Urban Planning facing Climate Change

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A Case Study on an Environmental Sustainable Best-Practice Example in Germany

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The chains of habit are generally too small to be felt until they are too strong to be broken.

Samuel Johnson

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Synopsis

Since decades the world has been polluted with green house gases by various emitters. Now, many countries do see recent events, such as raising sea levels, storms, dry phases and a world wide changing climate as related to these exhausts and encouraging to be addressed. In this respect many initiatives are started to cut CO_2 emissions, in which cities are included and seen as bearing many opportunities to reach this ambitious goal.

Within this thesis, a German example on a settlement development project was investigated in order to identify opportunities and limitations for urban planning in pursuing the objective to cut GHG emissions on settlements. For doing so, interviews with key actors within the planning process and a resident survey of the neighbourhood have been rolled out.

It was found that different regulatory means have been introduced on the new settlement, which aimed at a CO_2 reduction. They include means on housing construction, the physical structure of the site and legal frameworks on car usage. All regulations are well accepted by the residents and could to some extent also raise residents' environmental awareness and resulted in reduction in car-usage.

Still it was found that many regulations had to be lobbied for and that the ambitions from the municipality within the planning phase can be seen as not ambitious enough, regarding the need for cutting GHG emissions. It was further found that the maintenance of the quarters idea(l) faced difficulties. The pursue of the existing legal framework and the preference of financial neutrality within the cities budget have to be stated in this regard. Another limitation has to be seen in the effect on the broad environment, which remains limited without stronger replications of such projects.

It is in this respect suggested for urban planning to be open for new as well as old planning approaches and not to get lost in habits. It is furthermore suggested to include the issue of maintenance more deliberately into planning processes and to use urban structures for discouraging car-reduction more rigorously.

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Preface

This report, *A Case Study on an Environmental Sustainable Best-Practice Example in Germany,* was written by Alex Kalinke between February 2nd 2009 and June 11th 2009 in the 10th Semester of the study program Urban Planning and Management at Aalborg University, Denmark.

All references are applied according to the Harvard Reference Style, using the authors' name, followed by the year of the publication. In the case of multiple publications from one author within the same year, the reference is expanded with a letter for distinguishing the publications. Figures, tables and graphs without any reference are made by the author himself.

The findings of this report are relevant for people with an interest in urban planning in general and interest in environmental urban settlement development. May the readers of this report will find it useful and inspiring.

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Part One

Within Part One of the report, the field of interest, which gives the background of this work, will be outlined and the research questions presented.

This part also contains the methodological description this report used for answering the research questions.

1 Introduction

Vauban in Freiburg, a neighbourhood quarter of a refurbished and redeveloped former military site, is famous for constituting a state of the art neighbourhood focusing on ecological aspects. (Falk 2007) The planning of the quarter started in 1994, a time where urban planning was dominated by the discourse of sustainable development. In this regard Freiburg's rationale behind the development was the provision of high quality building spaces for young families and nature preservation paired with restrictions on construction and regulatory means to secure an ecological friendly environment within this neighbourhood. In this respect it was aimed at reducing car usage within the neighbourhood and promoting alternative transportation and influence the personal travel behaviour. (Freiburg 2007) (FoVa 2004)

The discourse about environmental concern under the heading of **sustainability** arose in the 1980s with the Brundtland Report. (SchwEid 2004) This discourse was elevated to a more international scale and by this a global scale in 1997 through the Kyoto Protocol. At that conference the discourse of climate change, in which not only a worldwide unsustainable development in general but CO_2 emissions in particular were seen as a point to address on a global scale got introduced. (UNFCCC 2009) Since then visible and upcoming results of the changed environment were recognised as an international problem and the demand to act globally against exploitation and harm to the environment accepted.

CO_2, one of the green house gases (GHG), **is now seen as the main contributor to climate change**, which is why many initiatives have been implemented to reduce its output in various branches like the exhaustions of cars. Globalisation and by this the opportunity to produce consumer goods anywhere in the world with an emphasis on low-cost production sites, in combination with the desire of the consumers to have access to all types of goods throughout the year, make this ambition very difficult to achieve but therefore even more important.

As human interaction with environment is broad so is the harm done to it. Deforestation, waste dumping, mining, the creation of great dams and many more can be listed. Another big contributor lies in human settlements. Since nowadays half of the world's population lives in cities and urbanised areas, human settlements have become highly concentrated agglomerations of inhabitants, housing, infrastructure and business. As a result cities demand more energy and produce more GHG emissions and waste products. This is why

cities and their surroundings play a big role for the environment and the debate about its preservation. (UN Habitat 2007) Since forecasts predict an increase in the trend of people living in cities up to 70% of the world population by 2050 (UN Habitat 2008) their output will become more and more of a problem.

Certainly, a focus on improving cities and their conditions can be only one starting point on which the issue of climate change needs to be addressed on since many other problematic areas exist. But cities comprise many fields necessary to address while anticipating a reduction of GHG emissions. Cities encompass industries, transportation means and housing, where the latter case alone contribute around one third of countries overall CO_2 emission to an increased pollution of the environment. (Power 2008) (Peterson 2007) Their concentrated and dense development bears many possibilities why an emphasis on their improvement needs to be undertaken. (Haughton and Hunter 1994) (Pacione 2005) As one of the important means on the city scale for **mitigation** and **adaptation** regarding environmental concerns, **urban planning** needs to be mentioned.

The idea that urban planning can address existing problems is not novel. Seeing the results from the industrial revolution as undesirable, movements like *Garden City* and *New Town* were pursued, offering a new understanding of the city and the environment whilst promoting a more sustainable layout for cities. In reaction to urban sprawl, *Smart Growth* became another popular movement in planning. (Pacione 2005) New and modern initiatives introduced by urban planners, urban designers and architects to react to the changing climate emphasise now **not the physical layout but the physical construction of cities**. In this respect, improvements of cities reach from the promotion of entire new settlement projects like Eco-Towns or Masdar as zero carbon settlements (Communities 2008) (Foster 2007), which under the perspective of a lifecycle assessment can never be entirely carbon neutral, over Eco-Hamlets (Gale 2008) to low or zero-carbon houses and passive house technologies, in which renewable energy, photovoltaic and improved insulation is used on inner city developments. Still, some ideas of previous planning ideologies are yet in use, like the idea of self-containing communities. Here the modern lifestyle and the employment market make it difficult to maintain or implement this ideal. From this development one can recognise a change in planning now addressing upcoming problems and issues rather than focusing only on existing problems, arisen in the past.

Still the agreed **actions** of many countries in the light of climate change **need a starting point.** Furthermore improvements on a city scale need to take into account many variables, which is why their implementation needs to be understood as a learning

process. (Kam 2002) In this regard, small developments like improvements on neighbourhoods should be seen as a chance for urban development to **learn for future city developments**. For doing so, best practice examples can be found – and indeed are found - throughout the world.

Thus not only physical or technical improvements need to be implemented and promoted widely. The best technology is not considered to be capable of reducing heating or cooling of buildings, trash production, energy waste or unnecessary car usage if the citizens do not employ it. Today it is even more important for urban planning to offer an urban environment, which is ecologically. In these developments, **regulations and boundaries need to be implemented, which discourage or minimise pollution and encourage a more public transport oriented movement of people.**

Here the example of Freiburg can be seen as a chance from which other, future developments could learn. Valuable lessons can be gained from this example, not only in how physically more economically developments can be planned and constructed but also in regard to their maintenance. It can be investigated if and how regulation means, set up by physical planning, can be implemented and to which extend and they are perceived or rejected by its residents.

1.1 Problem Formulation

The starting point of this thesis is the belief that acting in order to cope with climate change, technical changes are not sufficient enough. Furthermore it is believed that the usage of energy, materials and a reduction in congestion also needs to be seen in relation to the user. In this respect regulation and restriction means should be introduced via urban planning, which produce a more ecological sustainable neighbourhood, in which certain types of behaviour are affected, encouraged and/or discouraged.

While thinking about regulations, it appears to be a difficult task for both their introduction and acceptance. National targets for the reduction of GHG emissions are pursued on the local level. It is here the municipality, which creates through urban planning physical layouts in which restrictions and reductions can be found. But how far are governments willing to go and how far are residents willing to cut back?

Since urban planning is an activity, which shapes cities and their physical environment, it is believed that it can provide an adequate physical environment which addresses the

ecological aspects, necessary to act in line with aspirations to tackle climate change while still assuring adequate living conditions for its citizens. But how can it do so? How can urban planning regulate in a way that the exhaustion of hazardous gases gets reduced without restraining its citizens in an uncomfortable way? In this regard it is asked what can be learned from Vauban, a German neighbourhood, where ecological development was pursued ambitiously and regulations were implemented. This case gives in this sense the opportunity to investigate the issue of what is possible in planning of the urban built environment, its construction and maintenance through regulatory means and in return its acceptance by its residents.

1.2 Research Questions

In order to discuss the above raised problematic issue of creating ecological sustainable neighbourhoods through urban planning sufficiently, this thesis pursues the question of what opportunities and limitations urban planners face while creating such planned human settlements, where it is a deliberate policy to reduce impacts on the immediate and the broad environment. For doing so this thesis investigates possible regulative factors within a planned settlement, which may contribute to a more environmental sustainable neighbourhood.

For this purpose an evaluation of a best-case example of an ecological friendly neighbourhood is used, and the perception of its residents towards the implemented means are investigated. By doing so it is anticipated to answer whether ecological friendly neighbourhoods can be maintained and organised as aspired in the planning phase. Since Vauban was chosen as the best-case example, the focus of investigation lays in its concepts of reduced car usage, which constitutes a regulative approach affecting the individual the most.

These concepts aim at reducing car usage for its residents and hence anticipate gaining an impact on personal behaviour. The investigation of behavioural change towards one common trend in a neighbourhood is of special interest since nowadays cities produce rather a *Gesellschaft* (society) than a *Gemeinschaft* (community) in which individual needs and wants are dominant (Pacione 2005). To create a community with the same goals, aspirations and wishes in order to promote certain forms of behaviour and at the same time raising the possibility for citizens to change their behaviour as a general goal of urban planners and designers is in this regard an interesting and difficult approach, since it is questioned if nowadays a community life with common goals can exist and be

provided as a result of depersonalised urbanities. (Pacione 2005) However, this was attempted in Vauban.

The presented questions and their investigation will hopefully provide answers about the possibilities of urban planning, contributing to processes, which create a more climate friendly way of life in cities. It shall further be the outcome of this thesis to further describes the constraints for creating such a neighbourhood and suggests what lessons can be transferred to other (re-) development projects and the necessary content to do so. This investigation will be done under an urban planning perspective and not under a sociological angle.

Research Question

What are the opportunities and limitations for urban planning by creating planned human settlements where it is a deliberate policy to reduce impacts on the immediate and the broad environment?

Sub-Research Questions

I - Which regulatory means have been applied in Vauban?

II - How do Vauban´s residents perceive the applied regulations?

2 Methodology

This chapter describes the methodological approach used in this thesis for answering the presented research questions. It entails the design and components of the chosen approach and describes the general methods and the tools used within it. Furthermore it points out their purposes and on which research question they are applied.

2.1 Research Objectives

The work of researchers is underpinned by different objectives. Hence Kumar (2005) identifies four main research objectives: Descriptive research, correlation, explorative research or explanatory research (Kumar 2005, p.9) Hereby research is classified as ***descriptive*** if it is aimed at describing a certain phenomenon, situation, problem or programme in order to investigate what is common within the chosen topic and to lay out the characteristics of the chosen problem, situation or phenomenon. (Kumar 2005) (Kothari 2005) Goddard and Melville (2004) describe this type of research also as a case study research in which an in-depth analysis takes place in order to describe a very complex phenomenon. ***Explorative*** research tries to gain new insight into a topic which might be little or unknown for the researcher. (Kothari 2005) (Kumar 2005) ***Explanatory*** research is used in order to attempt to elucidate the cause-effect relationship between several phenomena, situations or aspects (Kumar 2005) ***Correlation*** research is applied if the researcher aims to investigate the "interrelationship between two or more aspects of a phenomenon or situation". (Kumar 2005, p.10)

It is his thesis´ purpose to investigate and outline which regulatory means urban planning can impose on new planned developments by applying a case study. In this respect this research constitutes an explorative as well as descriptive research study.

2.2 Research Approach

Within research, two main research approaches, namely qualitative and quantitative research, can be identified. Hereby ***quantitative research*** is understood as a method to explain, predict and confirm cause-and-effect relationships or phenomena by using variables through a statistical analysis, from which generalisations can be drawn. ***Qualitative research*** on the other hand is used for gaining a better understanding about a complex situation by using observatory means in order to explore, explain and describe a relationship or phenomenon. (Leedy and Omrod 2005) (Kumar 2005)

Since this study aims at gaining an insight into a given complex situation, the applied research approach is qualitative in nature. Quantitative and broad statistical investigations do not take place.

2.3 Research Design

According to Leedy and Omrod (2005) qualitative research contains five main research designs. In this respect Case Study, Ethnography, Phenomenological Studies, Grounded Theory Studies and Content Analysis are to be mentioned. (Leedy and Omrod 2005)

Thus a ***case study research*** is defined as a study about an individual programme or event in order to gain knowledge about a situation little is known about, and include the investigation of changes over time, circumstances and interventions. (Leedy and Omrod 2005) (Kumar 2005) ***Ethnography Studies*** focus according to Leedy and Omrod (2005) on a particular person, group or event, on which everyday behaviours over a certain time are investigated in depth. ***Phenomenological studies*** focus on a person's perception towards an event and its meaning with the ambition to understand the persons experiences, perceptions and understandings of a specific situation. (Leedy and Omrod 2005) ***Grounded theory studies*** aim to develop a new theory from gathered data through their analysis and a construction of a theoretical model, arising from the findings. (Leedy and Omrod 2005) ***Content analysis*** on the other hand aims to investigate the content of different sorts of communication, including books, newspaper, television and many more sources. (Leedy and Omrod 2005)

This thesis tries to investigate the opportunities and hindrances of urban planning in imposing regulatory means on new settlement developments. This intention meets the design standards of a case study, therefore this research design is chosen as the adopted approach.

2.3.1 Case Study as a Method

The point of departure of this thesis was the notion that the planning and development of ecological sustainable settlements must be underpinned by regulatory means, which might have a certain influence onto personal behaviour.

In this respect a case study as the anticipated approach is chosen since this type of study provides a qualitative research method and allows an in depth analysis of a certain field of

interest for a complex situation. (Leedy and Omrod 2005) (Yin 2003) Observation of one or more selected cases needs to be undertaken in order to accomplish satisfying answers to the introduced research question and its sub questions. Since the goal of this thesis is to understand from one implemented example, what opportunities and hindrances urban planning faces whilst introducing regulatory means on new planned settlements, a single case study approach on Vauban, a residential development in Germany, was chosen. It constitutes an exemplary case and provides a distinctive urban set up, compared to general settlement development in Germany, on which the desired problem and questions can be studied pragmatically but also critically by using qualitative methods.

2.4 Data Collection

Qualitative research consists of the usage of multiple forms of data and may include sources as identified by Leedy and Omrod (2005) and Yin (2003), such as observations, interviews, objects, written documents, audiovisual materials and electronic documents.

Hereby the research uses both primary and secondary data. ***Primary data*** is understood as data accumulated within the field of studies by the researcher itself, (Leedy and Omrod 2005) whereas ***secondary data*** consist of data already produced and available over other sources than personal accumulation, like articles, books etc. (Leedy and Omrod 2005 (Kumar 2005)

Within this research, observations, interviews and documents are used for gaining a deeper insight into the case. The documented information chosen for usage in this research includes plans and planning documents from the municipality as well as documents from parties involved in the planning process.

Interviews can be conducted in two different forms. According to Kumar (2005) interviews can be separated into structured or unstructured interviews. Unstructured interviews in his understanding provide great flexibility for the researcher since no binding structures are given; words or questions are set up in advance and allow an open and free communication with the interviewee. (Kumar 2005) Hence the researcher may benefit of gaining additional, unasked answers but gains different answers from the interviewees, which makes a comparison of the findings very difficult. (Leedy and Omrod 2005) Structured interviews on the other hand consist of a rigid structure, a set of pre-defined questions and their wording, appropriate for a comparison study. (Kumar 2005)

The interviews conducted within this case study, in relation to identified key actors will be hold face to face, using semi-structured and open-ended questions, including a few central questions. Since the goal of this set of interviews is to gain an overview about what regulative means can and should be applied but address different actors, a separate set of questions for the different interviewees will be created containing similar questions about this issue. The interview guidelines can be found in Appendix B – D.

The questions for the residents follow a structured interview guide since the aim is to gain perceptions of the resident in the neighbourhood and compare them. An identical set of questions is used for this group and can be found in Appendix A.

2.5 Sampling

An important aspect of research is sampling, here the researcher has to decide whom to include in his investigation. (Flick 2006) Thereby sampling can be understood as the filtration of an appropriate sample from a broader population (group), on which the analysis takes place. (Jupp 2006) For identifying the sample, different methods can be used. Flick (2006) identifies in this respect three main sampling strategies. ***A priori sampling***, in which different typologies such as age, job functions or social groups determine the sample, ***gradual definition sampling***, in which a group will be investigated and analysed and from which results a new group for interviewing can be determined. The third sample method is ***gradual selection sampling*** (snowball sampling). Here the interviewee determines relevant actors to which the interviewer needs to talk. (Flick 2006)

The underlying rationale of the interviews is to analyse how local implementation of regulatory means in order to secure an ecological sustainable development are perceived, accepted and maintained by the residents. Since the local municipality developed the neighbourhood in cooperation with private organisations, both parties could be identified for interview partners from the beginning. An *a priori sampling* was applied here, members of the municipality, private organisations have been identified and build together with the residents from the sample frame.

Within this frame, interview partners need to be identified. Fowler (2002) identifies several sampling strategies, such as simple random sampling, systematic samples, stratified samples or area probability sampling. (Fowler 2002) In this respect, by using ***simple random samples*** participants are chosen entirely randomly from a list or an

occasion, whereas in ***systematic sampling***, the randomly chosen participants are chosen after a pattern, i.e. every 20th person on a list. Under a ***stratified sampling*** strategy the choice underlies a pre-set arrangement of the persons on the list like their distribution after a certain region, income or so. This sample method is used when it is the aim to ensure that a certain percentage of the sample needs to be gained from a specific subgroup. ***Area probability sampling*** divides an area, such as a neighbourhood, into "mutually exclusive sub-areas with identifiable boundaries" (Fowler 2002, p.20) in which either all housing units are used as the sample or sampled again.

Since the neighbourhood in Vauban includes different types of residential areas, including car-free and parking-free areas, the sampling strategy for the residential interviewees is a combination of area probability sampling and simple random sampling. This allows gaining a random insight into the different types of residents, divided by their location.

2.6 Data Processing

To gain answers for a research question, the collected data needs to be analysed following a three-step-guide, as suggested by Monette et al. (2002) and include:

- ***Data reduction***: In order to gain insight into the gathered data and to present it in an ordered way the findings are generalised, categorised, summarised and sorted.

- ***Data displaying***: Represents an organised presentation of data and may include texts, graphs, numbers or charts, in order to enable conclusions to be drawn.

- ***Drawing conclusion and verification***: The researcher identifies meanings, patterns and causal connections within the data from which he interprets the findings and draws conclusions.

2.7 Framework

In regard to investigating a problem by research, Kumar (2005) identifies two frameworks necessary to apply: the theoretical framework and the conceptual framework.

In the ***theoretical framework***, a context around the research problem will be outlined, including theories and aspects from different authors, differentiated by themes and connected to the overriding problem of the research. (Kumar 2005)

According to Kumar (2005), the ***contextual framework*** emanates from the theoretical framework. It determines the basis of the research and lays out the aspects investigated by the research.

Within this research the theoretical framework consists of two theories: car-free neighbourhoods and compact neighbourhoods. Both together build the frame in which the research will take place. The findings from the literature study and information gained from the interviews shall be contrasted against findings from the framework.

2.8 Delimitation

This thesis wants to investigate existing opportunities and limitations within new settlement projects on a neighbourhood scale in regard to reducing GHG emissions by urban planning. Within this approach, no sociological investigation will be carried out and therefore a detailed investigation of a changed behaviour on the residents omitted. In this respect, an in depth investigation on transportation usage, regional product purchase, heating usage and cleaning behaviour are not part of this investigation.

Furthermore this research focuses on the physical structures and frameworks within a neighbourhood rather than introduced housing standards. In this respect, physical construction of houses are mentioned but are not the main focus of this report.

Since it was the aim of this study to elaborate how the residents of the quarter perceive the introduced means in order to identify if it is possible for urban planners to address both, adequate living conditions and CO_2 reduction within cities, visitors coming to the neighbourhood were not part of the investigation.

Part Two

Part Two of the report contains the theoretical background for this thesis. It goes on with the contextual framework, describing the German Planning Structure and Layers and describes the case study area by its physical context.

3 Literature Review

Within this section, a presentation of relevant literature concerning the case study will be presented. It includes different viewpoints from various authors and covers the topics of compact neighbourhood and automobile-reduced neighbourhoods.

3.1 Compact Neighbourhoods

Urban planning shapes cities and their environments in order to address existing problems or needs. In this respect many different problems are tackled. Since the car emerged, cities have adapted and formed in favour of this mode of transportation. Planners saw and still see this development as something worth addressing and aim to develop means in order to re-shape the cities towards a less car dependent environment. This chapter therefore presents ideas, found in literature, concerning the issue in favour of denser and more compact environments.

In the discussion about cities and their constitution, environmental concern is becoming more and more present. In this respect, ecological sustainability and a reduction of GHG emissions is a frequently discussed topic. Since the industrial revolution and the dominance of the car, CO_2 emissions arisen from this transportation mode became a prominent topic of discussion. As a result, methods of reducing car dependency have found a place in political discussions but also in urban planning. Roo and Miller identify transportation as one important discussion about a city, in connection with negative impacts on citizens and residents in terms of noise, odour, vibration and pollution. (Roo and Miller 2000, p.229) Haughton and Hunter (1999) add to this discussion the issue of safety and heath as negative effects alongside car-favouring development. Roo and Miller (2000) argue further that one solution to approach this problem lies in the introduction and promotion of public transportation, cycling and walking, which brings attention to a discussion about a densely built environment.

