. Reaching the right target group could also be improved trough increased cooperation among similar actors who have various channels (i.e. EARG, FAG). This network could be increased long-term by energy advisors if sufficiency was part of their education. Given the current low awareness for the topic, also the neighbourhood approach which was seen to work well needs to focus first on changing reasoning. The approach could allow for what Int 2 (MGö) called a *Begleitungsbedarf* [need for accompaniment] hence guidance over time towards a change of reasoning more towards triggering mechanisms. This is a prerequisite before other measures more geared at enabling reasoning (i.e. digital platform 'housing'). The neighbourhood approach might also aid difficulties with increasing participation in stakeholder engagement activities. Adjusting to political priority, the LSA will continue only with ½ which can be expected to significantly impact their capacity to provide these opportunities for change of reasoning. Another actor who has contributed to the institutionalisation of LSR such as the *FAG* is not able to continue the 'residing for help' project without funding. A solution to overcome this barrier was said to be to make climate protection a more official task for municipalities, hereby creating accountability. It could also increase financial support from higher government levels. This requires a paradigm shift towards focus on existing buildings rather than new ones and change of political priority also on higher government levels. A chance was also seen in framing LSR more as a social issue, also making the topic an agenda point for a broader set of civil society actors increasing political pressure.

4.3 Addressing shortcomings LSR policy mix to achieve LSR

The previous two sections have provided insight into LSR institutionalisation in Göttingen and how that shaped the provision of resources, opportunities and constraints to mechanism agents and the challenges to making this work. However, reasoning in itself does not necessarily lead to the triggering of mechanisms and thus to LSR manifestation despite optimal provision of resources, opportunities, and constraints by a policy programme. For example, a person might have the financial means and the motivation to reconstruct provided through a

policy but face regulatory barriers to do so. Int 8 (EARG) highlighted the gap between people having arrived at a certain reasoning (e.g. 'I want to reconstruct my place towards better energy standards)' and actual action. Contextual factors might thus impede the final trigger of mechanisms despite LSR institutionalisation. Policy coherence and alignment are crucial factors not necessarily only for creating favourable conditions for LSR mechanisms to work but for building down barriers that inhibit their take up. Thus, this section deals with the factors that impede the triggering of mechanisms, making outcomes less likely, which in turn can be used as a base for providing recommendations for complementing policy (changes). The structure is guided by emerging themes, however due to the interconnectedness of all issues, I am presenting these results in one big section. As it was also already seen in 4.1.3, constraints and resources are mostly absent in the policy mix, potentially limiting its success. This chapter also captures recommendations for additional policies that can enable reasoning and/or ensure the triggering of mechanisms.

4.3.1 Limitations of LSR policy to trigger LSR mechanisms and recommendations

A regulation impeding **LSR housing creation** and **reconstruction** that was mentioned several times is regulation for (wheelchair) accessibility (Int 6, WgG, Int 3, MGö). It leads to bigger bathrooms and hallways as radius of movement needs to be guaranteed. It was said that the law of Lower Saxony has strict accessibility criteria, also demanding every eigth flat that is newly built to be wheelchair accessible. The *WgG* built 166 flats in the apartment building for the students and had about 20 wheelchair accessible flats. While they acknowledged the progress towards inclusivity for wheelchairs, they also highlighted that the regulation is not responding to the actual demand for wheelchair accessible flats (Int 6, WgG). It was said that compliance with accessibility criteria can make **reconstruction** such as house division impossible.

Another topic inhibiting **reconstruction** towards increased living density (aspect of LSR) that was mentioned is the *Stellplatzsatzung* [parking space statutes] which states how many parking spaces need to be built per number of flats on the property (this is to avoid parking in public spaces) (Int 2&3, MGö). The requirement for proportional need of parking space increase can make it impossible to increase the number of housing units in existing housing stock. There are exceptions where a redemption fee can be paid to avoid these additional parking spaces, but it was said to increases the price of the undertaking (Int 2, MGö).

Similarly, increased living density through **either densification** mechanism was also mentioned to put pressure on the sewage system. Int 3 (MGö) shared that Göttingen has a very old sewage system with limited capacity. Public utilities are therefore always cautious about additional sealing of floor (decreases the capacity of the ground to absorb water) and additional water influx. As channel cannot easily be changed, sewage capacity needs to be considered as limiting factor for densification.

This feeds into the topic of *doppelte Innenentwicklung* [double interior development], which means that if density in existing housing is increased it also puts pressure on exterior areas which can be a limiting factor to **all redensification** mechanisms. It was emphasised that the process leading up to triggering of LSR mechanisms, therefore always needs to come with the consideration for an overall urban picture and quality of life through sufficient green spaces and general urban development (Int 3, MGö, Int 10, BL&H).

A sub-mechanism of **reconstruction** is to add another storey. Regulatory barriers that were mentioned several times are B-Plans, *Bauordnungsrecht* [building regulation law, on state level][22] and *Baunutzungsverordnung (BNVO)* [building use regulation, federal level][23] (Int 2-3, MGö). B-Plans were said to often only allow for one storey buildings but were created decades ago when the housing and energy situation was very different (Int 2, MGö). This means for each undertaking to add an additional storey, a new exception to the B-Plan needs to be granted in order to realise a reconstruction (Int 1, MGö). This is where interpersonal contextual factors become important to consider as this process was said to quickly lead to discontent among citizens which might oppose a granted exception or insist on getting one for their own reconstruction undertaking. Thus, Int 1 (MGö) suggested that for some areas it might make sense to just change the B-Plan towards allowing more storeys. Changing the B-Plan is a political act which also requires larger stakeholder engagement processes. Int 1 (MGö) said this to be a chance where all concerns can be brought to the table and then a clear decision can be made (e.g. to also only allow more storeys in certain houses). This can be thought more holistically; Int 10 (BL&H) said that they expand B-Plan changes in commercial areas to surrounding residential housing for more efficiency.

Another issue for adding another storey are the *Brandschutzvorgaben* [fire protection requirements] (Int 3, MGö; Int 6, WgG). From a certain building hight it is not allowed to use burnable materials (e.g. wood) as regulated in the *Niedersächsiche Bauordnung* [Lower Saxony building regulation]. This is problematic because wood fore example is a comparably light and a renewable building material. As Int 6 (WgG) mentioned, many of the houses from the 1950s are difficult to expand because of statical challenges, meaning lighter building materials make it more possible to realise a reconstruction. Int 1 (MGö) proposed changing the law to allow burnable materials that only burn after a certain time[24], giving the fire brigade time to arrive.

Another challenge for **reconstruction**, hence adding more units to a building, be it through dividing existing living space or building another storey on top, was said to be the additional cost of duplicating all the inventory, which can sometimes make it even cheaper to build a large flat (Int 5, Vhs):

[22] The *Bauordnungsrecht* differs for each state and regulates the construction, alteration, use and demolition of and in buildings.