This topic is not novel. Chapin (1972) identifies movement as an important area for urban planning since he describes human activity as taking place in different parts of the city. He goes further and draws attention to urban planning of the spatial distribution of areas of activity and the movement in between. He includes work, grocery, leisure, health, shopping, education, child-care, spiritual activities and recreation activities as areas of activity. (Chapin 1997, p.242) Even before that time, such an idea existed. Le Corbusier imagined already in 1929 a new concept for cities, the ***Compact City***, which relied upon a

dense, mixed-use development, reducing travel time and maximising public transportation. (Pacione 2005)

In order to address both issues of movement to areas of activity and GHG emissions, a discussion about the creation of denser environments arose in urban planning. One prominent example is ***New Urbanism***, a design oriented approach, which focuses on compact neighbourhoods for creating less car dependent neighbourhoods and cities and was introduced in North America as an alternative to prevalent urban sprawl. (Fainstein 2000) (Cervaro and Radisch 1996) (Stubbs 2002)

Another similar idea can be found in Germany. The concept of ***City of Short Trips***, also focuses on the existing car-dependent layout of cities and promotes a neighbourhood layout, in favour of pedestrian, bicycle and public oriented movement throughout the city in a compact and mixed-use form and can be found in many German cities. (Wegener 1999) (Monheim 2009)

3.1.1 Idea(l)s of Compact Neighbourhoods

Both movements follow the notionthat a reduction of GHG emissions in cities can be achieved by reducing car dependent travel within a compact and mixed-used development and take the neighbourhood unit as a starting point for such a progress. The argument, as set by Boone & Mondarres (2006) and Kemp (2007), that such an environment reduces the need for travel, can be enhanced by statements in favour of the concept of a ***Compact City*** and include benefits Jenks identified (et al. 1996, p.56):

- Lower emissions due to fewer car-dependency and reduced travel distances
- Reduced energy consumption of housings due to the compact form and possibilities of district heating
- Urban vitality and support of local facilities
- Preservation of green spaces in rural areas

To reach these benefits Monheim (2009) and Stubbs (2002) identify several imperatives necessary for the success of a compact concept. Some of these imperatives as stated by Monheim (2009), Stubbs (2002) and Jenks (et al. 1996) are:

- Mixed-used development (combination of living, working and shopping)
- A dense development structure
- Walking distances between areas of activity
- Access to public transportation
- Pedestrian and bicycle friendly street patterns
- Sufficient accommodation of growth
- Economic viability
- Ecologic integration and protection of quality of life

Since all these imperatives aim at creating an environment in which alternatives of motorised movement are dominant, Chapin (1997) introduces its understanding of convenience, which supports such a development. In his opinion health and safety are the main elements of the public interest which urban planning should serve. In his terms, convenience is measured in miles, blocks or travel time (Chapin 1972, p.47), thus he concludes that a higher density in cities is a requirement for convenience.

3.1.2 Argumentations around Compact Neighbourhoods

This idea is not free of criticism. Critiques of a compact urban form include those of actual changes on mobility, social and environmental problems. Within the following paragraphs, a discussion of some of these arguments will be presented.

Since Chapin recognises that some activities can be served within a community or neighbourhood, other activities can only be found outside. (Chapin 1972, p.242) This implies the necessity of such neighbourhoods being well connected to other parts of the city. Thus the idea of dense neighbourhoods bears difficulties within existing neighbourhoods, since adoptions in favour of convenience and accessibility to shops, work and other areas of activities might be impossible to introduce. In a similar vein, Jens et al. notice that *"advanced telecommunication technologies impose a reduced need for physical proximity for many forms of employment."* (Jenks et al. 1996, p. 56) The effect of reduced travel behaviour due to compact urban areas can also be seen in a critical light, regarding globalisation effects on separation of R&D (research and development) and production.

Furthermore, as argued by critics, it is unproven if such neighbourhoods actually produce a less car dependent environment due to the difficulties in measurement and inclusion of various entities for a subject of studies, which is highly complex and should not only be studied over a distance or trip oriented approach. (Maat et al. 2005) (Crane and Crepeau 1998)

Still, Cervero and Radisch (1996) conclude in their investigation on pedestrian and automobile oriented neighbourhoods that neighbourhoods with an orientation towards pedestrians and bicycles tend to have less car usage than neighbourhoods, which are not following a compact development concept are found to use walking and cycling more often to reach recreation areas and shops in their neighbourhood. Still their findings can only be validated to non-work related trips. Commuting in this respect, and the high degree of mobility expected of employees has to be seen as a factor, which can not be addressed by neighbourhood design alone. But neighbourhood density and mixed-used can affect some trips. In combination with sufficient public transportation, a broader range of effect might even be reached.

Hence, compact urban forms also promote and include mixed-use developments, different areas of activity are provided in a decentralised manner. This development of enhanced provision of activity, besides public service provision and amenities in the city centre, has an effect on travel behaviour of residents/citizens. As Naess and Jensen (2004) conclude in their findings, a well distributed pattern of areas of activity and residential areas influences the amount of travel carried out within a city and dense and concentrated city forms reduce travel distances and the usage of the car. The issue of provision of such facilities or areas of activity for residents in combination with their accessibility by either public transportation or walking distance therefore is in favour of a compact and mixed-used development and this can contribute positively to a reduction of unnecessary travel and as a result in a reduction of GHG emissions.

Another critical point mentioned by Jenks (et al. 1996) shows the difficulty of compact urban areas addressing ecological sustainability. Following their argument, compact developments work against the ambition of planners and municipalities to produce greener inner city environments since existing green and open spaces within cities have to be used for creating dense and compact environments and so reduce the amount of green space in cities.

Following the argument against inner city development, Jenks (et al. 1996) sees social problems resulting from such developments since amenities and recreation areas get reduced and have in this sense a negative effect on quality of life. They also recognise negative impacts, resulting from inner city development close to or over capacity. Their argument goes further by noting that "*unless new settlements are built, more compact cities can only be achieved through a process of making existing cities more dense, of encouraging more people to live in urban areas and of building at higher densities" (*Jenks et al. 1996, p.83). Dense city development is in this regard not seen as a positive progress.

Another aspect is added to the discussion by Roo and Miller (2000), who raise the issue of negative social effects resulting from compact urban forms. In their argument, they argue with possible hazardous effects on residents due to close proximity of residential areas and industries due to mixed-use and dense developments.

Ecological sustainable neighbourhoods therefore need to be seen with a holistic view, incorporating ecological, economical as well as social sustainability. The aspired positive results of a dense and compact development are convincing, but so are the serious arguments against it. Still, most of the above mentioned criticism does not just happen unforeseen. Critical assessments of the effects of future developments on social, economical and environment effects happen, or at least should happen in advance.

In this respect, a fine-tuned plan on a development, which encourages high density, compactness and the production of walking distances to reach different areas of activity, needs to be implemented, and react on given social and spatial contexts. A one-size-fits-all-solution cannot of course be the answer. Many aspects have to be seen while implementing *walkable* neighbourhoods and the interaction of social, economical and environmental aspects has to be set cautiously to avoid the above-mentioned problematic consequences within such a development.

3.2 Automobile-reduced Neighbourhoods

In this chapter the concept of auto-mobile reduced neighbourhoods shall be introduced. It shall be outlined what benefits and negative aspects are found in literature and which legal frameworks have to be implemented for its introduction. Since this work concentrates on a German example, only German laws were taken into consideration.

3.2.1 The Roots

The development of car-free neighbourhoods in Germany has its roots in the 1960s. At that time, city centres were to become less car dominated and therefore were adapted to the identified needs of pedestrians, namely more healthy and safer environments. ***Pedestrianisation*** is a key word in this context, a concept adopted in many other countries. It refers to streets only for pedestrian use. In this sense, closing streets for cars, provision of public transportation and parking provision in fringe areas of the city centre were introduced addressing the new identified needs of pedestrians for the inner city. (Hass-Klau 1990)

Introducing the idea of creating spaces in favour of the pedestrian in residential areas arose in the 1970s. At that time the necessity of reducing health and safety risks in residential areas got recognised. Traffic calming means which aimed on slowing down traffic was the first step, followed by restrictions of constructing parking lots within these areas. The latter point was introduced on various scales, including terraced-housing-neighbourhoods in which parking provision on the outskirts was introduced but also in large scale settlements from the 1960s and 1970s, in which due to their high density construction as a result of scarce settlement space, parking lots were reduced to a very minimum or even omitted. Today it can be seen as a universal strategy being introduced all over the world, including developing countries in order to improve pedestrians´ safety and mobility whilst also reacting on the need to decrease pollution. (Iranmanesh 2008) (Hass-Klau 1990) (Sperling 1999)

3.2.2 Main Idea

The idea of reducing cars in residential areas constitutes a counter development against a raised motorisation of citizens and follows thereby four main aspects as recognised by Sperling (1999) and Hass-Klau (1990):

- Increased safety for residents, especially elderly and children
- Provision of more space for settlements or open space
- Decrease of negative impacts on health and ecology due to reduced noise and pollution
- Promotion of alternative transportation modes

3.2.3 Means of Implementation

Within the creation of car-free neighbourhoods two main methods can be identified for its realisation. In the first, reducing of the parking lots in the neighbourhood, whereas in the second method households commit themselves to not owning a car. (Sperling 1999)

As to the first method, the existing requirement for constructing a parking lot for every household as required in the existing building codes of the municipalities has to be overcome. Since 1939 in the *Reichsgaragenordnung* (Reichs Garage Regulation) of the 3rd Reich constructors of a household have to secure a parking space for their household, in order to secure sufficient parking provision in a society of increasing motorisation. This regulation was overtaken into the regional building laws of Germany 1945. Since than many municipalities have implemented ***charters*** in which they ***reduce*** the ***creation*** of ***parking spaces*** for parts of the city to a minimum ***or*** even ***prohibit it*** entirely for some areas. (Sperling 1999) (LBO-BW 2000) (Busch 1999) (Scheurer 1998)

The second method in reducing parking space provision on a development site can be reached by ***omitting*** its ***construction through*** a legal-binding statement of the house owner to own a car. Such a statement is generally introduced as ***clauses in a sales-contract***. For such a case, land, which allows a parking lot in the future, has to be secured by the developer. (Sperling 1999) (Busch 1999) (Scheurer 1998)

Both initiatives can be found on different scales. An example of such an implementation on a small scale is Bremen. Here, a development project incorporating 23 car-free households was introduced. Parking lot provision for these households has been implemented in neighbouring areas. An example on a big scale can be found in Munich

where a project for 7.000 households with initiated with a mandatory parking space ratio of only 0,2 per household. (Sperling 1998)

3.2.4 Negative Aspects

Automobile reduced neighbourhoods are not only seen as a positive character applied to a residential area. Critics have mentioned many negative aspects. The argument concerning the practicability is a rather severe one. On one hand existing structures are difficult to be ***retrofitted***, the opportunities for introducing these kinds of neighbourhoods in existing structures are difficult. On the other hand neighbourhoods with reduced inner area parking provision are easier to implement on new development sites. Further arguments point towards the necessity of ***alternative transportation*** provision and the ***dependency*** of car-free-households on the provided lines and times of these modes. (Chapin 1972) (Sperling 1999) (Kemp 2007) (Hass-Klau 1990)

Another critical aspect lies in convenience. Parking spaces on the outskirts of a neighbourhood impose ***inconvenience*** on its residents, but also on its visitors. It is further argued by critics that residents within an area of reduced or prohibited parking opportunities experience a ***loss of flexibility*** since accessibility to the automobile is reduced and by this its utility is lessened. In times where mobility is imperative, not only for leisure activities, education or errands, but also especially in relation to work and labour, a quick and easy interconnection and accessibility of sites has to be secured according to the line of reason for the critique not unlike the argument on inconvenience. Furthermore ***safety*** is seen as an issue. Since in car-free neighbourhoods parking provision is implemented via garage parking outside of the area, critics see the garage itself and the long distances from the parking space to the home as a safety issue. (Chapin 1972) (Sperling 1999) (Hass-Klau 1990)

A further critical aspect lies in the problematic issue of implementation due to ***bureaucracy.*** Since existing structures in municipalities which might still favour the requirement of one parking lot per household have to be overcome, the introduction and implementation of a new way of thinking therefore often results in long planning processes. (Sperling 1999)

Another aspect which might cause critics to question this concept of reducing cars in neighbourhood are findings from Haefeli and Bieri (2008). They found that in car-free neighbourhoods, households who committed themselves to not owning a car, by and large represent retired people or persons in educating status below their thirties and consist of

households of mainly one to two persons. This might leave the conclusion that these neighbourhoods are not suitable for families or the working population.

3.2.5 Positive Aspects

Thus, as explained, the introduction of car-free neighbourhoods is a difficult goal. Still the concept has many positive aspects. Sperling (1999) strongly promotes this concept by stating social, fiscal and ecological benefits as a result of a reduced car-usage in neighbourhoods. Social benefits hereby include increased safety for pedestrians, the transformation of streets to playgrounds for children and meeting/socialising opportunities for residents and an overall calmer neighbourhood.

Fiscal benefits include the opportunity to reduce construction costs of a house if a commitment of a car-free household exists. Since no parking space has to be provided, its costs can be saved. (Sperling 1999) Through this arrangement a user-pays principle takes place, which supports households who, in other neighbourhoods, must pay for a parking lot regardless of an existing need for it. (Scheurer1998) Furthermore, construction of parking spaces on the outskirts of the neighbourhoods allows construction of these spaces in a more efficient manner, which saves space and in this respect less land has to be bought and provided. (Sperling 1999)

Ecological benefits include immediate as well as future benefits. Hereby the immediate reduction of pollution on the area can be mentioned as a result of less car usage in the area. Future ecological benefits can be achieved if people change their transportation modes and use more cycling, walking and public transportation. This statement is strengthened by Boone and Mondarres (2006), who recognise that decreased parking provision discourages car usage.

The latter point has to be seen in relation to public transport provision and accessibility to shops, education facilities, recreation areas and work. Moreover a provision of cycling lanes is necessary to support the scheme of car-free neighbourhoods. (Scheurer 1998)

4 Germanys Planning System and Structure

This section draws an outline of the German planning system tending to describe how federal state planning, regional planning and local planning are working together, are structured and organised. It will further outline which goals, broad and defined, can be found within these scales and by this lay out the contextual framework of this case study.

4.1 Germany's Planning Level

Germany is a democratic, federal republic. It consists of sixteen federal states, 114 regions and about 14.000 communes. In this system the state is governed by the federal government (*Bundesregierung*), the federal states by their federal state government (*Landesregierung*) and the communes by the communal government (*Magistrat or alike*). These three governmental levels produce together the spatial planning strategy for the republic. (Deutschland 2009) (BBR 2000)

In order to develop and organise the whole federal republic of Germany consistently, spatial planning is taken as a means. For this method the planning system is organised in accordance to the states ***federal structure*** encompassing ***the federal level, the federal state level and the local level***. All scales state that the republics development in a sustainable manner is mandatory whilst encompassing social, economic and environmental objectives. Concrete goals for reducing CO_2 emission are not stated in the planning documents, but can be found in economical agreements, in which they pursue a reduction of 25% until 2005 and 35% until 2012 compared to the used baseline output of 1990. (BMU 2000) (BBR 2000) (BMVBS 2006)

For ensuring sustainable development, a general and broad development framework for the whole federal republic is laid out by the federal government with its ***Regional Planning Act*** – *Raumordnungsgesetz.* This act works with overall concepts as ***guidelines for the lower tiers*** and is produced by the federal government. These concepts are substantiated within the federal level by their Federal Regional Planning Acts. (BBR 2000) (ROG 2005) In this tier the overall development concept for the individual federal state has to be sets up and is done by the federal state governments. (ROG 2005)

The ***legal responsibility*** of the implementation of these development concepts rests ***within the federal states and their local governments***. It is furthermore on the local level, where concrete action plans and concepts are defined and implemented. This is done

through zoning plans – *Flächennutzungsplan* - in which the development for the whole municipality is outlined. This document furthermore states the background for the legal-binging development plan – *Bebauungsplan* –, which cover smaller areas within the municipality. These plans state explicit how single parcels have to be developed and are the legal binding documents for developments. (BMVBS 2006) (BGB 2005) Both, zoning and legal-binding-development plan have to be made public on an early stage to inform the public and allow changes on the plans. How to make these plans public lies in the municipalities' responsibility. (BGB 2005)

For ensuring a consistent spatial development and organisation of the federal republic, the planning levels are interconnected through the ***counter flow principle*** in which the lower levels have to encompass the guidelines and goals from the next higher authority and planning level, whereas the higher planning instance needs to react upon and recognise needs from and within the lower tier. (ROG 2005, §4) (BauGB 2005) This in return can cause problems as neighbouring federal states have to coordinate their development by which goals and objective may oppose. (BBR 2000) In order to secure that development takes place under these conditions, spatial developments with a significant impact or importance have to be examined on their accordance to cross boundary cooperation and incorporation of the higher-level guidelines. (§15, ROG 2005) Henceforth development projects concerning energy production/use, material processing, waste treatment and settlement developments have to be examined on their indirect and direct impacts on humans, animals, plants, soil, climate, water, air, landscape and cultural goods. (§2 UVPG 2005)

Furthermore, all spatial developments have to be coordinated with existing sector planning organisations and administrations, including agencies such as federal landscape agency, federal agency for waste treatment, federal agency for road and traffic planning. (§14 ROG 2005) Figure 1 illustrates the interaction of the described system hierarchy and its interaction, followed by table 1 which summarises the different levels further.

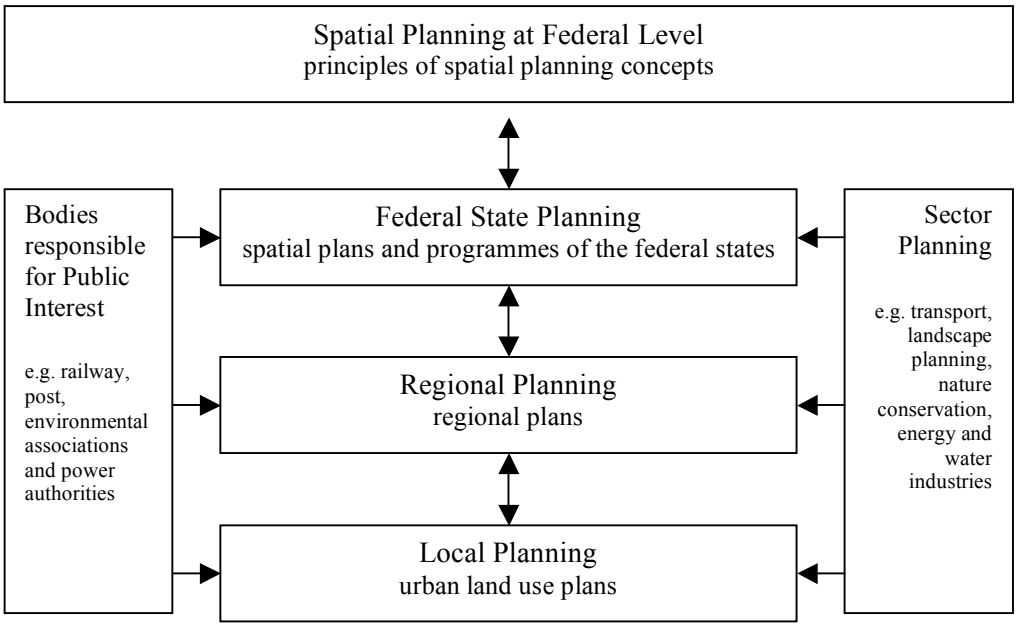

Figure 1: spatial planning system, BMVBS 2006, p. 7

Planning Tier	**Federal Level**	**Federal State level**	**Regional Level**	**Municipality Level**	**Local Area Level**
Spatial Coverage	All states	Single Federal state	Region within a federal state	Municipality	Quarters within a municipality
Function	Non-binding Guidelines	Federal State Act	Regional planning Act	Zoning Plan	Land Development Plan
Content	Guidelines for: Urban development structure Environment & land use Traffic	Goals for regional developments with: Settlement Structure Open space Traffic	Plans and means for: Settlement Open space Traffic	Determines areas for certain development: Development sites Greenspace Traffic lines	Binding specifications for parcel development in: Height Orientation Plot size …

Table 1: Germanys Planning Tier Overview, inspired by BBR 2000, pp. 4, 5

4.2 Planning Objectives at the Federal Level

Since this thesis investigates which regulations can be implemented on the local level in order to address climate change and a reduction in GHG emissions, it is necessary to look at the different planning level to find out what guidelines and objectives are set up. This allows stating if the case acted according to national objectives and further to point out where additional means were initiated.

In the Regional Planning Act, only broad guidelines and objectives can be found. However they address topics like settlements, land use and traffic. The following paragraphs outline these objectives and by this give an overview about how environmental concern is addressed in the highest planning level. The guidelines are translated on my own and may show only the main content of the selected clauses.

4.2.1 Settlements and Open Space

The main clause of the Regional Planning Act states that the whole territory shall be developed in a sustainable manner, in which social, economical and ecological aspects shall be reconciled. (ROG 2005, §1 (2)) For ensuring such a development, a well-balanced system of settlements and open spaces, with a functioning eco-system in its build- and non-build up areas shall to be pursued. (ROG 2005, §2 (1)) Hereby open spaces shall be maintained and improved and its importance for water balance, flora and fauna and the climate guaranteed or their function re-established (ROG 2005, §2 (3)) by securing, strengthening and merging greenspaces. (ROG 2005, §2 (5) (12))

Nature and landscape, including water, forest and see, shall be protected, maintained, developed and, if necessary or possible, to be recreated. Natural goods, especially soil and water shall be used gentle and derogations shall be compensated. Furthermore the prevention of air pollution shall be secured. (ROG 2005, §2 (8))

Areas shall be developed regarding reduced negative effects of traffic and additional traffic shall be avoided. Additionally, the reuse of derelict settlement areas has to be given priority over the use of open spaces and densely developed areas[1] shall be developed as residential, production and service centres. (ROG 2005, §2 (2))

[1] Densely populated area with high employment rate. Can be seen as opposed to rural areas. (UmDa 2003)

4.2.2 Traffic

An establishment of an integrated transport system and efficient gateways shall enhance the attractiveness of public transport in settlement areas (ROG 2005, §2 (5)), where a provision for environmental friendly modes of transportation shall be strengthened, especially in areas and corridors stressed by high traffic frequency. (ROG 1997, §2 (12))

4.3 Planning Objectives at the Regional Level

In general all federal states have to develop a Federal Regional Planning Act. Since the federal states are different in their natural, social and economical context different goals are strengthened. Still mandatory aspects have to be stated and explained in these acts, including central places, the planned settlement and open space structure as well as an outline about the states infrastructure. (ROG 2005, §7)

To secure transparency and allow changes to the plans the public has to be given the opportunity to comment on the Regional Planning Act in an early stage of its creation. However a public participation in its creation can only be used when spatial development is concerned about the civil society's safety and protection. (ROG 2005, §7, §15)

In order to describe the context of the case by its region, the main findings concerning environmental aspects in relation to planning, found in the Federal Regional Planning Act of Baden-Württemberg, will be outlined in brief. In this outline, the topic energy, not stated in the Regional Planning Act, is listed additionally.

4.3.1 Settlements and Open Space

In general the development of the state follows a decentralised settlement structure under the principle of sustainability in ecological, economical and social terms (LEPBW 2002, 1.1; 1.3) in which new developments shall be given priority on former settlement areas and possible open inner city spaces. (LEPBW 2002, 2.2.3.1) In this respect modernisation, restoration, revitalisation, area recycling, and an increase in density shall be strengthened to pursue and enable inner city development. In order to secure the existing ecological environment necessary settlement enhancements shall be developed in a compact form, by regarding the principle of short trips, and open spaces shall be preserved and developed towards an open space network. The latter point is in line with the principles of the Federal Nature Conservation Act, which constitutes clauses for securing existing natural green spaces and habitats of flora and fauna. (LEPBW 2002, 1.4) (LEPBW 2002, 3.2.2) (BNatSchG 2002) Moreover, developments shall be

undertaken ensuring low energy demand and be ensured with public transport provision. (LEPBW 2002, 2.2.3.3) (LEPBW 2002, 4.1.4) (LEPBW 2002, 1.9)

4.3.2 Traffic

For ensuring a more ecological development the provision of public transportation shall be enhanced. In order to promote a non-motorised movement, the accessibility of work, leisure, education and supply sites via bicycle lanes and footpaths in addition to public transportation shall be improved and taken into consideration for settlement developments to minimise emissions from transportation. (LEPBW 2002, 2.2.3.5) (LEPBW 2002, 2.2.3.6) (LEPBW 2002, 4.1.17) (LEPBW 2002, 2.2.3.2) (LEPBW 2002, 1.7)

4.3.3 Energy

Planned development shall focus on regenerative energy provision as well as the usage of modern plants and technologies for ensuring high efficiency in energy creation. (LEPBW 2002, 4.2.2) This means that the usage of hydro-, solar- and wind power, as well as biogas plants and geothermal sources shall be promoted (LEPBW 2002, 4.2.5) and means for energy reduction as well as passive solar usage shall be pursued. (LEPBW 2002, 3.1.7)

4.4 Planning Objectives at the Municipal Level

In order to provide the local context for the investigated case, this part lists the most important and mandatory city development objectives for Freiburg in regard to environmental issues.

4.4.1 Settlements and Open Space

The general objective is to give priority to inner city development on empty sites and fallow-land over development in the outskirts. (FNPF 2005, III 4.) (FNPF 2005, Appendix 1, I, 1.2, 2.2) Mixed-used development in combination with low space consuming developments shall be pursued and functional centres be created (FNPF 2005, Appendix I, I, 2.3; 2.4; 2.5) Furthermore settlements and developments shall be introduced alongside public transport lines and corridors. (FNPF 2005, Appendix I, I, 2.4) Since Freiburg constitutes a densely developed area (FNPF 2005, III 1) these objectives are in line with the objectives set up by the federal level for settlement development.

Further development objectives include a security of open space, forests, greenspaces and their interconnectivity with the city and the settlements within. It is also stated that interventions in soil shall be minimised and compensated through an equivalent mean. Moreover it is a declared objective to secure rainwater infiltration in newly planned developments and to secure and maintain river. (FNPF 2005, Appendix I, III 1; 2; 2.2)

4.4.2 Traffic

In similar vain to the Federal Regional Planning Act, automobile based transportation shall be reduced and public transportation increased. Henceforth the planning objectives set up the goal to create a tight mesh of public transportation, tram and bicycle paths in order to connect all quarters within the city and discourage car usage. (FNPF 2005, Appendix I, I, 3)

4.4.3 Energy

New planned settlements shall be constructed in a dense and low space demanding way and shall be supplied by energy from renewable sources. Additionally a decentralised heating system (combined heat power plant) shall be used within developments and existing plants substituted. (FNPF 2005, Appendix I, I, 2.4) (FNPF 2005, p.43) Hence Freiburg initiated in 2004 a concept, stating to gain henceforth 10% of the cities electricity from renewable energy sources whereby low energy and passive houses are supported and if possible mandatory to build, along with refurbishment programmes for the existing stock. (FNP F2005, p.42) The political goal to reach a CO_2 reduction of 25% until 2010 compared to 1996 does not find any explicit means in the zoning plan but is used as an argumentation for the above mentioned goals and objectives. (FNPF 2005, p.235)

4.5 Summary

In this section, the three German planning levels were examined. Thus, three main aspects, which urban development shall orientate on can be identified, namely the creation of a decentralised and balanced settlement structure for the whole state, a mixed-used development for densely developed areas within the federal states and a compact (re-) development of cities.

Within the next chapter, the neighbourhood Vauban will be described in its physical constitution. This will provide an insight into how the given spatial and urban planning objectives have been met.

5 The Case Study Area Vauban

Within this chapter, the case study area will be described. It begins with a brief historical overview of the city of Freiburg, followed by a short summary of the quarter's history. It continues with an outline of the planning and development process within the case study area and ends with a detailed description of its physical structure.

5.1 Spatial Context and Historical Background of Freiburg

Freiburg, a town within the federal state of Baden-Württemberg is situated in the south of Germany on the western edge of the black forest, close to the French and Swiss border (see Figure 2). The city's origins trace back to 1120, when Konrad and Duke Bertold III founded it as a free market town. Since then Freiburg belonged several times to Austrian and French territory until it became part of grand duchy Baden in 1806 and seat of government of the federal state of Baden in 1946. (Freiburg 2008)

Figure 2: Location of Freiburg

During the Second World War 80% of Freiburg was destroyed by and then rebuilt in the old historical style. After a rejection of building a nuclear power plant in the 1970s, Freiburg pursued a strict ecologically oriented energy supply policy. The energy concept of the city concentrated on a persuasion of photovoltaic and solar techniques. The geographical orientation and about 1.833h of sunshine per annum support this concept. The city could furthermore attract many solar institutions to locate their headquarter in the city such as the *International Solar Energy Society* (ISES) or the *Frauenhofer Institute for Solar Energy Systems,* which made the city known in Germany as the solar city. Today some 219.000 citizens reside in

FREIBURG i. Br.

Population:	219.430 (2008)
Unemployment:	8,5 (2007)
Scope:	15.306ha
Roads:	498km
Cycling Paths:	166km
Hours of sun:	1.883h/a
In commuter:	54.536 (2007)
Out commuter:	16.305 (2007)
Cars/1000 res.:	480 (2006)
ø Residents/ha:	48,1 (2008)
Mayor (until 2002):	SPD
Mayor (from 2002):	Grüne
Age (18-25):	11,8%
Age (25-45):	32,2%
Age (45-60):	18,7%
Age (60+):	21,0%
Foreigner:	14,3% (2008)

(Freiburg 2009b)

Freiburg, including about 30.000 students. (Freiburg 2008) (SoRe 2003)

5.2 Spatial Context and Historical Background of Vauban

The site of the newly planned and developed quarter Vauban lies in the south of Freiburg, about 2.5km away from the city centre and directly enclosed to the local recreational area of Schöneberg, an area of green and open space in the "three corner land" towards the boarders of Switzerland and France (see figure 3). (Sperling et al. 1999) (Freiburg 2007)

During World War II land of around 40ha was used for Nazi-barracks as a military site and was occupied in 1945 by the French army, which then used the facilities as an occupying force centre. Due to a housing shortage in Freiburg in the 1990s, voices for a transformation of the barracks into a housing area became louder and after the French military left the site in 1992 the municipality bought the area of 34,3ha dedicated for development for 40mil DM (app. 20mil €) from the federal state in 1993 with the aim for housing creation. The investment in purchasing the land and its provision of services should be compensated over the higher selling price after the development (VaAct 2000) (Freiburg 2007) (Sperling et al. 1999) (Freiburg 1994)

Figure 3: Vauban´s location in Freiburg

VAUBAN	
Population:	4.781 (2008)
Households (1-2persons):	64%
Households (3+ persons):	36%
Scope:	42ha
Cars/1000 residents:	85 (2006)
Residents/ha:	120,7 (2008)
Age (18-45):	52% (2008)
Age (45-65):	16% (2008)
Age (65+):	1,7% (2008)
Foreigner:	11,1% (2008)

(Freiburg 2008a) (StaVa 2008)

Meanwhile an independent settlement initiative (S.U.S.I) claimed some former barracks for low-income families and was able to purchase four buildings from the city in 1995, which include 45 accommodation units for rent on 3,7ha. A student union was able to purchase six former barracks for student accommodation. Furthermore the former casino was saved and used as a community centre and another barrack used as a service centre. All remaining barracks

were dedicated for demolition and replacement by new developments. (SUSI 2009) (VaAct 2000) (Sperling et al. 1999) (Diva 2009) (Freiburg 1994)

In the years between 1992 and 1996, after which the development work by the municipality began, the site was used for social purposes, including a kitchen and shelter service for the homeless and a refugee camp. Since 2006 the development of the site is completed and the neighbourhood is connected with a new tramline to the city centre. In the new residential mixed-use neighbourhood reside now about 5.000 people and the neighbourhood constitutes now the most recent developed quarter in Freiburg. (Sperling et al. 1999) (VaAct 2000)

5.3 The Development Principles for Vauban

Since the municipality dedicated the former military area for new housing development it announced an ideas competition in 1994, in which 60 planning and architecture agencies participated. In this competition principles for the new development were included. These principles were:

- Settlement for 5.000 residents
- Mixed-use with living and working *(City of Short Trips*)
- Dense settlements
- 500 jobs
- Priority for pedestrians and cyclists
- High integration of public transportation
- Minimisation of traffic area and car usage
- One parking lot per household
- Elementary school, sports facilities and day-care-centre
- Maintenance of the existing tree asset (80%)
- Mix of social groups
- Good connectivity of houses and open spaces
- Low energy and passive -house implementation
- District heating

(Freiburg 1994)

Kohlhoff&Kohlhoff, an architecture bureau from Stuttgart, won the contest and their concept got incorporated into the legally binding development plan in 1997. (Veith 2005)

To realise the concept, the municipality decided for the planning process to extend the mandatory citizen information (§3 BGB) to a citizen involvement in 1995. (Sperling et al. 1999) Within this extended citizen participation process, the municipality decided to leave the organisation of the development process to the citizens themselves, rather than planners from the municipality, a procedure not common in urban (re-) developments. In order to secure the partly outsourced development process for the new settlement quarter, the public organisation *Forum-Vauban*, a citizen lead non-profit organisation, was founded. This organisation was obliged for the development process coordination, organisation and information of (future) residents. Only legal matters were still rooted in the municipality, including the creation of legal-binding-development plans. The production of these plans took place in an also newly formed body, the *Project Group Vauban*. Proposals for the areas development and publicity means, ordinarily also in hand of the municipality, were now commissioned to the Forum which presented these proposals to the *Project Group Vauban.* This project group included members of the ruling parties of Freiburg, planning officers as well as members of the city councils administration, what made decisions passed within this body legally binding. (FoVa 2008)

Furthermore the municipality decided against a development plan covering the whole area. It was aimed at creating a quarter in which planning can take place in a flexible and adaptive manner. For this reason, the process was labelled as a "*learning planning process"* in which the development plan could and should be altered when seen as necessary. Additionally the area was divided into three construction sections (begin first section 1998 in the east, begin second section 2001 in the west, begin third section 2003 in the north) (Sperling 2002) (ÖkIn 2002). Hence the area was planned to be fully developed by 2006. This was not achieved and the process was delayed until 2010. (Freiburg 2009b) (FoVa 2008) (Sperling et al. 1999)

Within the next chapters, the Forum and its work will be presented followed by the interaction of this body with the municipality and the outcome for the planning process of this interaction.

5.4 The Development Process

This chapter presents how the development of the new settlement area has been implemented by presenting the work done by the Forum Vauban, which was commissioned for the organisation of the process and the interaction of the different actors within the process.

5.4.1 Forum Vauban

As outlined in the previous paragraph, the *Forum Vauban* was commissioned by the municipality to act as the coordinator and organiser for the whole development process. In the early stage of this process, between 1994 and 1996, the forum consisted of citizens, - mainly students - and people from environmental movements, who worked honorary for the Forum. Sponsored by a municipal budget of 40.000DM/a, allowances from the German Institute of Environment (1996 - 2002: 200.000€) and the European LIFE-programme (1997 – 1999: 700.000€), the forum could afford full time employees by 1996. The funding was also used for hiring experts, with whom the forum initiated a project, enhancing its coordination purposes - for which it was founded intentionally, towards the creation of a catalogue of measures. In this catalogue, issues on traffic, construction, energy, nature, water and living in the neighbourhood were dealt with. Furthermore the Forum's finances were covered by membership fees of about 10.000€/a. Over the years the forum grew from initially 7 members to about 400 in 2003 until it closed in 2004 due to a funding repayment to the EU. (FoVa2008a) (Sperling 2003) (Sperling et al. 1999) (Veith 2005) (Vauban 2003)

5.4.2 Addressing Future Residents

Since enhanced citizen participation for the new settlement quarter was chosen to be applied in the planning process, future resident of the quarter had to be included in the process. For this purpose the forum conducted an information campaign in 1996 in which 1.500 interested citizens as possible future homeowner or tenants were identified. (Sperling et al. 1999)

For these future residents, workshops about cooperative construction, passive houses, green spaces and street-design were initiated and proposals from the forum for the new development were presented to and evaluated by the residents. Henceforth the Forum introduced a magazine, in which current discussions and decisions were published every other month. (Sperling et al. 1999)

5.4.3 Coordination Work of the Development Process

Continuing its coordination work in the planning process, the forum furthermore participated in meetings with the *Project Group Vauban*, a new-formed planning team within the planning directorate of Freiburg. In these meetings representatives from the Forum could air proposals, suggestions and concerns about the development, from citizens and members of the Forum. Through these and meetings with members of the council in which the Forum played an informative role, participation in the political

discussions about the development was enabled and the Forums link between municipality and the citizens/future residents implemented. (Sperling et al. 1999) (Veith 2005) Figure 4 provides an overview about the interconnection of actors within the planning process.

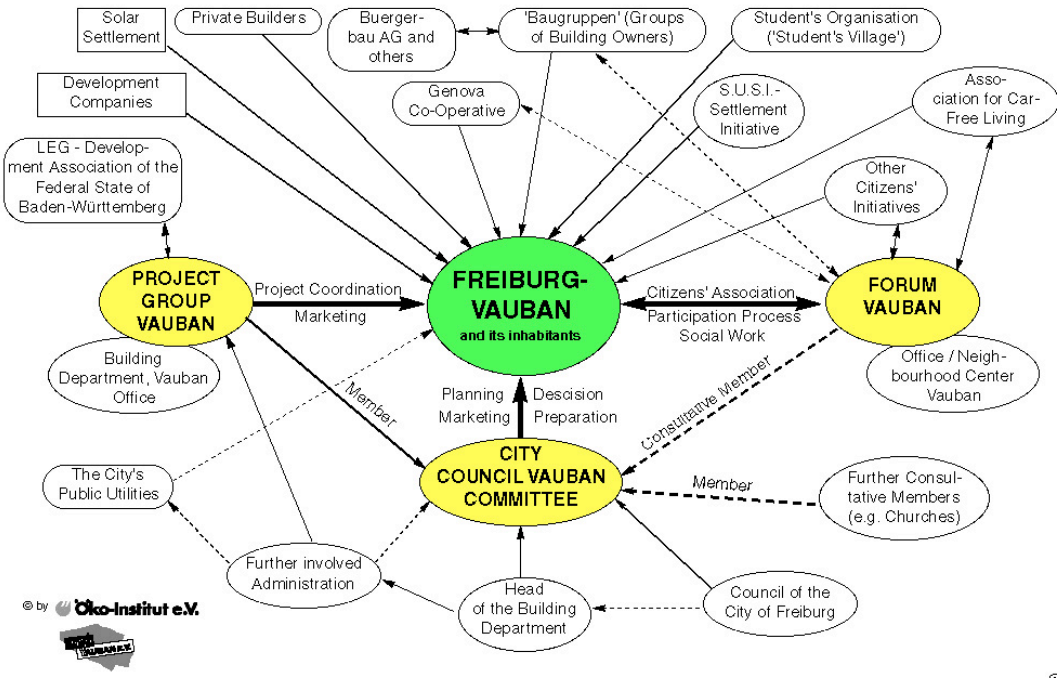

Figure 4: Actor Network Vauban

The outcomes of these meetings were enhanced objectives and development principles for the neighbourhood as initially set up from the municipality resulting in a change of the initial development plan according to the newly suggested principles. The Forum reached to include following additional principles into the revised legal binding-development plan:

- Car-free areas within the neighbourhood
- Parking provision via garages on fringe areas
- Promotion of areas dedicated for passive houses
- Creation of a market place and a community centre
- Promotion of building within co-operation building groups

(FoVa 2004) (Sperling 2002) (Veith 2005)

These outcomes show that the principles for the quarter of citizen participation, learning planning process and possible alterations of the existing development schemes were achieved and the community gained a stake into the planning and development procedure. Until the expected finish of the development process in 2006, the development plan was changed five times with detailed modifications, still within the initial overall structure of the first development plan. (Veith 2005) (Freiburg 2009)

At the end of 2006, the municipal body in charge for the development was disbanded. Hence the development process was extended until 2010 and planning matters now have to be decided by the municipal administration. This causes difficulties nowadays since no clear communication structure exists. Another problem, which occurred after the Project Group was disbanded, results from the political constitution within the municipality, which holds on old structures and therefore does not reach an agreement easily and decisions get blocked frequently. (Freiburg 2009b)

5.5 Physical Implementations in Vauban

This part elaborates the previous stated principles for the development on Vauban and describes them in more detail. Information about the sites structure, traffic system, energy concept and imperatives on housing construction is laid out in this part of the chapter.

5.5.1 Settlement Structure of the Site

In the whole area of Vauban some 2.200 households exist on about 22,5ha. This space is mainly developed for residential purposes, comprising 16,5ha for residential areas (below the blue dotted line in figure 5), in which only residential houses, buildings for cultural purposes and small shops can be built. The northern part of the neighbourhood (above the blue dotted line) consists of a 6ha mixed-use-zone and a commercial area, in which service and shopping opportunities, as well as the CHP plant and a voltage transformation station are situated, serving as a buffer to the enclosed industrial area north of the quarter.

Within the residential-only area, about two third of households are free of front-door-parking. The east of Vauban, the solar-settlement (orange area in figure 5), is an area dedicated for passive and plus energy houses only, mainly supplied by solar panels and central heating over a combined heat and power plant. In here some 60 from formerly 210 planned plus energy houses can now be found. (Freiburg 1994) (BauNVO 1993, §4) (BeP 2002) (Scheurer 2009) (Freiburg 2009b)

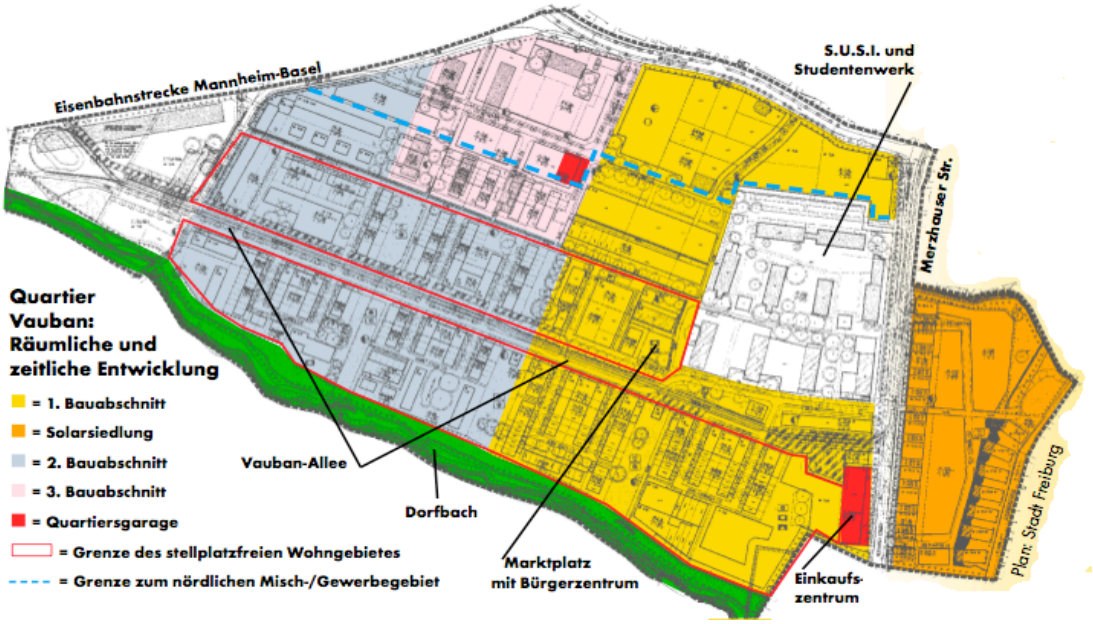

Figure 5: Development Areas

The white area includes the students' settlement *S.U.S.I.* These barracks are situated within the quarter but are not part of the development process as set up by the municipality. These barracks have been refurbished for gaining low-cost-accommodation for students and preserving the existing houses. An ecological aspect was not included in the main idea for this part of the quarter. (Freiburg 2009b) (SUSI 2009)

In Vauban reside today some 5.000 residents, making the new quarter with about 2,7 residents per household the most densely populated one in Freiburg. Still, it distinguishes from the ordinary image of a grey city, often found on dense city developments. Due to the preserved tree asset on the site, greened terraces and many arterial green spaces in north south orientation, dedicated for playgrounds and recreation, the quarter leaves the impression that one finds itself rather in a rural area than in a highly populated part of the city. The following aerial image illustrates the densely but green settlement.

Figure 6: Aerial View on Vauban in 2006

In this settlement the majority of houses on the site are owner occupied. Hence, besides buildings from owner cooperatives, several rental units exist, including rental units with and without public subsidies. Due to cutbacks from the Federal States housing programme, the number of these units needed to be reduced. Still, a shared-owned association (GENOVA) constructed in 1999 and 2001 two new houses, which include 73 rental units each, dedicated for households short in means. (GENOVA 2009) (FoVa 2004) (Scheurer 2009)

5.5.2 Imperatives on Housing Construction

The municipality decided to introduce certain restrictive criteria for the erection of buildings. In their legal-binding-land-use-plan buildings are required to confirm to a minimum height of 13m and a maximum height of 15m. (BeP 2004) Furthermore, the development principles for the site require all buildings to be built as low-energy homes as a minimum, what restricts their consumption to 65kWh/m^{2}a at the most. These building standard, as implemented in Vauban, enable standard lower consumption requirements than generally required by in the *German building regulative*. At that time, the common building standards for new buildings in Germany were 70 kWh/m^{2}a at the most and became reduced to 66 kWh/m^{2}a in 2007. (EnEv 2007) (Veith 2005)

Another aspect mandatory for constructors is the size coverage (GRZ) of 50% and the plot ratio (GFZ) of 1.5 as an average. This means, that on a parcel size of 500m^2 and a GFZ of 1.5 the house is allowed to be 750m^2 big. Hereby no detached houses were allowed for construction. Furthermore, all houses with a roof slope of less than 10° are demanded to implement roof greening and walls with less than 30% spared by doors and windows have to be greened as well. (Veith 2005) (BeP 2004) (BeP 2005) (Freiburg 1995)

Since the legal-binding-development plan does not allow restrictions concerning energy usage and other building standards than those within the *German federal building code* (BauGB) or the *German regulation for energy saving in buildings and building systems* (EnEV) the municipality has only the possibility to enhance these regulations via legal contracts. In this case, the municipality needs to own the land dedicated for development, which allows the introduction of settlement principles and development schemes including binding aspects, not able to be introduced via the legal-binding-development-plan itself. This was used in Vauban in the way that priority was given to interested parties on housing construction using renewable energy concepts and passive house standard. (Sprenger 2009)

5.5.3 Development Through Co-operation Building Groups

The concept of developing the quarter of Vauban was favouring cooperation-building groups. Big development companies were discouraged from process in order to react upon individual needs and aspirations of future house owners more flexibly. This subchapter lays out the principles of such an approach and goes further describing its implementation in Vauban.