[23] BNVO defines the kind of use (whether it is living, industry areas or mixed), the kind of building and what distances need to be kept.

[24] Doors mostly have a minimum standard for how many minutes they have to last before starting to burn.

> *"If I have three flats, I have to buy three front doors, I have to have three [power/water] connections, I have to equip the flat three times, […] electricity connections, extra fuses, extra wiring".*

Dividing living space is another sub-mechanism of reconstruction, for example for people living in a big house after children moved out. Despite reasoning being present or even having some financial means for the process, a very practical barrier to activating this mechanism was the stairway (Int 7, SWG). Many single-family homes built in the last century have their stairway integrated into the living area, meaning it is complicated to separate from the rest:

> *"And then there is really only the possibility of putting a new stairway in front of the house. That is very expensive and then you would also have to destroy the stairway and build new ceilings. That is the main problem and it is difficult or impossible to solve." (Int 7, SWG)*

Dividing family homes seems sensible at first to tackle issues around people not wanting to move and being attached to their homes. In 3.2.1, I mentioned flexible floorplans as suggested in literature as a sub-mechanism for **creation of new LSR housing** that enables reasoning eventually. Flexible floorplan mean stairways could be planned differently from the beginning. However, Int 7 (SWG) was sceptical about **creation of new LSR housing** with flexible floorplans. They said that: *"Such model projects have all existed before, they existed 30 years ago. The floor plans were never changed. People rather to move out."*. Int 7 (SWG) and Int 3 (MGö) share the notion that rather than reconstructing, it could be easiest if people just moved to a smaller flat and made space. This touches upon another complexity of LSR that policymakers face; working towards LSR can mean that it makes sense to increase the living space size. Thereby, bigger flats for families are created who might otherwise build a single-family home outside of the city where it uses a lot more space (WgG, personal communication, 25 March 2022)[25]. Int 3 (MGö) stressed:

> *"of course you also have to have alternatives. And I think that is another problem in a very tight housing market. People live in a single-family house that has been paid off, they don't really pay rent any more, they would of course get good money for the house now, but the interest rates are so low that you can't really do much with the money anymore."*

This suggests that policies, rather than focusing on reconstruction, would need to target and facilitate moving in combination with creating attractive alternatives to live. However, Int 8 (EARG) expressed scepticism for **moving** to be a feasible mechanism:

> *"Reducing living space, yes. Moving, I think, is almost impossible. There are the personal factors, what is my living environment like, how do I like my garden, what are the day-care centre and supermarket connections like?"*

They believed moving was not realistically feasible given *"any realistically feasible funding programme"* (Int 8, EARG). While this is something that could be addressed by the *LSA* or other LSR policy measures, there is a primary barrier to enabling **moving** that is not addressed

[25] This is not Int 6 (WgG). Another conversation was held with a representative from WgG prior data collection phase.

by the policy mix yet: the lack of alternative housing in the same neighbourhood (Int 5, Vhs; 6, WgG; Int 7, SWG). This ties into the general issue that the main target group of LSR is likely to be in an age where they would want to live in an accessible space that also fits their needs when they become less physically mobile (Int 5, Vhs). However, the availability of accessible flats is limited (Int 6, WgG, Int 7, SWB). Int 6 (WgG) highlighted that accessible flats are often in new buildings; however they then have higher energetic standards, in turn meaning that they are also more expensive (Int 5, Vhs). Elevators were also said to increase costs by a lot per housing unit. Additionally, the general rise of building costs forces building owners to ask for a certain minimum rent per sqm. Especially for people with old contracts and low prices it is not economically viable to move out (int 6, WgG).

Thus, a solution would be to focus policy specifically on an offer of small accessible and cheap flats for older people. However, Int 7 (SWG) brough up another issue that might limit LSR policy's ability to effectively enable reasoning for **moving** to a smaller place. They highlighted what they believed to be a central issue:

> *"The houses are full of various household items from the last decades. [...] If I now imagine myself in my mid-80s, I wouldn't clear out anything. Then I sit in my house full of ..., I'll call it 'stuff' now, which has accumulated over the last decades and which I'm still partly attached to, and I stay there."*

They say that living space would need to be cleared out when people are in their mid-60s. furthermore hypothesised that more empty houses and basements would lead to a much bigger willingness to move among older people.

Communal living has been seen as a LSR mechanism that was also targeted by the Göttingen Policy mix. However, what was said to generally inhibit **communal living** forms, is that resources and constraint provision (fundings and regulations) are organised per housing unit and not adjustable to more flexible forms of living where spaces are shared (Int 2, MGö). It was said that regulation and funding programmes would need to be adjusted.

One concern for communal living was whether groups are organised well enough to manage the process of applying for an advertised building site (Int 2, MGö):

> *"There are many people who are interested in it. But there are also many people who can't or don't want to find the capacity to actually organise it."*

Issues around **communal living** forms taking off were also observed by Int 7 (SWG). Policy solutions could thus focus on the guidance support during the creation process. Int 7 (SWG) added the pragmatic suggestion that housing groups could simply rent several flats in a building or a new housing estate in order to live together in close proximity. It was said that often there are neighbourhood centres anyway, where common rooms and meeting places are available which could speed up the process of coming to communal living:

> *"So you wouldn't have to build anything special. Of course, it is not planned and built as a community, but community living can also be implemented in this way. It would even be conceivable that another flat could be rented jointly for use by the group." (Int 7, SWG)*

There also have been experiments with communal areas in housing associations, some less or more successful). However, Int 7 (SWG) shared that their guest apartments are very successful and regularly used, and they will also consider them in the new building projects. This show cases a positive LSR reasoning. Nevertheless, community rooms seem more difficult as someone is needed to take care of them. They increase the rent but are often not used.

For **Sub renting** it was also said that barriers for turning reasoning into action is a legal unclarity. Int 9 (FAG) shared a story where someone in the *Wohnen für Hilfe* project died and then the students living with them did not want to move out and insisted on the rental contract. This feeds into recommendations for regulations to be adjusted to more modern ways of living such as communal living and sub-renting.

4.3.2 Intermediate conclusion

The third RQ was, what kind of policy adjustments or further policy measures are needed to advance the absolute reduction of living space per capita implementation in Göttingen? This last section provided a starting point for answering this. It evaluated the contextual factors that inhibit mechanism agents to trigger mechanism despite existing LSR reasoning and thus compromise LSR manifestation. It was built on the hypothesis that the triggering of mechanisms independently of whether reasoning was changed or enabled is likely to be impeded by contextual factors.

This hypothesis was very clearly confirmed. The data highlighted various conflicting policies on various political levels limiting the triggering of mechanisms, especially reconstruction (e.g. fire protection, accessibility, or parking space law). Thus, it was called into requestion whether the policy focus should be less on reconstruction and more on facilitating moving. The goal of this would be to increase availability and occupation rate of family-size housing. Policy needs to tackle change of reasoning and enabling reasoning. More opportunity provision is needed to open space for people to transform their relationship to living space given moving is seen as one of the mechanisms currently less feasible. This is also relevant to clarify barriers to changing reasoning about communal spaces. This is something the *LSA* could do given more resources. Policy needs to be directed to provide more resources towards creating alternative accessible affordable housing especially for older people to enable reasoning and turn it into action.