Co-Operation Builders

Co-operation builders constitute themselves through several parties, like singles or families, who want to purchase a piece of land and develop a house or multiple houses on it together. The rationale for forming such a legal body can be found in several benefits, resulting in a co-operative lead construction. Worth mentioning are hereby reduced construction costs, early integration and closer identification with the future neighbourhood, individual housing construction and shared costs in maintenance, tax and house insurance. Still, the enhanced involvement in the construction process requires high effort and discussions throughout the whole process and may result in inconvenient compromises. (Varlemann 2009) (Burdenski et al. 2005) (W5 2009) (Sperling et al. 1999) (Habitat 2001)

To reach these benefits several steps and legal forms for a co-operation party have to be applied. These steps include, as stated by Stuttgart (2009) and W5 (2009):

- Discussions between citizens for developing common ideas and goals.
- After identifying common goals, a legal body of a planning alliance gets formed. This body can be left easily.
- With the beginning of the construction work the legal body of co-operation builders gets formed. Leaving this body becomes difficult to secure security and continuity.
- By the end of the construction, the body of co-operation builders dissolves and is replaced by the legal body of a property owner community.

Co-Operation Builders in Vauban

The above-described principles on co-operation builders were applied within the redevelopment project on Vauban in its essence. Hereby *Forum Vauban* acted as a coordinator of the future homeowner party building process. To do so it initiated meetings and workshops in which broad groups were formed around similar ideas about building size, housing type, energy supply management, usage of common rooms and other general topics. (Sperling et al. 1999)

These meetings worked as a first step for forming possible building groups around a common idea and were accompanied by information about financing and insurances for the development projects and possibilities of including ecological aspects into the new buildings through the Forum, as well as general advises about the construction and planning process from architects to the future residents. These broad groups met in regular sessions, in order to discuss the concepts further and for developing a specific concept, including issues concerning barrier-free development, energy supply and waste treatment. (Sperling et al. 1999)

This step was followed by an application of the co-operation groups, which applied for a development site/parcel at the municipality of Freiburg. Hereby questions about the planned social and household structure, ecological concept and other topics were asked through a questionnaire, followed by a personal interview with the groups. (Sperling et al. 1999)

After granting building permission, on which passive houses were prioritised, the co-

operation builder formed a legal body for constructing a house and binding plans about building equipment and materials were implemented. In respect to this body, issues concerning part-ownership and special-usage-permits needed to be resolved and stated within the legal body description. (Sperling et al. 1999) This means that the further developed the process used for constructing a house, the more difficult it became for the participants of a co-operation building party to leave the arrangement since more and more binding commitments were necessary.

The last two steps within the co-operation building process were the construction of the buildings under supervision of the future residents, the usage of the constructed objects and the entry of ownership rights into the city cadastre. Since the initiation of the development process, co-operation builders have erected about 50 buildings. (Sperling 2006) (Sperling et al. 1999)

Within some co-operation groups, further implementations, such as rainwater usage, installation of photovoltaic panels, ecological building material usage and energy efficiencies of about 55kWh/m^2a have been implemented on a voluntary basis. (Veith2005)

5.5.4 Concepts on Car-Use-Reduction

For the quarter Vauban and its goal to create an ecological sustainable, family friendly and calm neighbourhood, car usage within the neighbourhood was aimed to be reduced to a minimum. Hereby in addition to conventional ***front door parking***, which can also be found within the quarter, the two concepts of ***parking-free*** and ***car-free living*** were implemented. In the first concept, parking provision within the neighbourhood should be kept to a minimum by introducing parking provision for households owning a car on the outskirts of the neighbourhood rather than on the housing site itself, whereas in the second concept, households could commit themselves to not owning a car.

Concept of Parking Free Living

As stated in chapter 4, the Regional Building Law requires a parking lot provision for every household. But since a change of this act in 1995, a household can get an exception of a mandatory parking lot construction if two requirements are fulfilled. Firstly the constructor can assure that he does not need a parking lot, and secondly he has to assure a piece of land, on which a parking lot can be constructed, if required in the future. (LBO 2000) (Veith 2005) (Sperling et al. 1999)

In order to assure parking provision for households owning a car two types of housing developments were stated in the legal-binding-land-use-plan. In the first type of area a construction of parking lots on the ground of the parcel is allowed whereas in the second type of area their construction is prohibited. For households of the second case, a collective garage was built on the edge of the neighbourhood. Households of a parking lot free development site need to acquire a share on the garage (33.700DM, approx. 16.000€) and are only allowed to park their car there. Permanent parking in front of the houses is prohibited, only a short hold for loading and unloading is allowed. This case applies for around two third of the area, as can be seen in figure 7. (Veith 2005) (Sperling et al. 1999) (BePV 2001)

Concept of Car Free Living

Some areas in Vauban also support car-free households. In relation to these parcels, no parking lot needs to be purchased and provided. This means that households can save the additional costs for the construction or provision of a parking lot. But in order to purchase such a parcel for development, the constructor has to declare his household as car-free. This means that he commits himself, and every person living in the household, to not owning a car. Still, every household has the opportunity to change his contract with the municipality from a car-free household into a parking-free household and vice versa. For this case the *Society for Car-Free Living* (founded in 1998) bought a piece of land in the west of the quarter on which future parking lots can be erected. Hence every car-free household has to purchase a share on this land for 6.800DM (app. 3000€) for its finance. Households which change their situation to a car-free living, can sell their parking lot to the city. Within Vauban, about 430 households have committed themselves to not owning a car and are members of the *Society for Car-Free Living*. (Lange 2009) (Sperling et al. 1999) (Veit 2005) (BePV 2001)

Figure 7 points out the above described areas of parking-free development areas, marked by the letters A, B, C, E, F, G and H and the provided garages, marked by the black squares. The area for future car owners of in car-free households is marked by the grey square. In the rest of the area, parking lots are allowed on the parcel of a house or on the street.

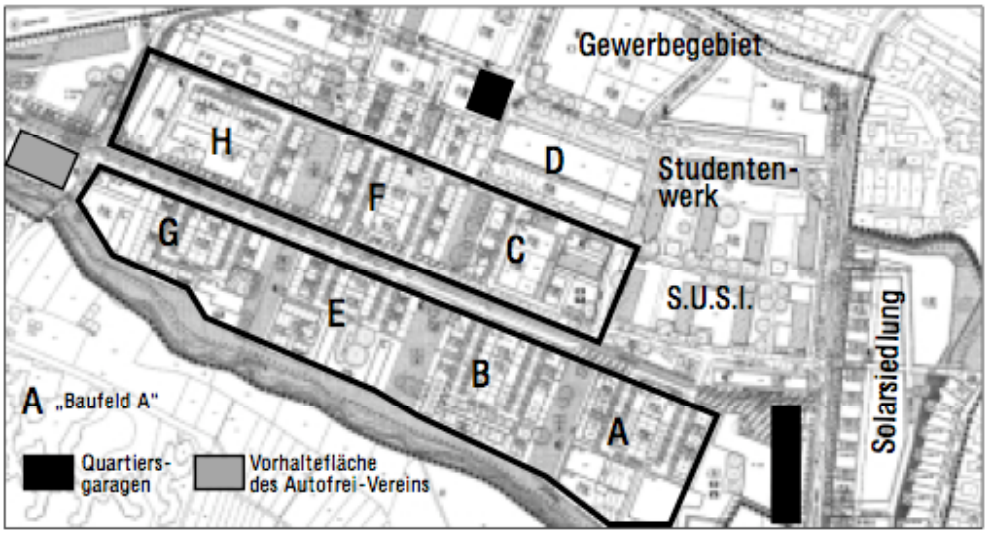

Figure 7: Parking-Free Areas

The following info-box gives an overview about the amount of households in the parking free areas, car free areas and the existing parking opportunities for all categories. Since no accurate statistics exist neither for the total amount of households nor concerning their different status, these figures are estimations, taken from the *Society for Car Free Living*.

Attribute	**Amount**
Household in total	2.200
Households Car Free	433 (20%)
Households Parking Free	≈ 1.300 (60%)
Households with Parking Lot	≈ 400 (20%)
Parking Lots in total	1.200
Garage Parking (parking free households)	470
Underground Parking (Mixed-used)	400
Public Parking	220

5.5.5 Traffic Concept

As pointed out in the previous section, parking in most of the residential areas is prohibited. In order to pursue a car-reduced environment further, 30km/h is the maximum allowed speed driven on the main streets in the quarter. All other streets are traffic-calmed streets, on which a speed limit of 5km/h is mandatory. (BeP 2004) Thus no more than three points is the quarter is connected to main traffic routes, situated in the east and north of the quarter (see figure 8). Furthermore no connections by car to other quarters can be found. This means that the traffic situation was introduced to encourage public transportation and bicycle movement, by making it difficult to use the car and restricting using the quarter as a short cut. Since the quarter was build to minimise car usage and to discourage car usage and ownership residential parking mainly takes place in garages on

the edge of the neighbourhood. Visitors have to park their cars on dedicated parking spaces, outside of the neighbourhood or on one of the 220 parking lots for public parking. For both options visitors get charged with the common fee for public parking found in the city (0,60€/h).

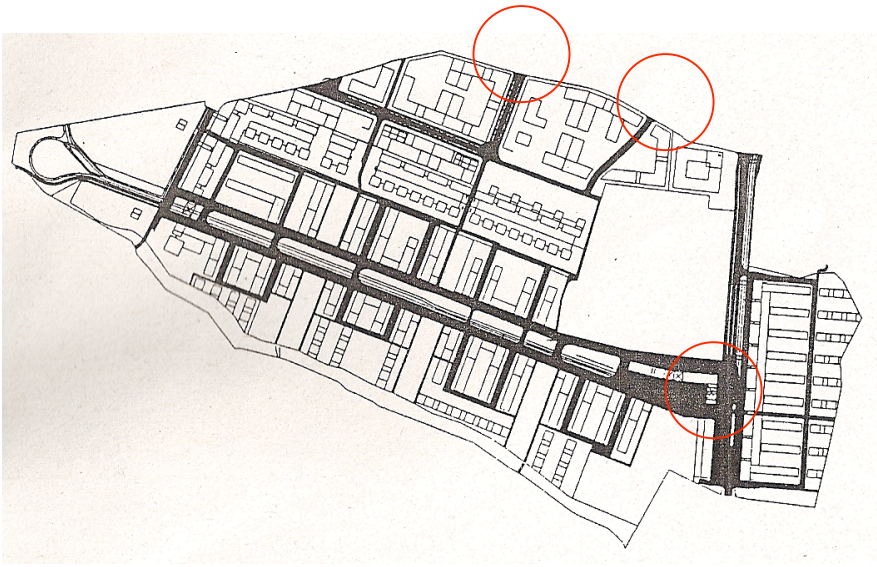

Figure 8: Street System in Vauban

Here problems occur since the public parking spaces are free of charge after 07.00pm and the weekends. This leads to the situation that some residents do not use the garage but the public parking spaces which reduces the scarce parking provision for visitors further. Another aspect is the fact that some residents do not abide by the legal scheme of parking free areas within the neighbourhood and park their cars in front of their houses, where parking is prohibited. A generally calm and relaxed atmosphere, resulting from an absence of cars, as can be seen in figure 9, gets changed and produces a more narrow and less enjoyable street, as seen in figure 10. To upkeep this concept, no further means as which can be found throughout the city, have been introduced or are planned. In this sense, signs which indicate parking areas and driving speed, as well as traffic wardens are used to facilitate the traffic concept.

Figure 9: Ideal Situation in Parking Free Area

Figure 10: Illegal Parking in Parking Free Area

In order to give the opportunity for car-free households to be mobile and not rely solely on public transportation, a car-sharing alliance (Freiburger Auto Gemeinschaft – FAG) offers the residents different types of cars. By now, the car sharing alliance offers 14 cars to the residents. Furthermore with entry in the alliance, a household receives a one-year public transportation pass and a one years subscription for a 50% reduction on all train tickets. (Sperling et al. 1999) (FoVa 2007)

Additionally to the car sharing pool, a bus system connects the city centre with the neighbourhood. In 2006 a light rail connection was introduced additionally, which runs every 10 minutes and reaches the city centre within 12 minutes. The light rail runs along the main road of the quarter and its tracks are greened, which means it is not an eyesore. (see figure 11 and 12) (Freiburg 2003)

Figure 11: Light Rail

Figure 12: Light Rail from Pedestrian Street

In this solution lies a problem; since the tracks are not secured and traffic calmed streets lead onto the main road, this can bear a safety issue for small children, who tend to play on the street and may use the green tracks also as a playground.

This concept seemingly could produce a neighbourhood in which car usage is not seen as imperative, mandatory and desired as in other parts of the city. Comparing the number of

registered cars per household in Vauban (85) towards Freiburg (430) suggests that the concept of a car-reduced neighbourhood could be implemented in Vauban. (Fabian 2008)

5.5.6 Energy Concept

As pointed out previously, housing construction in Vauban needs to ensure a low-energy-building as a minimum and building permissions are granted favouring passive house concepts. In addition, the requirements set out by the legal-binding-development-plan (BePV 2004) the whole neighbourhood needs to be connected to a combined heat and power plant. Hereby a problem with introducing the combined heat and power (CHP) plant occurred since the operating company for the electrical part of the plant faced bankruptcy. So far only the heating component of the plant is in use and electricity has to be provided from ordinary energy plants since the existing photovoltaic panels cannot provide the needed amount of electricity for the households.

In order to stimulate an introduction of even more strict standards on their new homes, several initiatives have been introduced for such a promotion including:

- Tariff-structure, benefiting a less heating consumption
- Subsidies for implementing solar panels
- Subsidies of 15% for purchasing energy efficient household appliances

In the Solar Settlement, situated in the eastern part of the quarter, only passive houses were allowed for construction. The development was pushed forward to the extent that 58 plus energy homes have been constructed, meaning passive houses combined with photo voltaic for more energy production than consumption. (PEH 2009) (SoSi 2009) (BePV 2004) Against the initial concept only half of the area dedicated for such houses was developed as passive houses. As a result of long lasting discussions between the municipality and the developer financial aspects forced the city to offer the land to another developer who introduced apartment houses in low energy standard on the site. (Sprenger 2009)

5.5.7 Social Services for Residents within the Neighbourhood

Vauban, as stated above, is not a pure residential area. It includes also a mixed-use and commercial area in which shops, service centres and other offers for the residents can be found. But also within the residential area small shopping opportunities can be found.

Alongside the about 500m long main road, which leads through the quarter, little grocery shops (orange circle), a hairdresser, a driving school, an architects bureau, a pharmacy, a bookshop and a handcraft shop can be found, situated in the black marked buildings in figure 13.

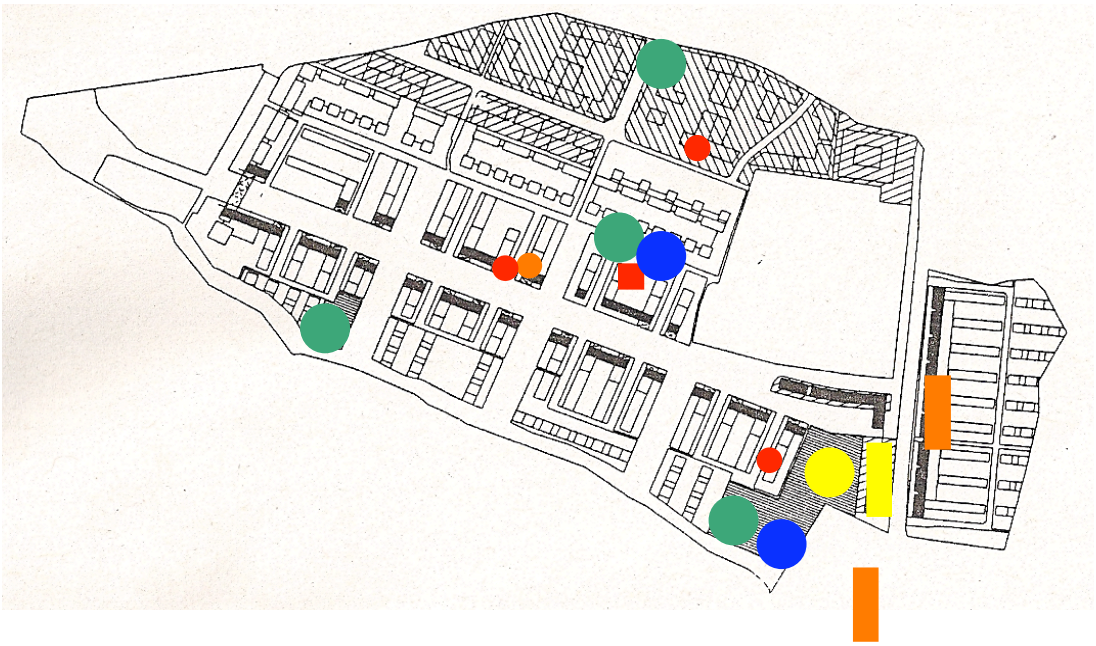

Figure 13: shopping opportunities

Right on the eastern edge, marked by the yellow square, of the quarter, included in the garage building, a big grocery store was opened. In the northern parts of the quarter, marked by the grey striped area, offices and administration, doctors, yoga studio, a computer repair centre, a bicycle shop, a canteen and other services are present. Four kindergartens, marked by the green circles, one elementary school, marked by the yellow circle, two children's and youth-clubs (blue circles) and two day-care-centres on the main route are placed throughout the quarter. Only restaurants and bars are scarce in the quarter and can only be found on the market place, the central point of the neighbourhood, marked by the red square. Still, three cafés are located within the quarter (red circles).

Furthermore the quarter offers a flea market and weekly farmers markets on the market place. Other shops, like a big discounter or a chemists shop are situated outside the quarter on the main road, accessible within 2 minutes by foot from the quarter's entrance, marked by the orange squares.

Part Three

Within Part Three of the report an evaluation of means and regulations introduced by urban planning on the example of Vauban in Freiburg is undertaken.

Special interest was laid on a scheme for a car-reduced neighbourhood and the concept of compact neighbourhoods. In this regard a survey with residents and qualitative interviews with an urban planner and parties involved in the planning process have been enrolled.

This part further contains a critical discussion about the findings with which the research questions will be answered. Furthermore recommendations for implementing regulatory means on future settlement projects will be suggested,

6 Assessment of Qualitative Interviews

It was planned to conduct qualitative interviews with key actors from the planning phase, in order to gain an insight into how far urban planning favours a new settlement development regarding ecological sustainability, as introduced in the case study area. Since the process on Vauban was not entirely led by urban planning alone, interviews with people involved in the planning process of both ends were anticipated. In this respect, interviews with a member of the Forum Vauban, Fabian Sprenger, and Hannes Linck, member of the Association for Car-free Living were conducted. Furthermore an interview with a local planning officer was carried out. Since the Project Group Vauban does not exist anymore and the planning department is short of staff, only one interview with an urban planner was conducted. This interview was not permitted for being recorded and the information gained from this interview will be used anonymously. Furthermore the interview partner was not directly involved in the planning on the new settlement. Hence this interview can only be used to gain a general insight into the existing planning perspectives of Freiburg, in regard to possibilities of urban planning to address a reduction of GHG emissions.

Within the next subchapters statements and insights from the three different parties will be laid out, concerning the means introduced on the site, the planning process, reflections about the achieved implementations and information about general upkeep of a project such as Vauban. This will contribute information relevant for answer sub-research question one – I **- Which regulatory means have been applied in Vauban**. *Since the interviews needed to be held within a tight time schedule and the questions were held open ended, some questions needed to be omitted. Furthermore, others could not be answered as a consequence of the interviewees not being involved in the earliest planning processes. Still, the main themes as introduced in the interview guidelines were addressed. Hence the gained information is distributed into themes of means of implementation, the planning process and the quarter's upkeep, rather than the questions from the interview guides itself.*

Since the interviews were conducted in German, the author has translated the following quotes.

6.1 Reflections on Means of Implementation

Within the interview with a local planning officer, how urban planning in Freiburg has the ambition to reduce CO_2 emissions within cities was addressed. Furthermore it shall be presented how a local planner sees the introduced regulations in Vauban regarding car-reduction via urban structures and the usage of compact neighbourhoods.

Within this interview, urban planning was not seen as the best tool to address this issue. As the officer stated, ***"to tackle the problem of CO_2 emissions, cities are the wrong end to begin with."*** In his opinion, political decisions, restrictions and taxation are the most fruitful point to address the issue with. Still, ecological planning objectives are pursued in Freiburg and seen as a positive development by the interviewee. These objectives include - as a general strategy for Freiburg's development - the implementation and facilitation of compact and mixed-used quarters. With this aim, it is tried to keep a city compact with economical and social vibrant quarters to strengthen the individual quarters qualities and make them less dependent from other areas. This strategy, as mentioned by the planner, helps to reduce travel and car usage and tries to preserve the surrounding open and green spaces and by this to reduce the urban footprint. Nevertheless it cannot be seen as a big step in cutting CO_2 emissions. He also noted that such a strategy cannot always be followed and bears certain problems.

The planning officer stated that Freiburg is a city which is already densely build, which is why further development towards increasing the cities density are difficult and that ***"sooner or later, open and greenspaces outside of the city need to be developed to satisfy the increasing housing need".*** Another problem he recognised lies in segregation, as a possible side effect of highly dense inner city developments.

Also mentioned by the interviewee was his point of view that the most fruitful approach to reduce CO_2 emissions within cities lies in refurbishment of the existing housing stock. Here, better insulation and the introduction of alternative energy sources as well as a more efficient energy usage need to be pursued and supported. But this type of strategy is costly and therefore difficult to implement since it has to be done on behalf of the house owners. Therefore financial incentives are needed in order to encourage house owner to improve their homes. Here Freiburg offered an overall budget for isolation within the years 2005 and 2006 financial support of 450.000€ for private insulation projects on old buildings and supports introductions of photovoltaic panels with 150€ per household in addition to available federal subsidies on this matter. (Freiburg 2007a) The municipality also undergoes refurbishment of communal stock, but since such a project is very costly,

"too little is done in this respect" as noted by the planner. According to the planner further financial support from the federal state or the federal republic is needed in this respect.