5 Discussion

In this study, I aimed to investigate the design and implementation of LSR policy measures in the city of Göttingen with the higher objective to contribute to the academic understanding of the practical institutionalisation process of LSR. I did so by taking a RE approach which illuminates different steps in the process between policy mix design and the triggering of mechanism (e.g. reconstruction, moving, sub renting) that are expected to lead to the desired outcome: LSR manifestation, an absolute reduction of living space per capita. The different steps examined cover the design of the LSR policy mix to provide resources, opportunities, and constraints provision, barriers for them to achieve reasoning change and enabling, and contextual factors that hinder the triggering of mechanisms even when reasoning was changed or enabled. This has allowed me to answer the RQs and these findings are discussed here.

5.1 Implications

LSR carries the wider sufficiency logic of 'politics of less' and its associated normative challenges (see 2.1.1). In chapter 1, I explained that the ultimate hypothesis that I drew from previous literature and built this thesis on is that an institutionalisation of LSR is necessary for its manifestation. As used here, institutionalisation captures the process of making LSR a recognised and permanent part of the societal system and describes an intermediate outcome before LSR manifestation. The findings are thus being discussed guided by the four strategies for an institutional framework for a sufficiency driven economy by Schneidewind and Zahrnt (2014). They suggest four pathways to a politics of sufficiency: framing, orienting, enabling and shaping (Schneidewind & Zahrnt, 2014b, p. 30). My RQ1-3 have been answered in the intermediate conclusions in 4.1.3, 4.2.6, and 4.3.2. Here, I used the logic of framing, orienting, shaping, and enabling as loose guidance for connecting my results to the broader aim of LSR manifestation and the process of institutionalising LSR via LSR policy design and implementation.

5.1.1 Framing LSR

(Political) framing refers to embedding sufficiency in an institutional framework, hence designing its politics with emphasis on sufficiency principles such as enhanced life quality and social justice.

Through RQ1, I found that Göttingen has a policy mix that institutionalises LSR mostly through the *LSA* and pilot projects in neighbourhoods. In the policy design itself but also in the way reasoning was aimed to be changed, the LSR framing shifted away from a sufficiency-dominated narrative to a space-saving narrative that was seen to be more relatable for political actors and mechanism agents alike. LSR was also integrated in housing and energy-related measures for example proposing pilot projects in neighbourhoods. This was seen to be successful for reaching mechanism agents via non-climate related communication channels and generally integrating LSR in projects that emphasise quality of life improvement which was said to be crucial (Int 3, MGö; Int 10, BL&H). This is in line with Heindl and Kanschik (2016, p. 49) who said that sufficiency policies should be *"integrated in a more comprehensive normative framework related to welfare and social justice"*. The departure from a sufficiency language in Göttingen reflects a reaction to its normative and moral spin that was said to be a barrier to

sufficiency (Stengel, 2011). The Göttingen case shows that an alternative language (in German) could allow for an LSR framing that highlights its merits and opportunities more.

One factor advancing LSR implementation was said to be a societal change towards seeing LSR as something desirable (Int 7, SWG). There is thus a need for a reversed cohort effect. The cohort effect was explained to be the change of standards for living space in various age groups for example due to a trend towards bigger dwellings and aging population (Bierwirth & Thomas, 2015). Switzerland and its 2000-Watt pilots in Zurich provide an excellent example of changing framing for LSR. Zürich decided to reduce energy use per capita to 2000 Watt by 2050. They also determined a strong need to focus on a change of reasoning as it is not lack of will but lack of knowledge inhibiting action. Thus, they established the '2000-Watt specialist office' comparable with the *LSA* (Stadt Zürich, 2011). It carries the strong notion of connecting sustainability and quality of life. Given the broader network of resources and information, Göttingen could consider becoming a 2000-Watt city to benefit and embed LSR in broader energy and sustainability strategy as originally shown in the Masterplan where a goal was set for 10% energy reduction from lifestyle change (Stadt Göttingen, 2015).

It was said that the *LSA* could benefit from better data to address their target group. Despite a thorough potential analysis of LSR in Göttingen. lack of data on where the exact potential is makes it more difficult to target the work of the *LSA*. Furthermore, it limits a full evaluation of the successful triggering of mechanisms. Kenkmann et al. (2019) for example calculated the potential of an institution such as the *LSA*, however, conclusions cannot be made without data.

More visibility of data could help to change the political narrative away from building new housing to creating more living space capacity in the existing housing stock. Besides, the potential for living areas that could be mobilised through LSR, the energy waste from taking down houses and building new was mentioned (int 3, MGö). This has been repeatedly been emphasised by Architects for Future (Nägel, 2021). It was proposed to change the *Gebäudeeenergiegesetz* [Building Energy Law]. It regulates criteria for energy standards for new buildings (Vattrodt, 2021). However, it does not consider the whole life cycle of a building. The improvement suggestion thus is to change the law such that not only energy performance during use of a new building is assessed to decide whether to demolish a building but that the whole life cycle is considered. This could lead to cases where the energy balance over the whole cycle is better if buildings are just retrofitted. This is a change that would need ot be implemented by the federal governmental level. The life-cycle mentality could for example be used to inform funding guidelines for programmes by the KfW for buildings.

5.1.2 Orienting LSR policy

Orienting refers to the offer of contrasting points of orientation, hence alternatives, compared to societal structures such as globalisation, acceleration, growth and commercialisation.

The *LSA* has been mentioned as key policy measure and institution in the process of triggering mechanisms by changing reasoning on living space. Even though not actively disruptive, it

informs and promotes a different vision for our relationship with housing. While the *LSA*, initially part of the OptiWohn project, now funded by the municipality, was said to be a major contributor to the institutionalisation of the topic, the OptiWohn project in Tübingen is ending with the end of funding (H. Kindler, personal communication, 24 May, 2022). An LSA as a policy measure has previously been suggested in literature (e.g. Kenkmann et al., 2019). Thomas et al. (2019) analysed hypothetical barriers to an LSA and found many barriers in line with the findings here, e.g. excess stuff impeding moving, lack of affordable alternatives in the neighbourhood. They suggested that LSAs "*should provide a combination of living space advice, practical support for moving, and financial support.*". This highlights again that the *LSA* in Göttingen could operate better if it could also provide financial support.

Another way to reorient our relationship with housing is the increased chance to live in communal housing which has been mentioned in line with LSR also in the policy mix. To support the emergence of these projects, given it was said much interest is there (Int 2, MGö), Bierwirth and Thomas (2019) suggested communal living support programmes to be designed per person instead of per object. This is consistent with Int 2's (MGö) statements that groups seeking shared living arrangements have difficulty because funding programs are not tailored to them and do not take shared living space into account. According to an empirical analysis by Schopp (2017), communal living forms might not always lead to LSR. This highlights that while it might be desirable at this point to promote a general shift of mentality towards a sharing economy, it might not be the ideal mechanism for LSR.

5.1.3 Shaping LSR institutionalisation

Shaping refers to the various policy fields which a sufficiency perspective could be attached to and which it could transform such as mobility, food and housing. As this implies a better collaboration of actors working towards sustainability, I am including comments on actor networks here.

LSR measures were found in the CP2030, but it was also seen that space-saving housing was addressed in the land use plan (pesch partner architekten stadtplaner, 2017) and the housing policy plan (Stadt Göttingen, 2018). The neighbourhood approach rooted in the *LSA* and policy measures for pilot projects shows an institutionalisation of LSR through the connection of various topics such as energy and housing. The policy mix could even be extended: Thema et al. (2017) for example argued for an integrated sufficiency and efficiency policy. The CP2030 (measure 1.1.4.1) already focused on a campaign of the *EARG* for energy efficiency. Göttingen could integrate LSR more in this measure.

This would increase but also stimulate the need to increase the management and coordination around LSR in Göttingen. It was said that it should be clearer what the tasks divisions are and how resources can be channelled to promote LSR. The *EARG, FAG* and *LSA* as key actors to trigger mechanisms for LSR could create a trilateral platform to communicate roles; this requires a stable contact person from the *EARG*. Furthermore, cooperation among actors could be extended to environmental interest groups. It was found that local groups such as the *BUND* do not have LSR on their agenda yet, despite higher levels of the organisation being

very involved with LSR (cf. BUND Germany). GöttingenZero, the local branch of GermanZero who provided almost all ideas for LSR policy instruments in the database by Best et al. (2022), also do not show any notion of LSR on their website. A more active role of these NGOs could be promising following Bohnenberger (2021) findings that state much potential for sufficiency in the housing sector to be in a coalition of environmental groups and housing associations as both move towards integrating environmental and social topics. This is also in line with findings that LSR should be attached to more social narratives to make it more accessible (Int 8, EARG). It was mentioned that housing associations, and that was also their own perception, do not play such a large role in the promotion of LSR because they often have already compact housing stocks. Nevertheless, they also still build new houses. In a scenario development by Bierwirth (2015), the role of housing associations is particularly emphasised to create shared areas. As the example of the shared washing machine room and community rooms showed, the reality however seems to be that even if shared space is created people might not use it.

One recommendation that came out of conversations was to include sufficiency in the education for energy advisors. In May 2022, the German government proposed a new work plan for energy saving which includes a campaign with advice for energy saving from June on (Bundesministerium für Wirtschaft und Klimaschutz, 2022). However, it was said that there are only 800 energy advisors for all of Germany (Götze, 2022). Given that energy advisor becomes an increasingly important job, now could be a fitting time to increase awareness of LSR and energy saving potentials in institutions educating energy advisors. Thema et al. (2017) already considered this option and found that it would lead to additional energy savings.

5.1.4 Enabling LSR manifestation

The *enabling* pathway focuses on making sufficiency lifestyles a reality and creating an environment where a 'Good life' can be realised. LSR manifestation directly relates to enabling sufficiency with focus on energy and housing.

Enabling actions for LSR manifestation have mostly been derived from the various incoherences of policies that hinder the final step when people have changed their reasoning to trigger a mechanism and act. Kivimaa and Kern (2015) argue that sustainability transitions come through "creative niche-innovation" as well as the "destabilisation of currently dominant regimes". The LSR policy measure mix in Göttingen contributes to the creation of an environment in which actors can change their reasoning or act upon existing reasoning. As was seen, much of the focus of already implemented LSR measures such as the *LSA* focus on the change of reasoning. However, the creation of alternative housing and lack of financial means are two points not yet addressed much. The change of the current housing system would likely be most effective with regulations: A cap on total housing was explored by Thema et al. (2017). While they acknowledge its limits to political feasibility, they highlight an example from Switzerland that imposed a *Siedlungslimit* [settlement limit][26] adopted in 2014. Other

[26] Refers to a law that prevents houses from being build all over the place and promoting more compact neighbourhoods.

regulatory instruments proposed by GermanZero (2021) concerned the regulation of parking space as this was seen to be a limiting factor for vertical densification; they propose to get rid of privileges for subterranean parking spaces anchored in the construction planning law. Darmstadt already provides an example for a city with no parking in neighbourhoods anymore (Bartraum, 2021).

It was seen that the Göttingen policy design focuses much on opportunity provision as LSR constraint (e.g. housing law) but also resource provision (e.g. direct funding schemes for individuals) is more outside the scope of the municipalities' work (Int 3, MGö). This matches findings from a study by Gröne (2016, p. 30). They found that the importance of sufficiency for infrastructure planning is recognised by local politicians while they also acknowledged financial constraints for action but that there is a need to define the role of in this case district government.

Lack of resources seems to be a general issue on a local level. More institutionalisations of LSR and thus more access to resources could be achieved by increasing political priority for the topic on the local level. For this it was for example said that making climate protection a duty of municipalities could help. This would not only help with resources but also with current lack of accountability for inaction on LSR that was found (Int 2, MGö). Currently, German municipalities are obliged under the *Haushaltssicherungsgesetz* [household safeguard law], meaning if their finances reach a certain low point, they go into a mode where they cannot do any spendings besides what they are officially obliged to. This means climate protection is one of the first spendings to be cut. Thus, it would be necessary to look into how climate protection could be one of these duties. This idea was already picked up in 2011 in the Bundestag which concluded that it would not make sense (Wissenschaftliche Dienste, 2011). This might change now. After the ruling of the German Supreme Court, Germany has to revise its (insufficient) climate targets until the end of 2022 (Bundesverfassungsgericht, 2021). A proposal was made to anchor climate protection as a mandatory municipal task in the *Klimaschutzgesetz* [climate protection act]: *"in coordination with the right to municipal self-government (Article 28 (2) of the Basic Constitutional Law) and the prohibition on transferring tasks (Article 84 (1) sentence 7 of the Basic Constitutional Law). Adapt funding legislation accordingly and secure funding for the mandatory task of climate protection in the municipalities."* (Wählbar 2021, 2021).

A key aspect to enable the institutionalisation of LSR is to build down other institutional barriers. One of the measures in the CP2030 is to influence framework conditions at state and federal levels that impede the achievement of goals (Stadt Göttingen, 2021a, p. 117). Following this, it was found that there are policies that might impede LSR in the city:

One of the barriers mentioned that need to be removed to create an enabling environment is the fire protection law that makes it difficult to use light materials such as wood. It was seen as a barrier to reconstruction such as adding another storey. This is problematic, as Schellnhuber, (2022), one of Germany's most famous climate scientists pointed out that wood could play a key role in sustainable building. However, it seems that § 26 in the Lower Saxony building regulation was changed just in November 2021, with effect from 1 January 2022. The

change increases the flexibility of using inflammable materials such as wood (Haufe Online Redaktion, 2021). It will need to be re-evaluated whether the changes were enough.