What can be done however is to set up high standards for new development projects to tackle the problem from both sides. In this respect, new houses have to be built now in passive house standard, not just low energy standard. On this issue the planner mentioned that, ***"Freiburg always wanted to go a step further than the general development."*** Still, this ambition did not seem for him being an argument for being more optimistic about the ability of urban planning to address GHG emission reduction within cities.

He saw a concept, such as in Vauban, where car usage is tried to be minimised very critical for having a broader effect. ***"People want and buy cars anyway, no matter how good a public transportation infrastructure might be."*** This hints that the interviewee does not see the influence on reducing traffic and car usage via urban planning as very approachable. He strengthened his point by stating that Freiburg attempt to keep the modal split to its current extent but this cannot be facilitated. He goes further by noting that ***"it should be on politics to introduce more taxes on car ownership, so that a reduction can be achieved."*** Still, the planning officer acknowledged that an overall car-usage reduction would be desirable and necessary to reduce the current CO_2 emissions, but does not see inner city development as strong enough. He noted further that ***"if urban planning in Europe would achieve such a development, there is still China."*** This leaves the impression that rather new and clean technologies for automobiles were seen as an approach on this issue, rather than urban planning and that the raise in automobile usage in newly developed countries counteracts such ambitions dramatically. Difficulties in acquiring these finances in addition to the voluntary implementation of refurbishments by house owners and his belief of urban planning's inability to discourage car-ownership and therefore car-usage might constitute the reason for his initial statement.

Yet the member of the *Association for Car-Free Living* who noted ***"many residents have sold their cars since the moved to Vauban"*** contradicts the planners argument of urban planning's inability to address this topic. Furthermore, the questionnaire undertaken for this report revealed that a great amount of interviewed residents use their cars less often than before, as will be shown in the next chapter. Both counter arguments support the idea that a car-reduced neighbourhood can affect the amount of car usage and that urban planning can by this contribute to reducing CO_2 emission from automobiles, even if it is not seen as very helpful from the interviewed planner. Still, the argument about newly

industrialising countries and their vastly raising numbers of automobiles, as raised above, remains strong.

Nonetheless, the planner sees a possible way for urban planning to address the necessity of introducing more ecological friendly settlements by imposition of stronger regulations on new settlements. Here he acknowledges the model of Vauban by arguing: ***"due to legal bindings, some restrictions are not able to be implemented by using the regular way of development. What can be done instead is to set up stricter rules through purchase contracts, as done in Vauban."*** Restrictions via purchase contracts can go further than legal-binding-development-plans since for the latter case existing ownership rights prohibit too narrow regulations. Imperatives for e.g. energy supply or building materials can be set as mandatory within such contracts. Still, some problems for urban planning exist in using such a solution on a wider scale as noted by the planner. He mentioned financial complications as a big hindrance since the municipality has to own the land to introduce purchase contracts on developments and secondly ***"after such contracts construction costs become more expensive, what leads to the effect that fewer land is sold, especially at the moment with the economical crisis."***

6.2 Reflections on the Planning Process

As a result of the interviews, an insight into the planning process was gained. However, none of the interviewees was active in the very initial planning phase. Therefore only insights into the processes after the very first legal-binding-development plan were gained. Still, interesting information was revealed. One major point was made from both interviewees of the *Forum Vauban* and the *Association of Car Free Living*. Both addressed the issue of strong citizen engagement as crucial for Vauban´s development, regarding the outcome of the project. Since the initial idea of the municipality did not include the scheme of an automobile reduced neighbourhood, members of the *Forum Vauban* acted "***as a push-factor for the idea"*** of introducing car free areas and the implementation of parking garages on the edges of the quarter. This idea was nevertheless not easy to introduce. Planning officers thought about this concept in the beginning as "***not realistic"*** as Hannes Link[2] pointed out and that supplemental legal advice from a lawyer was needed to prove that such a concept could be introduced regarding legal matters. "***Without such professional help, this concept would not have been implemented"*** as Fabian Sprenger recognised.

[2] member of the Association of Car Free Living

Furthermore Fabian Sprenger[3] noted that ideas such as the refurbishment of one of the old barracks to a neighbourhood centre, an area initially also dedicated for housing, as well as an introduction of a market place in the centre of the quarter instead on its northern edge as proposed from the municipality, were difficult to promote. Long lasting discussions and arguments with the planning officers were needed, but with the help of encouraged citizens, these ideas were implemented. Here, it can be noted that even within an open and participatory lead development project it is not easy to implement ideas aired by the included parties.

Still, compromises of some ideas such as on the design of the market place needed to be made. Here, Fabian Sprenger could identify two main critical points in this regard. Firstly the necessity of open and flexible political parties without which decisions cannot be made and secondly a financial budget, backing up a planning process. Since municipalities in general have a tight budget, the latter point can be seen as severe.

Hence many of the ideas aired by the *Forum Vauban* could be implemented, such as prioritisation of co-operation builders, prioritisation of passive houses, the mobility concept and solar settlement. This shows that the municipality of Freiburg was willing to implement means, extending the regular development standards and procedures in favour of an ecological sustainable neighbourhood. The results furthermore show that the used participatory planning approach was used honestly and not for backing up already made decisions, despite long lasting discussions. On some aspects the municipality also went further than required by federal states construction codes and introduced a stricter energy efficiency for buildings, preserved the existing tree asset to a large extend and favoured renewable energy supply, without being pushed from the outside.

Nevertheless, the planning process bears some drawbacks. Since the political leader ship in Freiburg changed in 2002 from *Social Democrats (SPD)* to the *Green Party (*B´90 d. Grünen*)*, the *Project Group Vauban* was disbanded as a result of the new "green" mayor. The loss of this body in addition to a conservative planning mentality from the political party lead to a reduced willingness to engage with the local residents concerning future development processes, as both Fabian Sprenger and the planning officer noted. In addition to this, Sprenger recognised that ***"after years of encouraged engagement, endless discussions and ongoing disputes, engagement of the residents becomes less, especially if one recognises a lack of interest in cooperation from decision makers."*** This development is quite interesting since one might expect a greater interest in the

[3] member of the Forum Vauban

development of cities towards environmental sustainability from a member of a party, which arose from an environmental concern in the 1990s and surpassingly still constitutes the party with the closest interest in conserving mother nature.

As a result, spaces within the quarter, initially seen as open spaces, are now being developed within the last years, but disregarding the concept of a car reduced neighbourhood. This can be seen in the development of additional apartment houses in the west of the quarter. In this area residents do not need to park their cars on the edges of Vauban, since front-door parking is enabled. This results in additional traffic throughout the quarter since cars need to drive through the whole quarter in order to reach the exits on the northeast and east.

Furthermore, the municipality decided to abandon some ideas such as the development of the solar settlement in the initial decided scope. Due to long lasting discussions between developers and the municipality interest rates became unfeasible for the municipality who, in need of refinancing the bought land, decided to construct apartment houses on half of the area of the solar settlement.

This shows that with the right political will, ideas favouring an ecological neighbourhood can be implemented. It was also visible that a strong inclusion of motivated and engaged citizens is needed in order to drive developments further and overcome existing structures. Here argumentations, discussions and compromises have to be seen as inevitable and municipal budgets as well as open-minded decision makers as critical for a successful implementation of citizen led ideas and schemes. It can also be noted that from the given insights it seems to be likely that as a result of a reduced effort of motivated citizens, planning falls back into old structures.

6.3 Reflections on Upkeep

Within the interviews the topic of maintenance was discussed, which is also addressed by the residents and presented in the following chapter. As mentioned by Link and Sprenger a lack of acceptance of the concept can be identified causing problems in its upkeep. Since the mobility concept comprises car-free living and parking-free living as two distinct characteristics, a disregard on the legal aspects could be identified on both schemes.

As described in chapter 5, car-free living is related to a financial benefit resulting from a reduced construction cost. Since a construction of a parking lot makes a difference of about 17.000€, some residents try to circumvent the system. As Link recognises, ***"some people reach a car-free living status by not mentioning car-ownership or register their car on a family member who does not live in Vauban".*** This not only creates social problems between people who own a car and bought a parking lot and those who did not buy one. But even more in terms of parking provision for visitors since parking takes place on public parking lots. Herein lies the second problem. Not all residents comply with usage of the dedicated garages. Instead, parking takes place on public spaces with a result of reduced parking provision for visitors and on residential streets, where parking is not allowed.

In this respect inconvenience seems to gain weight for some residents, resulting in disregard of legal matters. To maintain these legal matters, so far no concept was initiated, overcoming the problems resulting from wrongly parked cars. A discussion between the residential body *(Association for Car-Free Living*) and the municipality did not find a consensus yet. As Hannes Link noted, ***"it should be the municipality to uphold the legal framework by either stricter controls and imposed fees for wrongly parked cars or extending parking tickets to a 24 hour payment, including the weekends."*** This is contrasted by a planning officer who stated that ***"such a control has to be done by the residents themselves"*** since no additional traffic wardens or an extension of times for parking tickets can be introduced due to organisational and budget matters. Here a dispute about responsibility for the upkeep of the traffic concept can be observed which does not seem to be solved soon. As pointed out in chapter 5, the parking free areas rely on the residents to follow the introduced legal framework, indicated through signs. Parking on spots which are not dedicated for parking occurs in all parts of the city and is only to be controlled by traffic wardens who introduce fines for wrongly parked cars. If it should rest on the residents to maintain the parking situation, low success might be the result since no legal enforcements can be introduced through the residents and an appeal on people's consciousness or morale are the only means left.

The problem of residents who elude the car-free living conditions, set up by contracts is suggested by Hannes Link to be solved by stricter controls from the municipality as well. Here no statement from the planning officer could be gained. Such controls, as suggested by Link can be seen as beneficial but have to be seen as supplemental work for the municipal staff. This is why it cannnot be pursued to the necessary extent.

6.4 Conclusion

From these interviews four main conclusions can be made. Firstly, applying an extended citizens participation as done in Vauban can help to introduce means and regulations, which exceed the general methods and development principles of municipal lead planning programmes. Still, for such participation motivated and encouraged citizens who can fight for their ideas, as well as professional help in order to support ideas, can be seen as mandatory from the participants perspective.

Secondly, such an approach needs political support in order to be successful. Open-minded politicians and planners, willing to implement uncommon approaches and compromises, need to be seen as critical aspects when using an extended citizens participation approach. In this sense, communication of parties involved in the planning process and their willingness to identify and overcome existing problems, structures and belief are crucial for a project.

Thirdly, finances play a big role in ecological settlement development. Municipal budgets are tight and ecological sustainable settlement projects costly. Additional funding from environmental organisation or state reserves is needed to assist such projects. This also meets the matter of maintenance. Since it was noted that residents circumvent the legal systems additional resources have to be made available to work against these issues.

Fourthly, one has to be rational and acknowledge that an introduction of restrictions within a settlement, which affects the personal life and might impose inconvenience for its residents on certain aspects, are unlikely to be applied and accepted by all residents. Personal convenience will always play a part in social life and therefore control means, incentives and morale appeals will have to campaign a project, which needs personal dedication and acceptance towards introduced means. One might ask here the question if a traffic concept which aims at a discouraged car-usage whilst being reliant only on passive means as street signs, which can be disregarded easily, is sufficient. From the arguments presented it appears that some residents do not apply this mean and that consequences are too few. This suggests that such a traffic concept needs to be accompanied by more than only sign postings and more active controls by authorities are necessary. Therefore, the matter of maintenance needs to be included in planning processes more deliberately.

7 Outcomes of the Residential Questionnaire

From the outset of the research, the perception of residents on introduced regulations on a newly planned settlement should be investigated, The previous chapter introduced the physical implementations on the new settlement of Vauban and showed how urban planning can impose regulatory means favouring an ecological neighbourhood in regard to CO_2 reduction. In this chapter, the outcome of the questionnaire introduced on the quarter's residents will be laid out and the perspectives on the regulatory means evaluated. This shall give the basis for the discussion about introducing means and regulations on new planned settlements within the following chapter and contribute to answering the second sub-research question –II ***- How Do Vauban´s Residents Perceive The Applied Regulations?***

7.1 The Questionnaire Approach

As described in chapter 2, a survey should be introduced onto Vauban´s residents for gaining insight into the acceptance of residents of regulative urban planning methods introduced on the site.

Since a broad spectrum of responses was anticipated, the chosen sampling method for introducing the questionnaire to the case study's residents aimed at area probability and simple random sampling. Thus the questionnaire was introduced to residents in various areas of the quarter, at different times during the day over a period of four days. Within this period, 30 responses could be gathered, covering a broad range of residents with different ages, education and employment status as can be seen in figures 14 to 17.Since the collected questionnaires comprise only about 1% of the total population living in Vauban, it is not a representative sample since some dissatisfactions or perceptions might not be captured. Still the feedback comes close to the overall age distribution of Vauban, as well in terms of its unemployment rate. Dissimilarities between the below presented age distribution and the one presented in chapter 5 result partially from an non-incorporation of people below their mid-twenties, since the questionnaire did not aim to include these ages. Henceforth, compared to a renowned German opinion research company (Infratest dimap[4]), which uses a random sample of 1.000 citizens (which is about 0,16% for Frankfurt am Main) for political election projections, the gained feedback appears to be high enough for a representable usage. Thus the sample can be

[4] Gesellschaft für Trend- und Wahlforschung mbH (http://www.infratest-dimap.de/de/)

seen as covering the main prevalent groups in the quarter, which gives it enough validity for its purpose. Hence the results of the questionnaire were sought to provide a qualitative overview about existing difficulties within the quarter as well as to point out which aspects of the new settlement can be seen as being introduced in a good manner. The covered ages, social and educational statuses therefore allow this sample to be seen as representative in terms of the overall covered sample and its purpose.

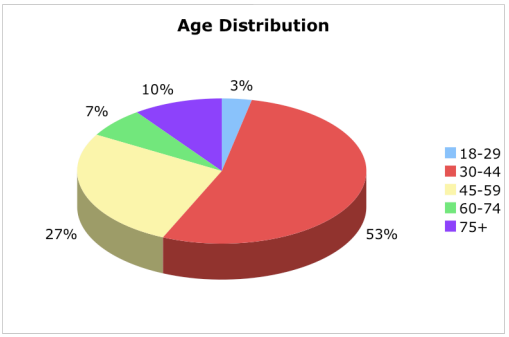

Figure 14: Age Distribution

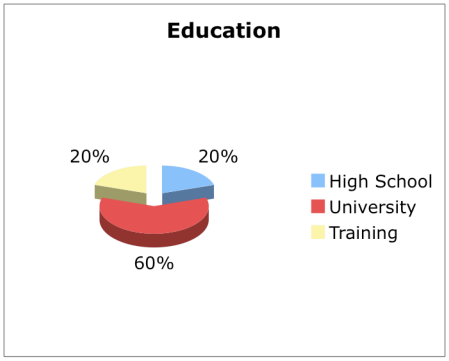

Figure 15: Education

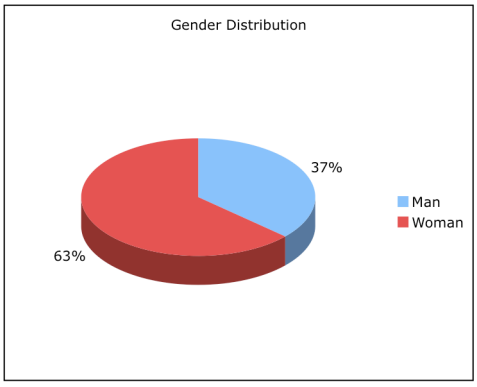

Figure 16: Gender Distribution

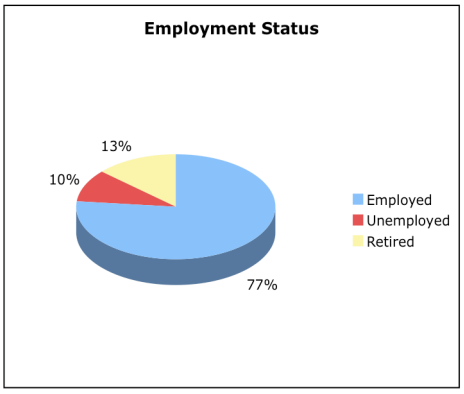

Figure 17: Employment Status

7.2 General Perspectives on the Quarter

For the analysis of the quarter questions about a general acceptance and satisfaction were included in the survey. From the given answers a positive trend towards the neighbourhood could be deduced. Two third of the respondents stated to be very satisfied with the new neighbourhood and one third stated to be fairly satisfied. No respondent stated to be dissatisfied with the general living condition in Vauban. This trend can be checked by comparing the current status of satisfaction with the neighbourhood against the satisfaction within the old living environment. Here 73% respondents could identify an improvement of the living condition in general with the new quarter. For 27% old and new living condition was seen as equal (see figure 18). This implies that the introduced regulatory means do not impose inconvenience, or result in a bad quality of life or living

condition for its residents. The fact that the majority of residents see their current living condition as improved compared with the old condition is in favour of this argument.

Analysing the reason for this satisfaction, the residents' decision for moving to Vauban was investigated. Here, the opportunity to own a house/flat was the most frequent answer followed by a family friendly environment. The least frequent answer was rooted in the opportunity to live in an ecological living environment. Other answers why people chose to move to Vauban lie in the implemented mobility concept as an active decision but can be contrasted by almost the same amount of answers which stated that due to a shortcoming of housing provision in Freiburg, Vauban was the only option available (see figure 19 on the next page).

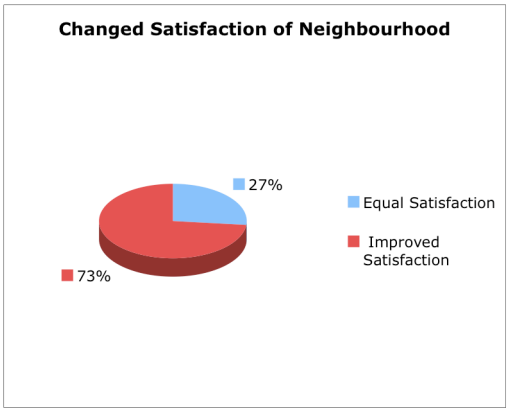

Figure 18: Neighbourhood Satisfaction

From these answers one might draw the conclusion that the concepts implemented in the quarter have been the reason for some of its residents to move to Vauban. But a fairly big amount of residents chose to live in Vauban as a result of housing needs and the scarce opportunity within Freiburg to fulfil the wish for living in ones own property. Only about half of the respondents chose to live in Vauban due to its special characteristics of mobility and ecological idea(l)s. Seen in relation to the general overwhelming positive acceptance of the quarter, these findings and a response rate of only eight residents , who see a need for improvement in the quarter suggest that the implemented regulations can be seen as generally accepted means, and not only by very ecological concerned and idealistic people. Here a first conclusion can be drawn towards a general acceptance of regulatory means favouring ecological living conditions within residential developments, which affect daily life, since only nine respondents stated that they make compromises living in Vauban. The remaining residents could not state any compromises necessary to accept as a result of their urban environment.

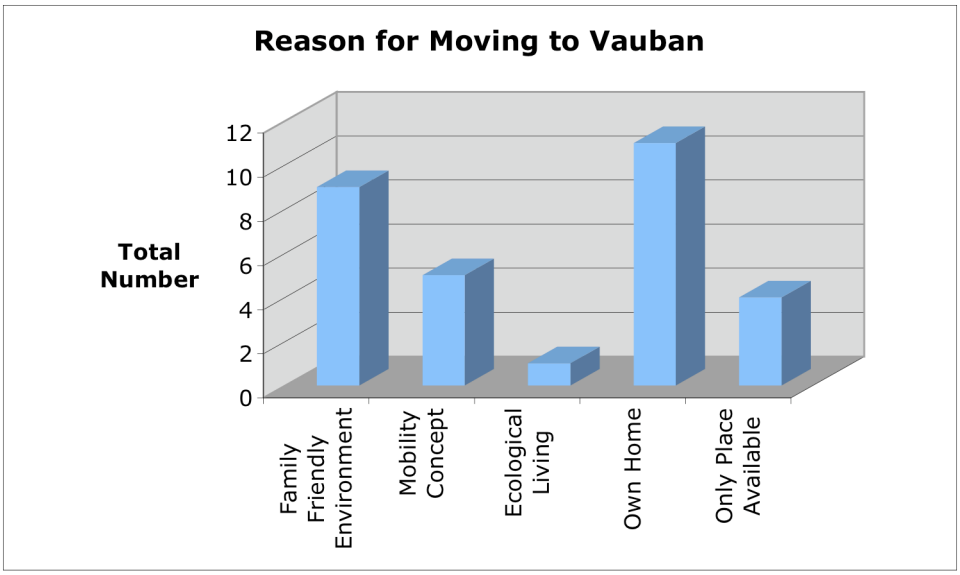

Figure 19: Reason for moving to Vauban

Within the next subchapters, findings from the investigation concerning the introduced regulatory means will be presented, covering means concerning compact neighbourhoods and car-reduced neighbourhood.

7.3 Perspectives Towards a Compact Neighbourhood

The ambitions for the new quarter as introduced in its planning phase which did not only aimed at reacting upon housing shortage within Freiburg but also on creating a family friendly environment, ecological aspects were seen as necessary to gain a high stake for the development. In this respect the reduction of cars was seen as a major imperative, serving both goals. Since a dense development with mixed-use development shall serve the daily needs and enforce pedestrian and bicycling by reducing the need for car-usage it is also open for disadvantages as discussed in chapter 3. This part of the case study's evaluation focuses on the responses of Vauban´s residents and present findings related to compact neighbourhoods, one mean introduced in the quarter.

As can be seen in figure 20, the quarter can satisfy to a high degree issues like accessibility to recreation areas, connection to the city centre and schools. Still, dissatisfaction can be investigated on issues like shopping facilities, the parking situation and to a high degree the neighbourhoods´ physical layout in regard to its density, compared to the level of satisfaction on other aspects.