Another change for the federal level is the improvement of §34 in the *Baugesetzbuch* [building code]. Article 3a specifies the criteria for deviation from the law. This could be extended with reference to ecological criteria. This would make it easier to justify for example adding an a storey or building in second row if it can be shown that it saves energy elsewhere.

It was found that rather than focusing on reconstruction, moving should be supported. To avoid practical barriers, emphasis was put on the creation of affordable, accessible smaller flats in the neighbourhood. However, Thomas et al. (2019a) present survey results according to which people rather than moving in small places, many people indicated to wanting to move into communal living formats such as shared flats or multi-generational living.

5.2 Reflections on methodological and theoretical choices and outcomes

This study has several limitations that impact the legitimacy and validity of my results. Firstly, one limitation in the presentation of the results and documents is the loss of meaning through the translation from German to English. While the word 'sufficiency' or 'sufficient' is more widely used in English, the word 'Suffizienz' in German is not very commonly used and seen as a scientific term with little meaning to practitioners (Int 2, MGö). This means that in the context of housing, alternatives are used, which, however, do not translate to English very well. The term consistently used in German is *flächensparendes Wohnen* [space saving living]. I instead used LSR as it captures the goal of sufficiency for living space more clearly in English. Furthermore, as the building sector can be quite technical, many words do not translate very well, especially terms to do with legislation (e.g. *Bebauungsplan)*. To avoid loss of meaning, I decided to, wherever possible, use the German word and add the translation in brackets. This limitation expands to direct quotes from interviewees.

Secondly, and this ties into methodological choices, qualitative research comes with a risk of bias. While I think using the clear structure from the PIAF to guide most findings helped to select information with little bias, my discussion and conclusions are of course product of my selective decision of what to include. Bias might go beyond myself, as many of the people I interviewed were interested in LSR themselves and therefore potentially less critical.

Other limitations to qualitative data collection and analysis are that views are very subjective (Creswell & Creswell, 2018). Given the scope of the master thesis, only 10 interviews were conducted, while more would have been beneficial to gain more perspectives. It was justified as a delimitation to exclude the investigation of whether mechanisms were actually triggered or not, instead the results have shown the perception of practitioners on reasons for behaviour change not to happen. However, a key limitation for this evaluation is the absence of the perspective of the target group itself and their motivations for developing reasoning and acting towards mechanisms that trigger LSR. The study by Kenkmann et al. (2019) already developed

a list of anticipated barriers that hinder the triggering of LSR mechanisms which served the purpose of identifying what policy instruments could be most effective. A quantitative data collection on people's openness and concerns about behaviour changes towards LSR could have complemented my study well. This is because recent progress on LSR institutionalised means that more perspectives could have been captured of people who already reached the step of wanting to move/reconstruct/etc. but face very real action barriers that could inform additional policy. In a framework for TBE for energy sufficiency proposed by Thomas et al. (2015), the authors propose to first analyse which policies can actually save energy and are socially accepted. This was beyond the scope of this thesis but could be a study building on this one.

Furthermore, the PIAF was used as part of the analytical framework. Since it was designed for agricultural policy in the African context and has not been used for similar studies as this one, the application of the framework in this context has not been tested before. As results cannot be compared, it is a limitation.

In 2.2.2, I summarised some TBE implementation challenges. While I tried to actively address them through a very explicit analytical framework, one of them concerned the quality of the programme theory. It says it should be rooted in existing research and potentially perspectives of those affected by the programme. The early stage of the LSR policy implementation and lack of data on its (intermediate) outcomes and thus effectiveness pose a limitation to results and recommendations. This is because it is not possible to make clear attributions of what worked.

In the discussion above, I have engaged with questions that ultimately try to advance sufficiency institutionalisation. However, I have only limitedly questioned its effectiveness. A limitation for efficiency was explained to be the rebound effect and a study by Sorrell et al. (2020) has looked at the evidence for a rebound for sufficiency. They do not explicitly discuss LSR, however, they highlight a rebound effect through the spending of saved heating costs. If mechanism agents were to actually live on less space and thereby save heating costs, it would need to be investigated further whether energy use is not just shifted elsewhere.

I also have not addressed the broader feasibility of sufficiency. It has to be noted that there are very clear barriers towards societal-wide adaptation of sufficiency strategies for economic decisions. I have focused on very practical barriers, however, political priority for sufficiency is impeded by existing deeply rooted values and beliefs; Stengel (2011) for example mentioned materialistic world views, the tendency of people to do what the majority does, and reluctance of "*cowardly"* politicians, and continuous pressure to consume in the capitalist system. This shows that my recommendations especially for resources and constraints will likely remain academic theory as much of sufficiency literature is. However, given the pressure from housing and construction market, it might also be that LSR specifically will grow in prominence in politics – potentially not under the sufficiency narrative.

6 Conclusion

In this study, I aimed to investigate the design and implementation of LSR policy measures in the city of Göttingen. By doing so, I sought to contribute to the only limited practical experience with LSR policy design and implementation. LSR is an energy sufficiency strategy with large potential for energy savings but also for addressing environmental impacts from new housing developments and social issues of housing shortages. However, as many other sufficiency strategies, it is not yet widely institutionalised. Previous studies have identified the local level to be suitable for sufficiency interventions, yet information and resources are lacking to design or implement them. Göttingen, home to the OptiWohn project through which an *LSA* was established, poses a pioneer case where LSR institutionalisation was initiated.

Three main RQs have guided the research:
RQ1: How does the LSR policy mix design contribute to the institutionalisation of LSR in Göttingen?
RQ2: How can the implementation of policy measures targeting absolute living space reduction per capita be advanced in the city of Göttingen?
RQ3: What kind of policy adjustments or further policy measures are needed to advance the absolute reduction of living space per capita implementation in Göttingen?

The results were analysed, considering the specific contextual factors that influence and shape the design and implementation process. Focus was put on understanding the mix of policies used and the barriers to its implementation. Recommendations for further policy measures and changes were also captured.

The answer to RQ1 is that the LSR policy mix contributes to the institutionalisation of LSR mostly through the *LSA*. Most policy measures focus on information, thus, the lack of regulation and financial support can be seen as a limitation to the institutionalisation process especially since previous studies emphasised the need for a policy mix with a combination of especially fiscal and informative instruments (Bierwirth & Thomas, 2019; Thema et al., 2017). What was noted is that Göttingen has departed from LSR as a sufficiency approach and instead integrated LSR more into general neighbourhood projects and energy topics.

Many of the barriers found were already anticipated by previous studies (cf. Bierwirth & Thomas, 2019; Kenkmann et al., 2019; Thema et al., 2017) and provide a base for what can be advanced (RQ2). For example, people would prefer to stay in their neighbourhoods, however, moving is a key mechanism for LSR. Improvement suggestions are that for the *LSA* to work better, more guidelines would be needed which is difficult given the lack of similar examples. More data availability and experience could make it easier to reach the right target group of 50–60-year-olds. Reaching the right target group could also be improved trough increased cooperation among similar actors who have various communication channels (i.e. *EARG, FAG*). This network could be increased long-term by energy advisors if sufficiency was part of their education. Given the current low awareness for the topic but policy focus on pilot projects, priority should be set on equipping the *LSA* to work in full capacity. However, adjusting to political priority, the *LSA* will continue only with 2 positions, which runs the risk to impact their ability to inform about LSR.

Additional policy changes (RQ3) that could benefit the process and tackle the problem from, for example, the lack of municipal funding was to make climate protection a more official task for municipalities, thereby creating accountability. It could also increase financial support from higher government levels. This requires a paradigm shift towards a focus on retrofitting existing building stocks rather than building new ones and a change of political priority also on higher government levels. A chance was also seen in framing LSR more as a social issue, also making the topic an agenda point for a broader set of civil society actors, increasing political pressure. Policy efforts need to be directed to provide more resources towards creating alternative accessible affordable housing, especially for older people, to enable reasoning and turn it into action.

Concluding, the potential of LSR to change our relationship with and to energy was highlighted, however, it meets many political, practical, and financial barriers. These can be tackled by prioritising information to citizens and creation of alternative options to realise LSR. For this, effort across governmental levels is necessary.

6.1 Recommendations for non-academic audiences

Much of the institutionalisation come through the creation of framework conditions which are usually provided by governments. From the conversations with practitioners and the above discussion the following recommendations can be made to stakeholders, but mostly government, on different levels.

A **recommendation specifically to Göttingen** is to provide more financial resources to the *LSA*. It was found to be the heart of LSR institutionalisation. Also, it was found that prior to implementing policy measures aimed more at enabling people to choose a higher awareness for LSR needs to be generated. Thus, success of LSR manifestation is directly dependent on the capacity of the LSA to promote LSR which is recommended to be expanded. A second recommendation for Göttingen is the improvement of management and coordination among actors such as the *EARG* and *FAG*.

A second **recommendation to the local government**, Göttingen but also beyond, is the change of B-Plans. This could start by taking Göttingen as an example where space-saving housing is a consistent narrative in the new land use plan (pesch partner architekten stadtplaner, 2017) that informs the B-Plans. A second regulatory issue that the municipality needs to tackle to enable LSR is parking spaces.

Given the results from RQ1, a very clear **recommendation to other local governments** is to establish an LSA. While the energy savings from the *LSA* cannot yet confirm the modelled savings from the previous studies (cf. Kenkmann et al., 2019; Thema et al., 2017), it has become very clear that the *LSA* in Göttingen has been the main driver for institutionalising LSR. Increasing cases of LSA pilots will also solve the encountered issue with lack of guidelines and can be argued to contribute to the body of experience improving LSA implementation. Furthermore, the neighbourhood approach could be replicated, allowing to approach citizen's about LSR less through a climate and energy narrative but through more community channels.

A **general recommendation** is to think and frame LSR as a chance for life quality improvement and less only as an energy strategy. It needs to be integrated with local mobility, housing and energy policy. The recommendation for actors dealing with these issues, from housing associations to local environmental interest groups, is to build more coalitions around LSR as this strengthening of a network also increases institutionalisation.

A recommendation to the **state government of Lower Saxony** is to revise the fire protection law to leave more room for certain wood materials to be used that might be inflammable but only after 1-2 hours, giving the fire brigade time to arrive.

A recommendation to the **national government of Germany** is a change of the building law book by changing §34, 3a to include something that makes it easier to justify divergence from the insertion plan if it is connected to sufficiency. A second recommendation is to change the building energy law such, so the energy performance of a building is not limited to its use phase but considers its whole life cycle. This way decision for building demolition would reflect the true energy footprint more. Lastly, a recommendation that is very relevant right now in the light of the new energy saving campaign is to start including energy sufficiency and LSR in energy advisory education. This could also be attached to trainings that working energy advisors need to do every year as the effect would only show delayed.

6.2 Recommendations for future research

This research was constructed around a postpositivist worldview; thus, I argue that the theory needs further revision and testing. This could be done by taking similar approaches to evaluate processes of LSR institutionalisation in other cities and then compare how resources, opportunity, and constraints were provided and whether mechanisms were triggered. Yin (2009) argues that investigating more cases allows for more generalisation as researchers might generalise their findings to the new cases. This calls for more research into similar cases.

I previously cited scholars arguing for an integration of sufficiency, consistency, and efficiency strategies. Research specifically in Göttingen could assess the energy saving potential from integrating LSR more into not only climate but energy strategy. This ties into general need for increased data availability.

There have been studies which have modelled the energy savings from a hypothetical implementation of an LSA or even measures not yet implemented but proposed here such as adding sufficiency to energy advisor education (cf. Thema et al., 2017). While I was able to shine some light on first results from the implementation of an LSA, data for its effect are still missing. More research is needed, as shown in Figure 3-1 in 3.2.2, to evaluate whether mechanisms were triggered. The literature proposes many policy measures; future research could be placed in Göttingen specifically to accompany their implementation and especially show results from the neighbourhood approach. With more data in a couple of years, the model for analysing energy sufficiency policy packages by Thomas et al. (2019a) could be used to validate the combination of policy ideas on LSR in Göttingen.

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7 Appendices

7.1 Appendix I – Collection of LSR measures

Mechanisms	Type of Policy Measure	Policy Measure	comment
Moving			
facilitate moving	regulation	right to exchange flats between the tenants of two different flats without rise of rent (except flats where the landlord lives in the same house with not more than two flats)	
facilitate moving	fiscal	moving bonus in case of switching from a bigger to a smaller flat	
Subrent			
facilitate sub-leasing	fiscal	fiscal relief for long-term subleasing room in the own household (not for touristic subleasing)	
secure space for living instead of tourist sub-letting	regulation	control of sub-leasing of a flat for tourist purpose by living space protection numbers (permanent rule)	
Reconstruction			
flexibilisation of living space	advice for change of use	advice from municipal advisory offices regarding building regulations for switching usage or adapting houses	
increase use of existing buildings	monitoring vacancies	monitoring vacancies and provide concepts for intermediate use of empty buildings and areas (municipal advisory offices)	
Secure supply of smaller flats to meet demand	Subsidy for splitting Single-Family-Houses	financial subsidy for structural partitioning of single family houses under the condition of subleasing (or sale) of part of it	
vertical densification	fiscal	tax advantages for vertical densification	