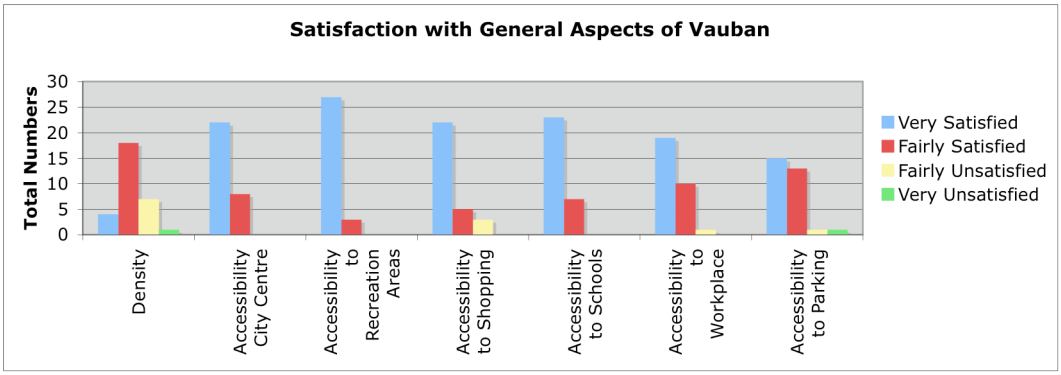

Figure 20: Satisfaction with General Aspects of Vauban

About 27% of the respondents were not satisfied with the density of the quarter. Mentioned in this respect were negative aspects connected to density like the loss of privacy, disputes with neighbours about the use of space and occurrences of noise and in some areas a lack of green and open spaces. This shows that critics' arguments about settlement development to and over capacity can result in social problems for its residents as mentioned by Jenks et al. in chapter 3. Suggestions about how to overcome this problem lay in the eyes of the residents in an abandonment of development of so far empty parcels within the quarter and the need for more tolerant, open and flexible mentalities of residents. Still, many residents pointed out that this dense neighbourhood promotes social interaction with neighbours and often results in spontaneous chats on the streets, which did not happen in the old quarters to that extent, facilitating the social life and communication between neighbours.

Regarding the outcome related to public service provision within the quarter show that Vauban´s concept of a compact neighbourhood could, despite some complaints about density, be seen as a positive implementation. As shown in figure 21, shopping opportunities and accessibility to recreation areas were improved compared to the old living condition. Equal or worse responses for factors like shopping opportunities came from people formerly living in the city centre. Hence, as pointed out in figure 22, the quarter can satisfy to a high extent needs for grocery shopping, general chopping, schools and recreation areas. Only offers for working within the quarter come short, since only three respondents stated to have their workplace within the neighbourhood. This shows, that even if daily needs can be fulfilled, the aspect of commuting, as pointed out by Cervero and Radisch (1996) in chapter 3, remains a factor, difficult to be served within a community. Still, it was not the aim of producing a self-sufficient neighbourhood. In this respect this aspect has not to be seen as a very critical point.

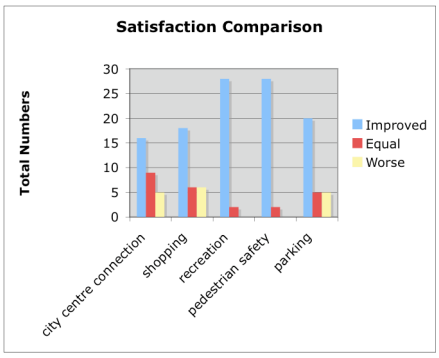

Figure 21: Satisfaction Comparison

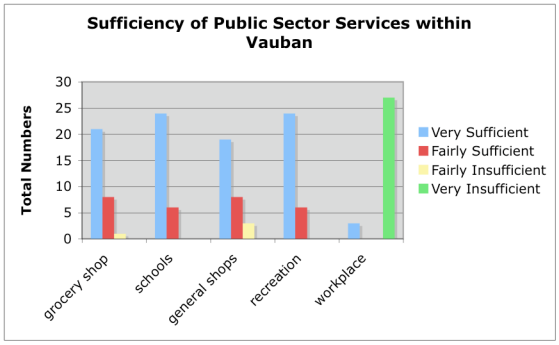

Figure 22: Sufficiency of Public Sector Services within Vauban

Hence 73% of the respondents stated to spend less time for daily errands since they moved to Vauban (see figure 23). These figures imply that offering residents basic public sector services like grocery, general shops, doctors, pharmacy, day care centres, schools and such within close proximity results in less travel time as suggested in theory. Furthermore a reduction of car-usage should be the result as pointed out in chapter 3. Figure 24 shows that actually 70% of the interviewed residents use their car less often since they moved to Vauban.

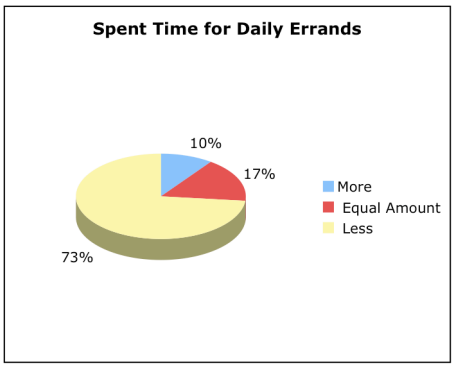

Figure 23: Spent Time for Daily Errands

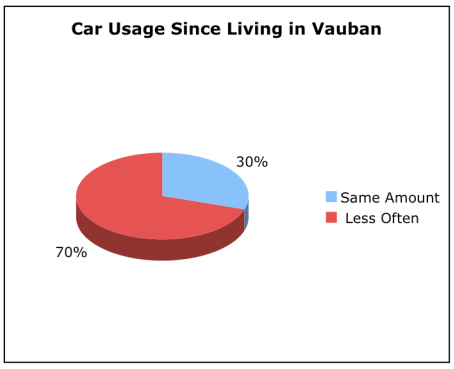

Figure 24: Car Usage Since Living in Vauban

This implies that offering shops, services, recreation areas and other need fulfilling amenities within a neighbourhood can result in changed car user behaviour and supports findings from Naess and Jensen (2004) as introduced in chapter 3. This conclusion can be substantiated by arguments from several respondents who stated that their reduced need to use the car and a reduction of time spent for daily errands results in the agglomeration of shopping opportunities like grocery or pharmacy within close proximity.

Still, many suggestions from respondents for introducing certain additional public sector services show that some needs are not served within the quarter and a trip into other neighbourhoods or the city centre is necessary. In this regard, book- and copy shops, post

office, restaurants, bars, clothing boutiques, discounter, butcher and facilities for teenager such as sport clubs were mentioned as missing but were put into perspective by additional comments such as ***"there is no need for serving everything in here***" or ***"it is not a bad thing that one needs to leave for the centre once in a while"***. Introducing these services within the quarter might influence the travel behaviour further but in the vein of the quote above, a vibrant city should not consist of autarkic quarters and the need for travelling into other parts of the city should therefore be kept to a certain degree. Still it might be asked if a neighbourhood which aimed at a car reduced environment, should not provide services and amenities to a very high degree in order to reduce car-travel as much as possible.

Within the next subchapter the residents' perception of the implementation of car reducing means will be outlined.

7.4 Perspectives Towards a Car Reduced Neighbourhood

One main regulation introduced in Vauban was the concept of reducing car-usage within the neighbourhood by imposing parking-free areas and many traffic-calmed streets. These means should favour pedestrian and bicycle usage, promote public transport usage and create a neighbourhood not only addressing environmental concerns about CO_2 reduction and noise reduction but also creating an environment which is safe for children and pedestrians in particular. Within this subchapter, residents' perception about these means and in particular the enforced discouragement of car-usage within the neighbourhood will be laid out.

According to the survey, about 80% of the respondents are living without a parking lot on their property where about one third is living car free. Only 17% of the respondents own a parking lot in front of their house (see figure 25).

These figures show that about two third of the respondents still own a car. The residents who stated not owning a car can be distributed in residents who never owned a car and residents who decided to resign car-ownership since they live in Vauban. The latter case comprises 45% of the respondents as pointed out in figure 26. The reasons for resigning car-ownership were two-fold: reduced needs due to good accessibility of services and shops by foot and public transport and an increase in ecological thinking, which lead to the decision to sell the car.

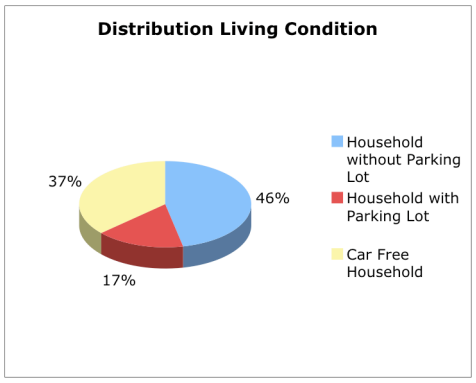

Figure 25: Distribution of Living Conditions

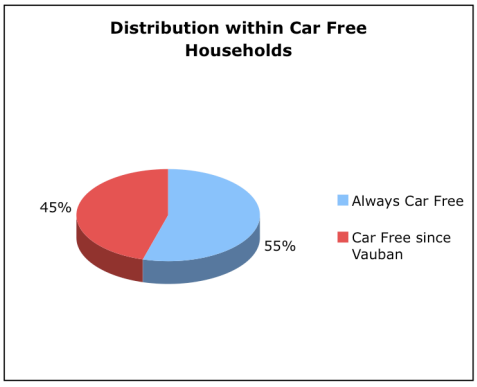

Figure 26: Distribution within Car-Free Households

Even car owners stated that they use their car less often since living in the new neighbourhood. It could furthermore be investigated that for this type of residents the reason for a reduced car usage lies in a decreased need due to improved walking distances to shops and a good public transportation accessibility. In total 70% of the respondents stated to use their car less frequently whereas 30% are still using it to the same extent as in the previous living environment. No resident stated using the car more frequently (see figure 27). Furthermore an increase of public transportation and bicycling usage could be identified as shown in figures 28 and 29. A positive effect on the user behaviour can by be stated and the possibilities of urban structures towards ecological living conditions facilitated.

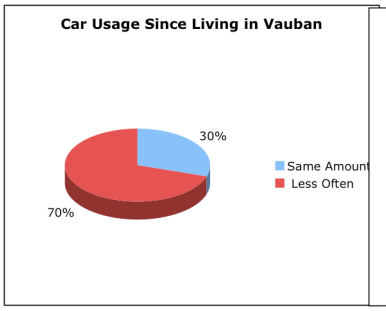

Figure 27: Car Usage Since Living in Vauban

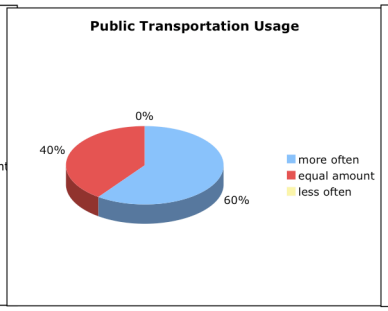

Figure 28: Public Transportation Usage Since Living in Vauban

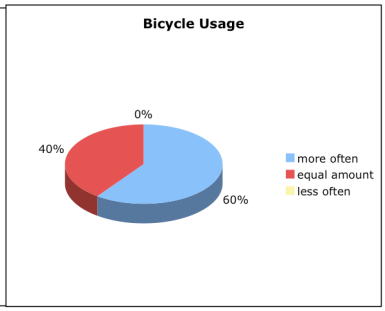

Figure 29: Bicycle Usage Since Living in Vauban

That the regulatory mean of reducing car-usage to a minimum within the quarter is widely accepted as it can be seen from both, the increase of public transportation and bicycle usage and the responses on the mobility concepts benefits and disadvantages. Only two respondents complained about the concept having a negative effect on their daily life by stating inconvenience due to the parking provision in the garages, which results in an increase of time for accessing the car. Another personal complaint was the

lack of parking provision and the difficulties resulting from the concept for people owning more than one car.

Other complainants did not see the mobility concept as imposing negative impacts on their personal life but creating difficulties for visitors. Since a lack of parking provision was given a priori and due to residents using parking lots dedicated for public parking increase, public parking provision became an even bigger problem as stated by 7 residents. Since the questionnaire focused on the quarter's residents, only speculations on the effect of this mobility concept on people not living in the quarter can be made, but it might be suggested that it could have the effect to force visitors to use public transportation for reaching the quarter as well. At this venture, this argument remains unproven.

The most frequent complaint was thereby rooted in the parking habits of some residents. Hereby it was mentioned that some residents disregard the parking regulation. The term of "wild parking" describes residents who park their car in front of their houses where parking is prohibited or use public parking lots, often even without paying the parking fee for its usage. Stricter controls by traffic wardens are seen as necessary in order to improve the concept concerning the parking regulation.

Further suggestions for the improvement of the concept are requests for speed bumpers since cars drive faster than allowed.

But despite these many complaints of the residents who aired some negative aspects about the mobility concept, this group also mentioned many positive aspects. Furthermore 60% of the respondents did not see any problems or disadvantages resulting from the mobility concept. The positive views about the concept from both groups are:

- Neighbourhood is very safe for children and converts streets into playgrounds (15)
- Neighbourhood became calmer (13)
- Cars do not pollute the streets visibly (10)
- Concept makes people think before using the car (5)

This shows that in combination with a well functioning public transportation provision and sufficient offers for the daily need, such a concept can be accepted widely and offer an alternative way of live within the city, both in terms of ecological understanding and safety issues.

7.5 Conclusion

As it was investigated within the fieldtrip, residents of Vauban accept both introduced regulatory means of compact neighbourhood and car-reduced neighbourhood to a large extent. Many positive aspects were stated and range from the creation of a calmer, more pedestrian and children friendly neighbourhood to a changed mobility usage and increase in ecological thinking as a result of the introduced schemes. Within the survey the calm and children friendly quarter was identified as the biggest advantage seen by the residents of the quarter and indicates an appreciation of the concepts rather than an acceptance.

Still complaints can be found for both means. A lack of shops and services, a disregard of the mobility concept and imposed inconvenience to some residents were investigated but in relation to the general satisfaction of the living condition in the new settlement these complaints did not affect the overall positive response.

Despite some negative points articulated by residents about the concepts, one can identify an increase in public transportation and bicycle usage from the residents as a result of their new neighbourhood. Furthermore many advantages were mentioned resulting from the concept, which leads to to the conclusion that the introduced regulations resulted in an increase of quality of life, since a calmer and safer neighbourhood was created and a reduction of car-usage can be enforced via urban planning.

This suggests that both instruments, which were seen fairly critical as pointed out in chapter 3 and 6.1, can be seen as acceptable or even appreciated when being introduced onto a new settlement and that they have a positive effect on personal transportation behaviour. No complaints were stated addressing a loss of flexibility or safety issues due to a parking situation further away from the houses. Henceforth, since the majority of respondents are found employed and above their thirties with only 17% of retired persons one can state at this point that this case rejects an argument pointed out in chapter 3, which suggested that a concept of a car-reduced neighbourhood does not work for people of their working age or families. This shows that many critical arguments about a car-reduced neighbourhood cannot be supported by this case study

As the majority of residents living in Vauban are people with higher education, one might raise the question if this acceptance and positive effects on transportation behaviour might be different within a different social context. Since this case study does not cover groups of residents with a lower education or no education to a large extent, this question remains unanswered. It can only be found that for the investigated social context, two

controversial concepts in favour of an ecological neighbourhood are accepted and do not impose much negative aspects on the personal life. On the contrary, it was found that both can be seen as a gain within an ecological and social understanding.

8 Discussion on Findings in Relation to the Sub-Research Questions

This part of the report focuses on the findings gained in chapter 6 and 7 and forms a discussion around them. It will by this give answer to sub-research question one ***(I - Which Regulative Means Have Been Applied in Vauban?)*** *and two* ***(II - How Do Vauban´s Residents Perceive The Applied Regulations?)*** *and by this provide the basis for answering the main research question, which will be answered by concluding the results of both sub-research questions in the following chapter.*

8.1 I - Which Regulatory Means Have Been Applied in Vauban?

In order to address sub-research question one, this section of the chapter focuses on the means introduced in Vauban and forms a discussion around regulations on houses, density and car-usage. Positive and negative aspects will be pointed out and their applicability for general development projects discussed.

8.1.1 Regulations on Houses

As described in chapter 5 different regulatory means were introduced in Vauban. They include regulations on housing construction as well as on the physical layout. For both aspects, the initial question of how far the municipality was willing to introduce regulatory means has been interesting. In terms of housing regulations, far-reaching mandatory means have been set up by the municipality, exceeding existing standards required by the *German Federal Building Code* as described in chapter 5. These exceeding standards included roof and wall greening, insulation standards and energy supply and have been set up from the beginning. This implies that energy reduction and efficiency on housings is seen as an important aspect by Freiburg's urban planners. From the interview with an urban planner, a statement in this respect could be gathered as quoted in chapter 6. The implementation of very low energy demanding houses and a promotion together with available subsidies for passive house constructions is in line with this statement and shows an acknowledgement that houses contribute to a large extent to energy consumption and CO_2 emission. Setting housing standards higher than required shows that in Freiburg's urban planners tried to raise the level of energy efficiency on houses to reduce their energy consumption. This is also helpful for future refurbishments on existing houses towards a better energy consumption since a good basis to work with

is provided. Furthermore, future refurbishment becomes cheaper.

This point bears in mind the problematic issue of applicability. Since Freiburg bought the land from the federal state it was able to enhance the existing standards via regulations, set up in the purchase contracts for the parcels. Since not all municipalities own the land which has to be developed and furthermore might not be able or willing to purchase it, this topic remains difficult for further application on future development projects. Imposing **stricter building regulations on new homes** on future development sites, **are** in this respect **dependent on landownership and the municipal budget**. Thus dependency on finances not only affects the ability to impose stricter building regulations on housing developers but also the ability to maintain them in the construction phase. Even despite municipal landownership, the anticipated scope of the solar settlement could not be fulfilled and imposed restrictions had to be lowered as a result of long lasting discussions with developers and the need by the municipality to gain back the made investment by selling the existing parcels. Municipal budgets need in this respect to be seen as the crucial aspect whilst talking about additional housing standards, set up by the municipality for housing projects, since their introduction might incorporate longer planning and construction phases and constitute by this a possible financial loss for the municipality.

The found standards on new houses are therefore a good step to begin addressing CO_2 emissions on houses, but contribute only to some extent to a successful and wide reaching reduction of GHG emissions in cities. In this respect it was mentioned that the greatest achievements here need to be made within existing stock. Thus, as mentioned in chapter 6, **it needs to be put more effort in existing stock refurbishment** but that here big hindrances exist. Mentioned in this respect was a reliance upon house owners and the immense costs of such projects. To overcome such hindrances, financial incentives are necessary. Some incentives, as stated previously, are already available for house owners and include state subsidies or special interest rates for debts. Still, great additional expenses are required for such projects. Since many house owners do not see the need to reinvest in their homes by making them more energy efficient, **an introduction of mandatory improvements, e.g. insulation for houses built before 1970, might give some stimulus in this sense**. Furthermore municipalities should pursue a refurbishment of the existing municipal stock. Cutting down CO_2 emissions in cities needs to concentrate on both existing and new homes. To address global warming on the city scale, whilst talking about GHG emissions from houses, it has to be recognised that the majority of emissions are produced from the existing stock. Therefore it is imperative to

not only focus on “green” new developments.

To acquire the necessary finances for such a stock refurbishment can cause difficulties for private house owners, municipalities, federal states as well as the state since existing subsidies only partially cover the necessary expanses. **Finances are here the main critical point, to pursue a GHG emission reduction in cities by focusing on existing stock refurbishment**. Recognising that additional funding for such projects is imperative, it might here be questioned if municipalities or the state can offer the necessary financial incentives. Bearing in mind the financial crisis and Germanys debts as a result, accompanied by an increase in unemployment and a flattened economy it does appear that other investments will be prioritised and a necessary refurbishment of existing stock will not be pursued in the near future. Still it opens the possibility for an enhanced municipal stock refurbishment since many financial policies designed to address the financial crisis support the construction sector. It is aimed for a refurbishment of schools and other public facilities with state money. But to what extent this chance is going to be used for addressing both, state economy and CO_2 reduction on houses cannot be answered at this juncture. Thus it can be stated that a maintenance and improvement of existing stock becomes less cost intensive, if higher regulations within the construction phase had been applied in an early stage. Therefore the model of Vauban needs to be seen as a positive chance for the future, concerning refurbishment of existing stock.

8.1.2 Regulations on Density

Another regulation found in Vauban was a dense development, which was planned and pursued from the very beginning. Reacting to increasing housing needs under the aim of preserving the natural open and green spaces outside of the city, a compact city development was promoted and used. Not only a high density in terms of households per hectare but also a mixed-used neighbourhood was created, in which shopping facilities, day-care, elementary schools and recreation areas can be found. Guidelines from federal and regional planning objectives, as pointed out in chapter 4 were in this respect met.

Yet these means were not used to address housing shortage without further reaching aims but producing a family friendly dormitory neighbourhood. Instead it was also aimed at creating a quarter which is strong and less dependent on other areas, so that unnecessary travelling could be reduced. Planners seem at this point to have understood the ability of urban planning to shape a city towards a more environmental friendly development, not only regarding the urban footprint but also to offer an environment which promotes a less car-dependent daily life.

Within the interviews, it could be investigated that this development helped to reduce car-usage, resulted in less travel time for daily errands and an increase in social interaction on the streets. Still, besides these advantages this means was seen as controversial by theorists as presented in chapter 3, the interviewed planner and some residents. Since the collected sample of the survey does not allow concluding the overall very positive responses about this quarters physical structure as representing all residents´ perceptions, it is still suggested that such a dense and mixed-used development has to be seen positive in regard of the benefits towards social life and an ecological point of view. It is therefore recommended for future developments, to produce neighbourhoods on formerly developed land, in which due to given density and the physical structure, social interaction becomes easy and access to main shopping facilities and services by foot is given. This contributes not only to a good urban life but also helps preventing cities from sprawling.

Yet former barrack sites or **brownfield areas may not be available in all cities in need for an expansion, making development of undeveloped land unavoidable for many cases**. It also has to be kept in mind that close proximity of residents might result in social problems, if people lose privacy due to a very close proximity to neighbours. Therefore it is necessary to offer free spaces within such settlements to aerate the neighbourhood and use recreation areas as a buffer within a neighbourhood. Furthermore, **it should be aimed at offering enough housing provisions for lower income residents as well as public sector services**. This would help to incorporate a broad range of societies, in order **to give little chance for segregation**.

In addition to this dense development, great effort was put into preserving the existing tree asset as shown in figure 30 and 31. This shows that nature preservation plays a big role for urban planning in Freiburg and that in combination with the greening regulations on housings, nature is seen and used as a tool to adopt settlements to future temperatures. Using trees, roof and wall greenings for cooling purposes and the introduction of many green spaces within a residential area, which act as water storage and also addresses the *urban heat island effect* hints that the urban structure in Vauban does not only try to minimise emissions from houses in terms of mitigation.

Figure 30: Green Structure

Figure 31: Existing Tree Asset

Moreover it shows that a dense urban development does not necessarily lead to an abandonment of green structures, as proposed in chapter 3. Future dense developments must in this respect not to be lacking in green spaces and recreation areas, as proven by the investigated case. An introduction of greenspaces in new developments should therefore not be forgotten and can be pursued, as suggested within federal and regional guidelines in chapter 4.