vertical densification	regulation	reduce approval requirements for house-top story addition	
vertical densification	fiscal	support scheme for roof extensions	
horizontal densification	regulation	reduced requirements for min. distance requirements in case of retrofits	
flexibilisation modifications/retrofit	regulation	ease fire regulations for retrofits	
flexibilisation of usage	regulation	designing development plans with diverse and mixed use	
Vacancies			
mobilise unused areas	information	mobilise unused areas within the building stock by recording them in a cadastre (law on national level obliges municipalities)	
Communal Living			
Supporting housing cooperatives	fiscal	investment grants for housing cooperatives are necessary because they do not profit from depreciation rates like the commercial housing construction. the grants must include an upper limit for living space measured in m²/person: 30m² for a single person an 15m² for every additional one.	
Supporting housing cooperatives	fiscal	(Increase) subsidy/premia for buying housing coop shares.	
Reconstruction			
flexibilisation of living space	advice for change of use	advice from municipal advisory offices regarding building regulations for switching usage or adapting houses	
increase use of existing buildings	monitoring vacancies	monitoring vacancies and provide concepts for intermediate use of empty buildings and areas (municipal advisory offices)	
Secure supply of smaller flats to meet demand	Subsidy for splitting Single-	financial subsidy for structural partitioning of single family houses under the condition of	

	Family-Houses	subleasing (or sale) of part of it	
vertical densification	fiscal	tax advantages for vertical densification	
vertical densification	regulation	reduce approval requirements for house-top story addition	
vertical densification	fiscal	support scheme for roof extensions	
horizontal densification	regulation	reduced requirements for min. distance requirements in case of retrofits	
flexibilisation modifications/retrofit	regulation	ease fire regulations for retrofits	
flexibilisation of usage	regulation	designing development plans with diverse and mixed use	
New Building			
Secure supply of smaller flats to meet demand	subsidies for small flats	subsidy for municipalities when building small flats (<40qm)	
flexibilisation of usage	fiscal	loans for conversion to living space	
reduce need for parking space	regulation	abolish obligation for car parking spaces	
reduce need for parking space	regulation	abolish priviliges for underground parking spaces	
reduce demolition of living space, increase renovation rate, upcycling/circularity/lifecycle emissions	regulation	introduction of a wrecking permit	
reduce demolition of living space	regulation	time limit for replacement construction	
General (overarching)			
training push for need-based buildings (new/rebuild)	fiscal	financial and social upgrading of professions in the construction sector	
training push for need-based buildings (new/rebuild)	education	financial and social upgrading of professions in the construction sector	
reward sufficient living spaces	bonus payment for living on small space	bonus for having less living space (at primary residence) than regional or municipal average (also for shared living concepts)	
facilitate moving / facilitate sub-leasing / flexibilisation of living space	information	municipal advisory offices for moving, sublease and home exchange (main target group: elderly people living on more than 80m2)	

7.2 Appendix II – Consent Form

EINWILLIGUNGSERKLÄRUNG März 2022

Wissenschaftliche Studie zum Thema „Rahmenbedingungen für Urbane Energiesuffizienz schaffen - flächensparendes Wohnen in Göttingen ermöglichen“

- Ich erkläre mich **freiwillig** damit einverstanden, an dieser Forschungsstudie teilzunehmen. Ich kann meine Teilnahme jederzeit **widerrufen** oder die Beantwortung einer Frage, ohne irgendwelche Konsequenzen **verweigern.**
- Zweck und Art der Studie wurden mir **erläutert** und ich hatte Gelegenheit, Fragen zur Studie zu stellen.
- Ich bin damit einverstanden, dass **mein Interview aufgezeichnet** und transkribiert wird.
- Ich verstehe, dass ich in jeder Phase der Forschung (bis zum 01. Juni 2022) das Recht habe, **Zugang** zu meinen eigenen personenbezogenen Daten zu erhalten, **deren Berichtigung, Löschung** oder **die Einschränkung der Verarbeitung von Daten** zu verlangen.
- Mir ist bekannt, dass meine Antworten **ausschließlich für die Zwecke dieser Studie verwendet** und **vertraulich** behandelt werden.
- Mir ist bekannt, dass, dem Standard der Universität Lund folgend, **alle personenbezogenen Daten passwort-geschütz gespeichert und nach maximal 10 Jahren gelöscht werden.**

Bitte kreuzen Sie an:

Ich bin einverstanden in der Veröffentlichten Masterarbeit

☐ mit meinem Namen, meiner Funktion und meiner Organisation/Institution zitiert zu werden

☐ nur mit meiner Funktion und Organisation/Institution zitiert zu werden

☐ nur mit meiner Organisation/Institution zitiert zu werden

☐ Direkte Zitate meiner Aussagen sollen mir vor Verwendung in der Masterarbeit zur Prüfung zugesendet werden via Email.

X

Datum, Unterschrift, Name

Bei Fragen zu dieser Studie wenden Sie sich bitte an:

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7.3 Appendix III – Policy Implementation Assessment Framework (PIAF)

Dimension	Explanation	Emerging questions
1. Resources		
Budget	Funding to support the policy implementation	Does your organisation/institution have enough financial resources to achieve LSR? How is funding being secured at the moment?
Human resources	Staff with time but also with adequate knowledge and skills. It therefore relates a lot to capacity and potential capacity gaps	Does your organisation/institution have enough human staff and expertise to achieve LSR? What expertise is missing?
2. Planning and Coordination		
Targeting	Policy focus on area of biggest impact	Is the target group for LSR implementation clearly identified? What groups are difficult to reach?
Guidelines and documentation	Specifying roles and responsibilities	To what extent is it clear who has to do what to achieve LSR?
Management and coordination	The rational of this is that a high capacity of implementing agencies can improve the performance. It also refers to coordination within government. It refers to questions such as who is responsible for the implementation but also the oversight of the policy. It is to work out where they might be conflicts of authority and where dependencies are too big, work out alternative ways for implementation	Are there overlapping authorities working on LSR? What institutional structures are in place to support LSR implementation? Are there any platforms to coordinate LSR implementation?
Policy alignment and sequencing	Policy coherence, conflict between different laws or policies	What other policies or laws interfere with the implementation of LSR? What other policies are prerequisites to implement LSR?
3. Leadership and Ownership		
Public Sector champion	Leaders who pioneer the policy and thus might push more for its implementation on multiple levels	Are there any specific individuals pushing for LSR?
Inclusive stakeholder engagement	Actions to include diverse actors that can facilitate or undermine the policy design or implementation	To what extent have different stakeholders been consulted in the design of the Climate Plan 2030 outlining LSR strategy/the implementation? Why and how might stakeholders disrupt implementation?
Education, messaging awareness	Education and awareness of main actors who have to implement the policy	To what extent are stakeholders already aware of existing LSR policy and its implementation? How can

		a common understanding of LSR policy be achieved?
4. Measurement and accountability		
Monitoring systems	Data systems to monitor and track implementation	How and by who is the implementation currently being monitored? What are the difficulties of monitoring LSR?
Transparency and public access to information	Systems to make information more transparent to the public	Are there any requirements to make progress of LSR implementation publicly available?
Institutional accountability	Oversight mechanisms to highlight poor implementation and ensure accountability	What are the consequences if LSR is not being implemented? How could more accountabilities be ensured?
5. Political Economy		
Power, incentives, institutional norms	Power relationships, incentives and institutional behaviour	What incentives shape actors' motivation to implement LSR? What institutional norms prevent LSR implementation?
Political priorities	Importance and urgence of policy on the political agenda on different levels of government	To what extent is LSR a political priority in Göttingen and Germany?

7.4 Appendix IV – Interview guide [translated to English]

Experts on LSR policy (MGö, FAG)

1. What is your role in your organisation?
2. What is the current state of policy? (MGö)
    a. Why was the narrative changed away from sufficiency since the masterplan?
    b. How did LSR end up in the climate plan 2030?
    c. Why is so much focus of the climate plan on information and not funding or regulation?
3. Residing for help (FAG)
    a. What was your motivation to participate? Is the intention of the project rather the communal aspect or the reduction of living space?
    b. How is the project funded?
    c. Who pushed for the project?
4. Network: How is your contact with the FAG/MGö? How is the contact with the housing associations and the EARG?
5. Implementation of X [LSR (MGö)/residing for help (FAG)] (inspired by PIAF)
    a. What hinder the implementation of X and what is needed to make it more successful?
    b. Do you have enough financial and human resources to implement?
    c. Is there any documentation to guide the implementation?
    d. Do the policies target the right topics?
    e. What are contradicting policies?
    f. To what extent is the implementation monitored?
    g. What are the consequences if X policy measures are not implemented?
    h. To what extent is your role in the implementation clear to you?
    i. Who are actors that are rather sceptical of X and might hinder the implementation? Via which platform do you communicate with other stakeholders?
    j. To what extent do people already know about X?
    k. Would you say are public sector champions?
    l. To what extent is X already a political priority?
6. What is needed from (higher levels of) government?
7. What regulation would need to change?
8. Where is more funding needed?
9. Where should information be channelled to?

Advisory Roles (BL&H)

1. What is your role in your organisation?
2. How much is LSR already part of your work?
3. New housing
    a. Europaquartier (EQ)
        i. How much was LSR considered during the planning for the EQ?
        ii. Was LSR pushed by any actor in particular? If yes, who? If no, why do you think this was not a topic?
        iii. Will there be any communal areas?
        iv. Did you consider flexible floorplans?
        v. To what extent did LSR come up in stakeholder engagements?
4. To what extent are you working together with the LSA?

5. To what extent are you working with the FAG and 'residing for help'?
6. Would you say the MGö targets the right policies to make LSR a reality? Why?
7. What conflicts with other policies or regulations do you see?
8. What are factors impeding LSR implementation?
9. What regulation would need to change?
10. Where is more funding needed?
11. Where should information be channelled to?

Influence groups (BUND), same questions for EARG

1. What is your role in your organisation?
2. To what extent is LSR already topic in your organisation?
3. To what extent do you believe LSR to be a topic in Göttingen?
4. Were you involved in the process of making LSR a topic in the Masterplan or Climate Plan? Do you support the climate plan?
5. Which other actors do you engage with and are they relevant for LSR?
6. What do you think your role is for LSR in Göttingen?
7. How are you engaging with the LSA?
8. How are you in touch with the MGö and can you/do you want to influence their politics on LSR?
9. Do you have the resources to work on LSR?
10. Do people know about the GHN?
11. Digital Platform Living: Would you promote this platform? (only BUND)
12. To what extent is LSR already a demand from your clients? (only EARG)
13. Where do you see information are most needed to enable LSR?
14. Where do you see regulation most needed to enable LSR?
15. Where do you see funding most needed to enable LSR?

Housing actors (SWG, Vhs, WgG)

1. What is your role in your organisation?
2. Do you have any policies in place that regulates the occupancy rate of your flats?
3. Moving
    a. How common and how easy is it to move withing your housing association?
    b. Do you promote moving when people stay behind in big flats after children have moved?
    c. To what extend are you working with the LSA?
4. Reconstruction
    a. How common are reconstructions for LSR within your building stock?
5. Sub renting
    a. Are your members participating in the Project 'residing for help'?
6. Vacancies
    a. Are there vacancies in your building stock?
7. Communal living
    a. Do you have communal living areas such as a guest apartment/community room and if so how well does it work?
8. New Housing
    a. To what extent do you consider LSR when you build new?
    b. Do you consider communal areas and flexible floor plans in new buildings?
9. Resources
    a. Do you have enough staff and money to engage with LSR?

10. Leadership and Ownership
    a. To what extend has LSR been a topic in your organisation?
11. Management and Coordination
    a. Which policies or regulations do you see that impede LSR?
12. Political Economy
    a. How much influence do you have on the housing politics of Göttingen and would you push for LSR?
13. Where do you see information are most needed to enable LSR?
14. Where do you see regulation most needed to enable LSR?
15. Where do you see funding most needed to enable LSR?

7.5 Appendix V – Interviewee List

Key Stakeholder	Organisation	Interviewee	Position
Local Authority	Municipality of Göttingen	Int. 1 (MGö)	-
Local Authority	Municipality of Göttingen	Int. 2 (MGö)	-
Local Authority	Municipality of Göttingen	Int. 3 (MGö)	-
NGO	*BUND Göttingen,* local section of BUND Germany (Friends of the Earth Germany)	Int 4, BUND	-
Housing	*Volksheimstätte eG*, housing cooperative founded in 1948, they have more than 2500 apartments and more than 1400 owner-occupied flats.	Int 5 Vhs	*Abteilungsleiter Vermietung* [Head of department: Renting[
Housing	*Wohnungsgenossenschaft eG Göttingen*, housing cooperative founded in 1891, they have around 12.500 members and hold 4600 housing units.	Int 6 WgG	Department Project development and new buildings
Housing	*Städtische Wohnungsbau GmbH Göttingen*, Public housing association, founded in 1960 by the city with the goal to create housing for family with lower income. They hold 4700 apartments.	Int 7 SWB	Managing Director
Non-profit organization (NPO)	*Energieagentur Region Göttingen e.V.*, they call themselves partners for energy saving, energetic modernisation and renewable energies, they provide advice for individuals and companies on energy matters and related funding options	Int 8 EA	-
NGO	*Freie Altenarbeit Göttingen e.V.*, a local association founded in 1986 that deals with housing and living in old age [Wohnen im Alter]. One of their projects was Housing for/with support [Wohnen mit/für Hilfe] which is a strategy proposed for LSR.	Int 9, FAG	Managing Director
Urban Planners	*Bankert, Linkert & Hubfeld Architekten*, architecture and urban planning office from Kassel, they are involved with the new Europe quartier [Europaquartier], a development project of the city where many new housing units will be created	Int 10, BL&H	Partner