8.1.3 Regulations on Car-Usage

Still, some regulatory means were not foreseen from the municipality from the very beginning of the planning phase for the new settlement. Through the extended citizen participation a mobility concept, which is not often used so far within Freiburg, was introduced. From the interview with the urban planner one could identify a strong belief in inefficiency of urban planning to address personal car-usage behaviour. The findings of the residential questionnaire however imply that an effect can actually be gained by introducing means of discouraging car usage. Since the interview covered only one urban planner it is not sure whether his belief constitutes a general planning mentality in Freiburg or acts against it. Still, the fact that the mobility concept of a car reduced neighbourhood needed to be introduced and pursued strongly through the extended citizen participation points towards a general uncertainty of urban structures being effective towards reducing car usage. **Old planning structures** therefore **seem to be prevalent and common practices being used**. This might imply in relation to planning practice two things. Firstly that new/alternative approaches are known but rejected as a result of their impracticability or secondly, that alternative approaches are not known and therefore not used. A reliance on flexible planners and decision makers, who are open to new approaches, need to be mentioned in this respect and hints that **planning an unconventional mobility concept is difficult to introduce without lobbying for it**.

Furthermore new developments on the site, which are falling back to old development principles, emphasise such a necessity. The fact that some parts, developed within the last few years on the site, do not apply the idea of a car-reduced neighbourhood anymore as a result of a changed political situation in Freiburg shows that settlement developments are great dependant on political will. This indicates that **alternative development structures need to be lobbied to a greater extent, not only within its planning phase, but also within its construction phase.**

That such lobbying was initially done by residents and engaged citizens, hints that participatory planning approaches can contribute to an initiation of ecological favouring settlement projects. It also needs to be said that such an approach has its limitations and political lobbying should not be forgotten. In this sense one might state that it appears to be likely, at least in a German planning context, that a mobility concept as found in Vauban, could be applied anywhere if political back up exists. However such a back up is strongly dependent on personal beliefs of a politician. Therefore it has to be noted that gaining such a political support can be gained easily or, in the worst case not at all due to the inability of convincing the political leadership.

Yet positive experiences can be gained from a car-reduced neighbourhood concept in terms of its acceptance and its effect on personal car-usage and can be seen as an approach which, maybe because of its relation to the compact and mixed-used neighbourhood, became well applicable. Still, one argument remains strong in this relation. As mentioned in chapter 6, it was seen questioned whether a reduction of car-usage within a neighbourhood can be seen as a great success for addressing a reduction in CO_2 emissions on a global scale. For this argument, newly industrialising countries and their increase in personal motorisation were mentioned. Seeing this development, one might question if strong efforts done in the western world in regard to reducing car-usage can be seen as fruitful or can be seen as fruitless due to such a counter development.

But such an argument cannot be seen as persuasive. It is just an argument resulting of a resignation facing an evidently great challenge and disbelief that actions, methods and idea(l)s, which try to tackle climate change by using urban planning, can be adopted in different countries and cultures. Such disbelief can be seen by the statement of the urban planner who noted that cities are the wrong end to address CO_2 emissions. But cities are seen as a point worth being tackled concerning the climate change by reducing CO_2 emissions on various levels. Attempts and approaches are visible in different countries and include new urban planning principles, such as eco-towns in England, in which not

only improved housing standards, but also means to reduce car-usage can be found. Thus, more and more cities in Germany enhance their public transportation systems and introduce strict parking regulations within cities, to discourage car-usage, as can be seen in Frankfurt. Here the inner city core lacks parking provision on purpose and consists mainly of residential parking only. But also within other cities such as Abu Dhabi (Masdar), Vienna (Florisdorf), Bern (Halen) or New York (Times Square), projects with the aim of a reduced car-usage within neighbourhoods or part of the cities can be found. This shows that ecological city development ideas spread around the globe but also that time for such a distribution of ideas and their application needs to be accepted. In this sense, good examples of settlement development in an ecological manner are necessary to work as a facilitator for such ideas and to accelerate en environmental friendly city development.

8.2 II - How Do Vauban´s Residents Perceive The Applied Regulations?

In order to provide an answer for the main research question, sub-research question two is addressed and a discussion around the perceptions of Vauban´s residents towards the introduced regulatory means outlined in this part of the chapter.

8.2.1 Upkeep of Regulatory Means by Residents

In order to discuss the new quarters success, not only physical implementations need to be discussed but also to what extent residents perceive, accept and upkeep opportunities, limitations, regulations and existing frameworks within the quarter. Here it shall not be the aim to discuss existing housing standards, but rather the quarter's physical frameworks by addressing its construction and maintenance phase. From the findings in chapter 7, a general positive feedback towards both introduced means was identified. Still both concepts incorporate some aspects, on which improvements could be made, especially on the concept of a car reduced neighbourhood.

Parking Situation

Since this concept relies, despite the given physical framework, mainly on its voluntary appliance by its residents, it is not maintained as anticipated throughout the whole quarter. **A disregard of the introduced speed restrictions was identified**, which constitutes a common problem in cities. Speed limits of 5km/h or 30km/h are often seen as inconvenient and are therefore disregarded, especially in streets, which are not equipped with street bumpers or speed cameras. An introduction of these means would certainly help to upkeep the speed limits within the quarter more strictly and result in

supplemental noise reduction and increased safety for pedestrians and children playing.

The other difficulty identified **within the mobility concept lies in** the parking concept. As stated in chapter 6 and 7, **wrongly parked cars** are regarded as an important issue for some residents. It can also be found that problems concerning this issue affect visitors, who suffer on insufficient parking provision, since some residents are not using their own parking lot on the edges of the quarter but use public parking lots instead. Furthermore some residents even parked their cars in front of their homes on streets where generally parking is prohibited. This might be explained, since a disregard of the parking concept can resolve inconvenience of longer ways to ones own car. This shows that an-upkeep of the introduced regulation on parking can also be overcome easily. But from the visit on the site, and the gathered statements of residents and interviewees, it can be concluded that such a disregard does not happen all to frequently. **The majority of the residents commit themselves to the regulation and apply them**.

Personal commitment is the key to this concept. People who moved to Vauban knew about the concept and also knew about the hereto-linked advantages and disadvantages. Since the undertaken studies do not allow a comparison study on the parking situation and their development over time, it can not be stated if the upkeep of this regulation became better or worse since the quarter was introduced. Yet it can be speculated what could improve the situation. It was suggested in chapter 6, that traffic wards are more likely to achieve success in reducing the amount of wrongly parked cars, since financial fines might convince people better than morale appeals by their neighbourhoods. By this it can be assumed that **a concept which aims at reducing car-usage can not be kept up entirely without strict active regulations and controls**, additionally to passive regulations as set up by legal and structural frameworks.

Still, as could be found in chapter 6, some residents accept a fine for their wrongly parked car in order to park closer to their homes. This leaves the impression that even with additional active regulatory means like an increase in parking controls by traffic wardens, a mobility and parking concept as introduced in Vauban can never be kept up entirely and that always a certain amount of residents will disregard such concepts and regulatory means. It also implies that residential self-effort in terms of morale appeals should be seen as a mean to facilitate such a concept. This opens up the question if a disregard of such a mobility concept and regulations on parking differ within different communities, societies or cultures, to what extent it can be applied on other sites with similar positive effects and if areas exist where such an approach would not work out at all. Since this

research focused on only one site it is difficult to answer this question. It might be assumed, that such concepts are generally transferable on new development projects but that the degree of their success in terms of acceptance might vary within regions and cities. It is suggested to undertake future investigations in this field to support or reject this assumption and to identify factors which might influence such variation. It is furthermore suggested that the mixed-use approach contributes a great deal to the application of these concepts by its residents and that settlement projects on other development areas with a similar mobility concept, should therefore provide sufficient facilities and services as well.

Compact Development

Yet, well perceived are the introduced concept of a compact neighbourhood and the provision of varying public services within it. Here many responses identified a decrease of car-usage, a decrease in daily travel time for errands, an increase in public transportation or bicycling usage and a high degree of satisfaction with public service provision within the new neighbourhood. This implies a high degree of perception towards the introduced mean of a compact neighbourhood despite its lack of certain facilities, as outlined in chapter 7. Furthermore, as a result of this acceptance and the obvious usage of the available facilities it is suggested that this part of the introduced regulations are well maintained.

Ageing Population

In this regard the issue of an ageing population within the quarter needs to be mentioned. Since children grow up and people in their working age become retired in the future, services and facilities need to be introduced in this manner on the site to satisfy upcoming needs, not being served at this stage within the settlement. Such a lack is already visible since some respondents within the questionnaire aired a need for certain facilities. Mentioned in this regard were services and facilities for young children and seniors. To what extent the quarter can serve future needs on these issues can at this point not be stated. However, it is recognised that an adaptation towards changing needs will certainly be necessary in the future, in order to avoid an increase travel time due to a lack of services for elderly and young grown ups and to maintain the idea of a neighbourhood of short trips. Future settlements should therefore plan a holistic service provision if possible, especially for quarters which are likely to comprise fluctuations in ages.

8.2.2 Upkeep of Regulatory Means by Planners

Vauban as a newly developed residential quarter was not implemented and developed within a few years. After 14 years of physical development some parcels within the quarter are still undeveloped. In this regard it is worth discussing to what extent the introduced regulatory means and ideas on the quarter were kept up by the urban planners and decision makers during the quarter's development.

Upkeep of the initially set up Ideas

Two points can be identified, affecting the quarter's maintenance from this angle. ***Firstly*** one can state **inconsistency in following the initial idea of minimising car usage within the quarter as much as possible**. In the beginning of the quarter's development, almost all parcels on which parking in close proximity to the house is allowed are situated in the mixed-used area and the commercial area, the northern part of the quarter. But **within the last years, some parcels within the residential area in the east of the quarter have been developed, where front-door parking is allowed**. Since this area can only be reached by car whilst using the main road, an increase in the inner neighbourhoods traffic occurred. Such a development can be seen as being contrary to the initial idea of keeping cars out of the residential area. This shows that **from the planner's side, an upkeep of the overall concept was not stringently pursued**. As discussed previously, long-term development projects can easily be influenced by changed personal perceptions of key decision makers within such projects. In this respect such projects are difficult to judge towards their reproduction on other cities, whilst talking about upkeep of anticipated goals.

Another point on this topic is the **development of housing provision on areas formerly zoned for open spaces** Since the municipality bought and prepared the land for settlement development, a high investment needed to be made by the city. Long lasting discussions on some housing projects resulted in fewer financial returns and in its result a lack of covering the expenses. As a result the municipality decided open parcels, formerly zoned for open land, for housing construction, in order to regain their financial loss. Furthermore the solar settlement was realised only to half of the initial planned size, also due to the need to refinance the municipal investment. This shows that economical aspects play a big role for settlement developments, not only for developers and private investors but also for the municipality. It further shows that economical incentives can interfere easily with ecological favoured ideas and that their initiation depends to a large extent on the financial background of such a project. One can state at this juncture, that the municipality, as a result of their financial situation, could not maintain the initial idea

of the quarter's development. Upcoming projects need in this respect to secure their financial background sufficiently or, if lead by a municipality should offer the opportunity for additional investments from other budgets, or the willingness to enter liabilities. It furthermore shows that positive effects for development projects through municipality owned land bear limitations for such approaches, as visible by the economical aspect and therefore might offer a financial negative counterbalance to its benefits.

Secondly, **a lack of upkeep on the introduced legal aspects could be identified**. As already discussed in the previous sub-chapter, stricter controls on wrongly parked cars are considered as being necessary. On this topic, the municipality seems to be unable to recruit additional staff for the new quarter and needs to distribute traffic wardens equally throughout the city. This point opens up for an argument, seeing this **municipality** as being **mainly interested in a creation of a project, by forgetting about its future maintenance**. Since it could have been obvious from the beginning that residents might not apply the legal terms due to personal inconvenience, strategies for their upkeep were and still are necessary, including means for securing the introduced parking scheme. As an in depth investigation on this issue was not carried out within the interviews, only two speculations can be drawn. Firstly one might argue that it was simply not foreseen that the introduced concept is going to be disregarded to some extent, or secondly that it was recognised and accepted by the local planners, that the parking scheme might not be adhered by a hundred percent. The latter point can therefore point towards either a **lack of motivation to secure such a concept to its full extent or**, what seems to be more rational**, an understanding that disregarding parking regulations will never be applied correctly and therefore has to be seen as an unavoidable side-effect,** resulting from experiences on parking schemes on other parts of the city. Still, it should be the aim to maintain introduced regulations as far as possible, so a need for maintenance strategies exists and their introduction should be included in planning processes from the very beginning.

Upkeep of Car-Free Households

The other legal aspect concerning the car-free household status constitutes further problems in maintaining the idea of the quarter. Mentioned in chapter 6 by Mr. Linck, **it appears that the commitment of not owning a car is neglected by some residents.** Since on this point, different ways exist to bypass the terms and conditions it seems to be a very difficult approach for the municipality, to identify such residents. The idea behind these contracts includes an interesting and well-meant approach to discourage car-usage.

But to maintain and secure this idea many resources are needed, which in times of staff-reduction and tight municipal budgets, can result in either insufficient persecution or an abandonment of such. Here, a similar conclusion as before needs to be made, addressing the importance for identifying means for an upkeep of introduced regulations in addition to their support by sufficient resources.

8.2.3 Consequences for Goal Achievements

The discussions above pointed out that some aspects within the neighbourhood have only been able to be maintained to a certain extent. It was the objective for the quarter to create an ecological friendly neighbourhood by reducing car usage and not banning them entirely. Furthermore a family friendly living environment should be provided. In this respect one can raise the question to what extent the not fully applied regulations affect the results of these goals.

Effects on Personal Behaviour

The survey indicates that **a reduction of car usage for daily errands took place as a result of the dense neighbourhood and the existing public service provisions** within it. It was also investigated that almost half of the residents who participated in the questionnaire sold their cars since they moved to Vauban and that some residents now use their cars more consciously and using public transportation more often as a result. Here it can be evoked that the anticipated goal concerning car reduction could be reached within the provided legal and physical framework. Stating this it appears that a disregard of existing regulatory means does not minimise the positive effects for its residents and the environment. Yet this argument needs to be seen cautiously since this conclusion is based on a rather small amount of residents. To what extent not sampled residents changed their mobility behaviour cannot be stated by this study. Yet within the observed sample no increase in car usage took place as well as no additional car was bought. Therefore it is suggested that these results can be transferred to the remaining sample and by this an overall positive effect on the goal be stated.

Effects on Pedestrians

Furthermore as the findings from chapter 7 point out, the quarter is seen as being very safe for pedestrians and children at play. It was also found that many answers from the questionnaire indicate Vauban as being a very calm neighbourhood and the few cars parking within the quarter were recognised positively. Such viewpoints indicate that the objective to create a family friendly neighbourhood has to be seen as being reached for the quarter. Both statements in addition to the many playgrounds available in the quarter

and their frequent usage furthermore imply that the identified aspects of disregarding regulatory means might only have limited consequences on the neighbourhoods' anticipated role.

Effect on Main Objectives

From this point of departure one might argue that the quarter can be seen as a success for both main objectives. In regard to an environmental friendly settlement one has to acknowledge that additionally to the green structure, a reduction on GHG emission due to the introduced types of houses can be found. Furthermore an effect on personal lifestyle and thinking was identified. This leaves the impression that the newly developed settlement contributes positively towards a reduction of CO_2 emissions.

Due to the quarters´ attributes of green space inclusion, its proximity to nature, its provision of daily needs, services and activities, a strong distinction between residential areas and mixed-used area and a reduction of car usage, Vauban can be seen as constituting another approach of evolving the *Garden City* idea. Since this movement has already been a prominent movement in the early 20th Century in Germany it shows that urban planning can apply old traditions and adopt them to current contexts. Self support via sufficient job provision, a low-density settlement structure, a surrounding greenbelt and a reduction of the aspired population size were altered. But in its essence the old idea is still visible. It further implies that urban planning can address the issue of environmental responsibility with its residents, raise ecological awareness and provide alternatives to automobile transportation dependency without compromising personal lifestyles in a negative form.

Seeing the physical constitution of houses introduced on the quarter, the effect on car-usage and to some extent a raised awareness of personal environmental responsibility, one can hereby state that neighbourhoods and by this cities can be seen as a starting point, in which it is worthwhile to address the issue of climate change and reductions of GHG emissions, since many positive experiences could be gained on this investigated example. The findings therefore contradict the interviewed planners opinion. This shows that not only the awareness about the necessity to live in an environment friendly manner needs to be raised for the user of a city, the residents, but also for their producers, the planners. In this sense, a raised awareness about the ability of urban planning to address this topic by shaping a city is needed.

Still, it is believed that the well perceived attributes on reducing cars and on existing

service provisions need to complement each other. It is believed that a solitary introduction of one of these means might not have the same positive results in terms of decreasing times for daily errands and an increase in public transportation, cycling and walking.

Te following table tries to summarise the difficulties of the fund regulatory means within the different phases of a development programme.

Development Phases / Applied Regulations	**Housing**	**Density**	**Car-Usage**
Planning	Enhanced regulations require landownership or ambitious developers	Is commonly included in planning phase from urban planners	Great need for lobbying since not commonly applied by planners
Construction	Municipal budgets might affect their introduction	Is likely to be constructed as planned	Can be disregarded after a long development process
Maintenance	The lower the housing standard, the stronger the need for refurbishments towards energy efficiency	Financial need due to landownership can result in a denser than planned settlement structure Social problems might be a result due to loss of privacy.	Legal aspects difficult to be maintained by the city. To some extent not accepted by the residents.

Table 2: Introduction of Regulations within Planning Phases

9 Conclusion and Recommendation

Within this chapter of the report, findings from the case study and the previous lead discussion are drawn together and lead to an answer of the research question ***- What are the opportunities and limitations for urban planning by creating planned human settlements where it is a deliberate policy to reduce impacts on the immediate and the broad environment?*** *It will be presented which opportunities and limitations in light of the research question exist or urban planning. It goes on by concluding both sides and giving recommendations for future development projects.*

9.1 Opportunities

On the case study of Vauban, it was investigated which regulatory means have been applied and how they have been perceived by its residents. It shall now be laid out, which main opportunities for urban planning in regard to an implementation of settlements which aim at a reducing CO_2 emission this study has found.

- It was found that **via purchase contracts stronger imperatives on house construction can be implemented than by applying common construction parameters**. An improvement of energy efficiency on houses would be a result, leading to an increase in energy efficiency and hereby a decrease of GHG emissions from this sector was achieved. Landownership, the imperative for such contracts, has therefore to be seen as a great opportunity for urban planning to introduce more environmental favouring regulations than possible by being bound to existing laws and clauses.

- Furthermore it was found that via financial incentives, **renewable energy usage on singular households** was promoted and implemented. This **in combination with an introduction of a CHP plant** helps to reduce dependency on nuclear power plants or coal plants and by this also **contributes to some extent to decrease CO_2 emissions** from the industrial sector.

- Lobbying for "green" ideas have been seen as imperative and fruitful for Vauban and its realisation. In this respect, **urban planning can enhance existing development strategies towards greater environmental sustainability by including lobbyists**. One option for doing so, lies in an enhanced citizen participation programme, as shown in the case.

- The introduced physical urban structure minimised car dependency and promoted walking, cycling and public transportation usage. A reduction in GHG emissions due to less car-usage can be seen as a result. One might at this point recognise, that a **dense and mixed-used development can contribute to the existing need to cut CO_2 emissions within cities.**

- Sold cars and statements about a raised environmental awareness were observed as a result of the introduced regulatory means. A **positive impact on the personal behaviour due to the physical environment** has to be recognised and by this an opportunity of urban planning to contribute to a more environmental friendly way of life in cities.

- A positive perception, rather than a rejection, of regulatory means in favour of ecological friendly settlements was found. Furthermore these means created a family friendly environment, in which pedestrian safety is high and noise pollution low. Here, opportunities also lie in an **increase of quality of life and** by this the opportunity for urban planning **to merge needs for ecological friendly settlements, housing provision and an adequate living environment.**

- An inclusion of green spaces in inner city residential developments was visible on the site. Together with brownfield development and a compact mixed-used form, a preservation of existing open and green spaces and additional green spaces within the city have been the result. Here the urban structure can be used for adaptive purposes towards increasing temperatures and ground water preservation. **An inclusion of green spaces within new settlements can** therefore **be seen as an opportunity for social, environmental and, in regard to its cooling purposes, also economical terms in inner city developments.**

9.2 Limitations

The introduced regulatory means on Vauban are not without limitations, which urban planning has to address whilst implementing such settlements. The main limitations found in this case study are presented in this section of the report.

- The **regulations** on the physical environment **have to be applied by the quarter's residents**. Structural **and** legal frameworks can promote certain behaviour but **can**

also **be rejected**. Enforcements of legal conditions are necessary but can be difficult to be applied. Limits can therefore be seen in the extent, to which residents apply introduced physical and legal frameworks.

- Also seen as a **limitation** for such projects lies **in the** ambition as well as **ability of municipalities to maintain such ambitious projects**. It is likely that planners forget about the maintenance of newly developed settlements and the introduced legal and/or physical frameworks within. Furthermore, it might happen that ideas are introduced which require frequent observation or controls and by this constituting additional expenses for the municipal budget. Thus, development projects must go further than producing an idea(l) and must not forget about it after being (close to its) finish(ed), including thoughts about financing its upkeep.

- Another limitation for urban planning to address CO_2 reduction within cities lies in the **existing housing stock**. Here it **needs** political action, **laws and clauses, which make it mandatory to refurbish** old houses by introducing e.g. insulation why urban planning is unable to pursue this goal any further. **Only municipal owned stock can easily be refurbished** so far, but here tight budgets bear further limits.

- **Development processes**, which last several years, **are** likely to be altered to the initial frame by their political authority. Changed political leadership within the development period can lead to a changed perception about the idea of such projects by which initial idea(l)s become rejected or not necessarily maintained from authorities. Limitations can therefore be seen in the implementation of such projects, by being **dependent on political will**, a factor which is very limited to be foreseen in its magnitude.

- As could be identified, several aspects on the case have not been implemented or have been altered towards the initial idea due to financial shortages. **Limitations in such projects can in this regard be found in their financing, in particular when the developed land is bought and developed from the municipality with the aim to cover the made investment to a hundred percent by selling the land** to housing developers. Landownership, especially when bought by the municipality for the development purpose, therefore also has to be seen as a possible critical attribute within such a development.

- From the initially introduced development principles and the proposals, arisen from the enhanced citizens participation process one might conclude that the extent to which urban planning wants to achieve a reduction of GHG emissions in new settlements, does not reach full capacity by itself. **Lobbying for environmental friendly settlements need to take place strongly** in this respect **and** it is suggested that **a lack of such might result in less ambitious projects**.

- The geographical situation holds limits for such projects. The introduction of photovoltaic panels only makes sense in regions in which sun is sufficiently available. Furthermore, as discussed in the previous chapter**, a project like Vauban can mainly be achieved on brownfield areas or open space**. An inner city development in which not only a dense and mixed-used environment is found, but also parking provision shall be minimised or being enabled only on edges of the quarter, requires retrofitting existing infrastructure. Such an approach might not only exceed financial applicability but would also face structural hindrances, unlikely to be overcome. In this sense, **retrofitting of existing settlements**, especially in regard to the investigated mobility concept **is seen as very limited** for its application in future inner city redevelopment projects.

- Further **limitations** of such small-scale projects can be seen **in** their **effect on the broader environment** in regard to a reduction of CO_2 emissions. A worldwide interconnectivity favours good transportation throughout the globe, emission trade with developing countries and an increase in car ownership in newly industrialised countries all act against such small-scale development projects such as Vauban.

9.3 Conclusion

The research of this thesis was conducted under the topic of ***"A Case Study on an Environmental Best-Practice Example in Germany"***. In this study, the point of interest was to explore and describe possibilities in urban planning to minimise GHG emission within new settlements. To approach an answer towards this point of interest, the research was conducted under following research question:

What are the opportunities and limitations for urban planning by creating planned human settlements where it is a deliberate policy to reduce impacts on the immediate and the broad environment?

Several aspects were investigated within this study. It was identified, that different regulatory means have been implemented on the settlement area. They included regulations on housing constructions, physical structure, energy supply and car usage, and constitute thereby the answer to sub-research question one (see page 80).

Effects on the Immediate and Broad Environment

These means have besides their direct impact on a reduced GHG emission stemming from the introduced housing and energy supply solutions, also a positive effect on the personal mobility pattern and resulted in a reduction of car usage and great satisfaction with the quarter in general. This hints that regulations favourable to the environment can contribute to a reduction of GHG emissions within a quarter and be imposed on residents without resulting in great dissatisfaction or compromises on the individual level. A contribution to the immediate environment is therefore possible.

Planning Process

Hence residents, rather than urban planners, have promoted these regulations, which indicates that more effort is needed within municipalities to think in an ecological sustainable way for city (re)development. Less popular methods or approaches difficult to implement approaches have to be taken into consideration by political leaders and urban planners and a "green" development should not only focus on projects with means of easy implementation. Here it needs to be acknowledged that lobbying unconventional ideas and stronger regulations are necessary steps. The proposed regional guidelines about discouraging car-usage can also be seen as worth of some improvements, since stricter guidelines might result in improved ecological development within cities. Furthermore, it is suggested at his point that **urban planners should** use their broad knowledge and theoretical background and **not be solely driven by habits and reproduction of common development strategie**s. In this sense it is suggested that theory, new but also old development approaches, should be discussed thoroughly within planning departments in order to find and implement ways to let cities emit less GHG emissions. **Hereby, means, which affect the personal life, should also be included and enhance the focus about the physical structure or construction**.

Promotion of Alternative Settlement Structures

It was also shown that model projects such as Vauban are crucial for the future. Since industries and car-usage are growing in many countries, best practice examples are needed to promote the idea that a car-reduced living is possible without the feared

compromises. Such projects need to be reproduced in order to achieve a broader than just an immediate effect on the environment. The case study showed that many opportunities lie within such a concept. Their application should therefore be promoted and used more frequently. Nevertheless, Vauban exemplified that great visions on environmental sustainable settlements have to be carried out ambitiously to the end. The high objectives of the quarter could be fulfilled to a high extent. However, recent developments are not in line with the main idea(l) anymore and focus on economical stimuli, rather than the initial vision. Here **an understanding of a need to favour environmental concerns more than economical aspects is seen as imperative for municipalities within development projects.**

Focus in Urban Planning

This example implies that a cities ability to contribute to a CO_2 reduction by using means such as housing standards, a dense and mixed-used development is recognised in Germany. Also a refurbishment of existing stock is seen as a fruitful approach and does take place to some extent. But in regard to influencing car usage and creating neighbourhoods and cities with a less car favouring physical layout, more effort is needed. Old paradigms on provision of front-door parking are still common, which does not discourage car-usage. The case showed that this paradigm can be overcome and creates as an effect a calm and safe neighbourhood, with a good quality of life. It also implies that there is a need in urban planning to rethink common development strategies. It is necessary for a city's development to not only focus on social and economical aspects, and to enforce an inclusion of environmental aspects. It also suggests that **the importance of a cities´ physical layout must not be forgotten and a focus only on the cities´ physical construction thus be avoided in future projects.**

Retrofitting of City Quarters

The transferability of the found regulations on car-usage within the quarter as a general mean for inner city redevelopment strategies has to be seen critical. It needs to be recognised, that a project as Vauban is difficult to be implemented within a city, where the physical structure is already in favour of car usage. Retrofitting is difficult and in some cases even impossible. Therefore its application is most likely to be happening on areas, which can be designed from scratch. **Refurbishment of existing stock still remains essential. It therefore must not be forgotten for future development projects if the aim to cut CO_2 emissions drastically shall be fulfilled.**

Opportunities Within Cities

Yet, the investigated case suggests that development projects within a city can contribute to a great deal to minimising CO_2 emissions, and that cities, especially with a focus on stock refurbishment and the opportunity to effect car-usage, can be seen as a good starting point to address climate change by city redevelopment. Cities bear many opportunities for a reduction of GHG emissions, such as energy efficiency on houses, energy conservation, promotion of cycling, walking and public transportation, adaptation on climatic changes via green structures and usage of regenerative energy. Furthermore the hypothesis of urban planning being able to incorporate both needs, provision of housing and addressing the issue of climate change, as introduced in chapter one, can hereby be stated as being supported by the case. In this sense, urban planners should be more aware of their possibilities, to contribute towards a worldwide GHG emission reduction and act as advocates for ecological sustainable settlement developments. **Urban planners should moreover support the incorporation of "green" technologies or alternative construction materials in housing developments towards developers and should not only leave this topic to architects and developers**. Hence, it might be suggested that the old idea of a garden city should become a new value within contemporary settlement projects.

Change in Planning Habits

Nevertheless, it needs to be noted, that urban settlement projects appear to orientate well on the given planning guidelines but do not go much further than stated specifically. Introduced mandatory implementations on housing construction are fulfilled and an objective at creating dense, mixed-used settlement structures can be found. Furthermore the objective to preserve greenspaces can be found within the case study. But willingness to reduce car-usage by urban structures, by other means than public transportation provision, was not given from the initial planning phase. This suggests that the given planning guidelines ought to include some more proposals in this direction. From the given findings it is also suggested that urban planners need to incorporate thinking about how to reduce car usage within cities. Since here big reductions in CO_2 emissions can be achieved and the urban structure can actually contribute to such a reduction, this topic needs to find a stronger place in urban planners thinking about reshaping a city besides issues such as housing provision or quality of life. In this respect, **how urban planning can contribute to a reduction of GHG emissions does not necessarily incorporate new ways or methods of developments but the usage of existing ideas, theories and methods. What is needed though is an understanding of what urban planning can achieve by which means and the application of this understanding within**

development projects. Therefore it is the appeal for urban planning to break out of common schemes, to be aware about the existing challenge towards climate change and to give this issue the same value as, eg. housing provision.

9.4 Recommendation

From the gained insight into the case study and a discussion about its impact and transferability, several recommendations can be made for future development projects, which aim at creating an environmentally friendly neighbourhood.

Economy

From the planning process and difficulties in introducing regulatory means two things are recommended here for new developments on open spaces or brownfield areas. Firstly an inclusion of second party opinions within a planning process should be incorporated, Meant is here to **use expertise and inputs from parties, which are not part of the general planning organisation within development projects**, like it was done in this example by using the *Forum Vauban*. New possibilities and insights might be the result, since praxis seems to orientate itself rather on experience than on theory. Secondly **municipalities should buy the land**, dedicated for development, **in order to gain opportunities for introducing higher regulatory means,** as stated previously. To reduce financial shortcomings, a financial cover of the investment needs to be rethought. The aim should not be to cover the initial expenses by using the increased value from the developed land alone. Instead, introduced assets on the site such as roads, sewers, light rail stations, schools or other public services, should be seen as a financial gain, since they constitute municipal owned assets and therefore should be subtracted from the initial investment to reach cost-neutrality within such projects. This would reduce the amount needed to be gained from sold land to cover the made investment and by this allow the municipality to be more flexible in long lasting discussions with developers on e.g. stricter housing standards. The afore mentioned need to abandon certain development idea(l)s (solar settlement and development of formerly open space) thereby becomes less severe.

Housing Refurbishment

It is also suggested to **introduce mandatory refurbishments for old houses and to enhance the existing subsidies to make such investments more attainable**. As it was recognised previously that newly build settlements can only contribute to a limited extent

towards a reduction of GHG emissions within cities, which is why an improvement of existing facilities has to be seen as imperative. Since this does not only involve urban planning but to a great extent politics, stronger actions from this side towards tackling climate change are clearly needed.

Settlement Structure

It is further recommended that efforts for inner city redevelopment should not only rely on housing refurbishment, but also include the idea of a physical structural change, to discourage car-usage and facilitate public transportation usage as well as walking and cycling. **Solely residential developments should be avoided** and always incorporate a mixed-use development. Furthermore, urban planning produces the build environment and by this also a social environment within a city. If the built environment offers a good social environment, this can contribute to a strengthening of a place, its attractiveness and increase its quality. Combined with a good public service provision, this should lead to a reduced need for travel and so creates the opportunity for urban planning to take part in actions towards a decreased GHG emission.

It also needs to be noted that dense **development projects should incorporate green spaces and recreation areas**, to avoid social problems and to increase the quality of life of the areas. Furthermore it is a beneficial mean towards climate adaptation by additional cooling effects for houses.

Mobility

From the survey it can be identified that in a neighbourhood which reduces parking provision and introduces areas in which no front door parking exists, a reduction of car-usage can be found. It is therefore recommended that **future settlement developments should use a mobility concept, which reduces inner residential parking as far as possible** since it holds the opportunity to promote a CO_2 minimised way of life by addressing both, a minimisation of car usage and reduction in car ownership.

If a car reduced neighbourhood is introduced, in which parking provision is physically available but not legal to use, **maintenance of the legal concept needs to be secured**. This is necessary in order to keep up the initial idea to a high extent and to work against moral complications, resulting from wrongly parked cars, especially when applying a parking system, which promotes financially non car ownership or non parking lot ownership.

10 Reflection and Epilogue

This last part develops some reflections on the report, and discusses the used methods. Difficulties within their usage, the extent of their fulfilled purpose and by this their impact on answering the research question are discussed. This chapter furthermore points out aspects, not covered by this thesis but interesting to be investigated in future research.

10.1 Reflection on used methods

Within this study, different methods were used in order to provide input to answer the research question and their sub-questions. They will now be investigated to point out weaknesses of their usage and the usefulness of the chosen means for the research's purpose. This discussion might be helpful for other researches in a similar vain.

10.1.1 Interviews

The initial research question partly aimed at an understanding of difficulties for urban planners within the planning phase, the construction phase and the maintenance phase of a project such as Vauban. In this respect, interviews were chosen for gaining insight into these topics. This aim faced the problem of availability of sufficient key actors from the initial planning phase and multiple responses from the urban planning site due to disbandment of key operating groups of both planning sites. In depth insight into negotiation processes concerning regulatory means could therefore not be gained. This aspect needs to be seen as not ideal for the research purpose since more detailed information has been anticipated. Still the gained insights from the conducted interviews with Sprenger and Linck gave valuable insights into the quarter's maintenance as well as previous and still existing problems concerning the neighbourhood and its realisation. Hereby they provided sufficient information for the research purpose

Furthermore the interview with the local planning officer also needs to be seen as not ideal for the research purpose. The planner was not involved in the planning process of Vauban and no planner who has been involved could be gained for an interview. This constitutes a crucial point, since arguments from the before mentioned interviewees could not be contrasted to a great extent. Furthermore, the planners argumentation about urban planning's effect on car-usage reduction, has to be seen cautious as well. Since his point of view could not be affirmed from other urban planners of Freiburg's planning department, the made assumption in chapter 9 about this departments orientation on experience and habits rather than theory might be rejected by another planners opinion. It needs in this respect to be recognised, that a reliance on single persons opinion as a

representative of one group should be avoided. Still, his answers were helpful for arguments about transferability of such projects and by this still very helpful for the research.

10.1.2 Questionnaire

The findings from the enrolled survey revealed insights into the residents' perception about the site and the introduced regulations. Still, the collected sample comprises a rather small amount of residents from the neighbourhood. A bigger sample might have revealed additional perceptions towards the introduced regulations. This shows that case studies and a usage of qualitative studies, which appears to be representable bear limitations towards covering all existing perceptions and therefore might not include all prevalent issues for the studied subject. Admittedly, an inclusion of all residents for a qualitative study incorporates difficulties in terms of applicability. Telephone interviews, questionnaires via mail or even single interviews on every household would have been necessary to reach a greater sample. Since a single person conducted the research within four months, such a scope has to be seen as inapproachable and the chosen method for the conducted interviews as reasonable. Furthermore, the collected sample comprises a broad range of residents regarding age, sex, social status and education. Furthermore, the gained results showed a clear trend around some major issues. Therefore it is questionable if with a bigger sample additional important issues would have been revealed. In this respect the sample needs to be seen as representative and appropriate for its purpose and the best method able to be used within the studies scope.

10.1.3 Single Case Study Approach

From the outset of the research, a single case study approach was chosen for being used. Regarding the outcome of the study and their findings it has to be acknowledged that valuable information could be gained and valuable lessons for future applications of similar projects be gained. Still, additional data would have been beneficial. A comparison study, in which a similar site would have been investigated, would have provided supplementary information about applicability, perceptions and maintenance. As it was already mentioned in chapter 8, a perception towards similar introduced regulatory means on other sites including other social groups and societies would have been beneficial. Still, limitations and opportunities regarding the financing of such projects, the involved political parties, the necessity for lobbying and existing opportunities for urban planning to address car usage reduction via physical and legal frameworks have been revealed. In this sense, the chosen single case study approach has to be seen as reasonable regarding the outcome and the scope of the study but also as not being ideal for the research purpose.

10.2 Impact of Findings on the Research Question

Despite of some non ideally chosen methods and non ideally circumstances for the chosen methods, the gained information within this study provide valid information about the planning process, initial ideas for the development from the municipality, additional stimuli from residents and citizens as well as information about the quarters maintenance. In this respect the study provides the necessary basis for answering the sub-research questions and the main research question. Henceforth one can hereby state that the aim of the study, to gain an insight into opportunities and limitations within urban planning to produce ecological sustainable new settlements, was reached.

10.3 Epilogue

From the findings and the reflection on the research, several aspects interesting for future and/or follow-up research can be found.

Since the study only encompassed one case study on one particular site, it is suggested to develop a comparison study, in order to contrast or facilitate the findings of Vauban with a similar study on a similar project but a different social and cultural background. This would help to identify aspects on which perceptions towards the found regulations might alter and ideas about their improvement for future development projects arise.

It is further suggested to undertake a sociological study, in order to identify to what extent and in which aspects of the personal life the given environment might interfere with the personal lifestyle. This study might include aspects like cleaning behaviour, airplane usage and waste disposal. This might be of certain interest to identify weather or not an ecological friendly physical environment can have a greater effect on personal behaviour than a reduction in car-usage. Further it might show if and where people might get influenced by their natural environment towards a more environmental friendly lifestyle.

A third interesting point - possible to be addressed in further studies - might root in a measurement of CO_2, saved by settlements with low-energy demanding houses, high amount of inner neighbourhood walkability and a reduction of car-usage. This could be contrasted to the CO_2 output of an ordinary quarter, in which front-door parking is allowed and no passive and plus energy houses are introduced. The purpose of such a study lies hereby in a promotion of energy efficient settlements in order to lobby for a greater amount of low-energy houses, passive and plus energy homes in new settlements as a contribution of inner city CO_2 reduction.

The last suggestion for a future research on such a topic bears an economical interest. It might be helpful to develop a study which points out ways to decrease construction costs for settlements, which aim at a GHG emission reduction through its physical structure. In this regard it would be beneficial to identify available grants, subsidies and other financial incentives for housing developers of environmental friendly homes, such as passive houses.

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12 List of Figures and Tables:

Appendix

Appendix A: Questionnaires for Residents

General questions

1. Since when do you live in Vauban? _____

2. To what extend are you satisfied with your neighbourhood in general?

Very satisfied___ fairly satisfied___ fairly dissatisfied___ very dissatisfied___

3. How satisfied have you been with your old neighbourhood?

Very satisfied___ fairly satisfied___ fairly dissatisfied___ very dissatisfied___

4. Compared to your old neighbourhood, how do you see the neighbourhood condition of Vauban in terms of:

	Better	Equal	Worse
Connectivity to the centre	___	___	___
Offers of shops in your neighbourhood	___	___	___
Recreation areas in your areas	___	___	___
Safety	___	___	___
Parking Situation	___	___	___
Other _____	___	___	___

5. What was your intention to move to Vauban in the first place?

Family friendly environment ___

Social Community ___

Mobility Concept ___

Ecological living conditions ___

Own/new home ___

Other_____

6. Does living in this neighbourhood offer you benefits, which you could not find in your old neighbourhood?

Questions on people's perception on introduced regulations

7. Did you have to make any compromises in your daily live since you live in this neighbourhood?

8. In regard to the whole neighbourhood, where do you see a necessity to introduce changes?

9. How satisfied are you with the following aspects of Vauban?

	Very satisfied	fairly satisfied	fairly dissatisfied	very dissatisfied
Density of construction				
Parking situation				
Connectivity to city centre				
Access to amenities				
Access to shopping				
Access to schools				
Access to work				

10. The aspect causing the most inconvenience to you, how do you think can this be improved for you?

<u>Questions about neighbourhood of short trips</u>

11. To what extend can the neighbourhood satisfy your daily needs in regard to:

	Very satisfying	fairly satisfying	fairly dissatisfying	very dissatisfying
Grocery				
Schools				
Shops				
Recreation area				
Work				

12. Would you say you spend more or less time for your daily needs since you live in this neighbourhood?
    More___ Same___ Less___ Why_____

13. Can you think about any additional offer, which should be introduced on Vauban?

Questions about mobility concept

14. In terms of the mobility concept in Vauban, what are the benefits for you?

15. In terms of the mobility concept in Vauban, what are the disadvantages for you?

16. Regarding the mobility concept, where would you like to see changes/improvements?

17. In terms of auto mobile transportation:

	Yes	No	
Did you buy a car since you live in Vauban?			Why? _____
Did you sell your car since you live in Vauban?			Why? _____

18. Do you travel now less/more often by car since you moved to Vauban?
    Less Same More Why_____

19. Do you travel now less/more often by public transportation since you moved to Vauban?
    Less Same More Why_____

20. Do you travel now less/more often bicycle since you moved to Vauban?
    Less Same More Why_____

21. Are there any other issues I forgot and you think are important to be aware of?

    _____

    _____

    _____

Questions towards the person (circle the correct)

Sex	Age	18-29	45-59	75+	education	high school __
M F		30-44	60-74			uni __ trainee __
				employment	employed / unemployed	

Car-Free Household

Parking Lot Household

Parking Free Household

Appendix B: Interview Guide for planner of the municipality of Freiburg

Friday 23.04.2009 10.00

Questions on the Planning Process

1. Do you think that generally the planners think sufficiently about how to (re-) develop a settlement in regard to ecological sustainability and in the light of climate change?

2. Do you think that ecological sustainable settlements can be introduced sufficiently through resources from the municipality alone?

3. If not, to what extend do municipalities have access to additional funding?

4. What in your opinion is the main hindrance for urban planning to plan and implement ecological sustainable settlements like Vauban?

5. Would you say that an enhanced public participation process can develop a better or a worse outcome of a development than produced in the common way?

6. In which aspects does it so and why?

Questions on Regulations / Restrictions in urban planning

7. Where do you think is urban planning necessary to be used as a regulatory tool regarding ecological sustainable development?

8. Do you see a need for even stronger regulatory means/tools than the ones already existing? And if so, where?

9. Do you think it is easy to implement them via urban planning?

10. Do you think these means go hand in hand with some sort of inconvenience for its residents?

11. Would you like to see more explicit objectives in the Regional Development Plan in order to reduce CO_2 emissions or should this issue be left completely to the municipalities?

12. To what extend do you think can urban planning dis-encourage car usage?

13. What do you see are in this respect the most fruitful means possible to implement by urban planning?

14. What do you see as disadvantage of dense and mixed-use developments?

Appendix C: Interview Guide for Neighbourhood Centre

Fabian Sprenger Wednesday 22.04.2009 11.00

General questions on the neighbourhood

1. In your opinion, is the concept of Vauban as an ecological sustainable neighbourhood working as anticipated?

2. What do you think are the main opportunities for the residents within this neighbourhood?

3. What do you think are the main disadvantages for the residents within this neighbourhood?

Questions in regard to what the municipality is willing to implement

4. What was your experience with the municipality and their plans for implementing regulative means in favour of an ecological sustainable neighbourhood?

5. Do you think the municipality's plans were anticipating enough?

6. If not, where do you think was the municipality "too soft" and could have gone further?

7. Where do you think should urban planning generally be stricter by developing new residential settlements?

Questions on the acceptance of the residents

8. What are your experiences with the residents' satisfaction of the living conditions in this neighbourhood?

9. Can you identify any major disadvantages within this neighbourhood onto its residents?

10. Can you identify aspects of the initiated means, which are not accepted by the residents?

11. Can you identify any aspects within this neighbourhood where the overall concept did not work out?

12. Do you have any supplementary comments on a topic I forgot to mention?

Appendix D: Interview guide for association for car-free-living

Hannes Linck, chairman of *Association for Car-Free Living* 20.04.2009

General questions on the car free living concept

1. In your opinion, is the concept of car-free-living working as anticipated?
2. What do you think are the main opportunities incorporated by such a concept?
3. What do you think are the main disadvantages incorporated by such a concept?
4. To what extend can such a concept be applied on every common new development?
5. Through which means could it be improved?
6. Who could improve it?
7. Do you believe this concept can be maintained over a long time of period?

Questions on the cooperation of the municipality of implementing such a concept

8. How difficult was it to get the municipality on board for that concept in Vauban?
9. Have there been any compromises you had to make towards your initial idea in relation to the ideas of the municipality?
10. Have there been any aspects you could convince the municipality, which were not included from the beginning or seen as impractical by the planners?

Questions on the acceptance of the residents to the concept

11. How good is the concept maintained/accepted by the residents?
12. What are the residents pleased with the most?
13. Which aspects are not accepted/appreciated by them? / Where doe the concept not work out?
14. Do you think the concept could reduce an overall usage of cars and encourage a usage of alternative modes of transportation?
15. Do you have any supplementary comments on a topic I forgot to mention?