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Executive Assessment Report

Innovation Case: **"Quartier Vauban"**

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Project overview

Quartier Vauban is an internationally renowned model district for ecological, low-energy, low-car & traffic urban development. Bought by the Freiburg City Council and developed in association with a community group, the former army barracks site has been transformed into a sustainable neighborhood. The project consists of refurbished former barrack buildings and new build areas, of which approximately 40% has been self-developed by community groups (Baugruppen) in the so-called "co-housing model".
The new neighborhood performed exceptionally well on Planet & Process indicators in the Eurbanlab B4U assessment method, and provides a good example of what low-carbon urban development can comprise.

Location
- Germany
- Freiburg

Urban Domain
- Residential neighborhood

Type of Innovation
- Energy
- Organisational

Size
- 5000 residents
- 2000 housing units

Investment value
- Total development costs of €500 million

Dates
- Planning: 1993
- Completed: 2008

Client
- Municipality of Freiburg
- Forum Vauban

Service provider(s)
- 40 independent building groups

Other key words
- Solar energy
- CHP-systems
- Participatory design
- Brownfield

Introduction

The suburban redevelopment project '*Quartier Vauban'* (QV) is situated in the foothills of the Black Forest in Freiburg, south-west Germany, and is "one of the most celebrated model sustainable districts" (ITDP, 2011, p. 96). Vauban illustrates the development of a sustainable urban district, adopting a cooperative planning process and socio-ecological values (Schroepfer & Hee, 2007). Often referred to as the 'solar capital city of Europe', Freiburg is a regularly mentioned forerunner in environmental practice and policy.

Vauban "was used as an army base since the 1930s until 1990 when the French military presence ended and activists created the slogan 'barracks into dwellings' in light of an acute shortage of homes in the Freiburg area" (Schroepfer & Hee, 2007, p. 343). Construction of the 41-hectare urban regeneration project began in 1998 and was mainly completed by 2006, although a few lots were still being developed in later years (ITDP, 2011; Kasioumi, 2011). The sustainable urban district is now home to 5000 residents and provides 600 on-site jobs.

As will be discussed in the following paragraphs, Vauban has important lessons regarding government & regional policies, transport, waste and urban design. Though the biggest lesson is about public engagement and the incorporation of social, economic and environmental principles. Resultantly, Vauban has received national and international recognition as an exemplary sustainable city district (Schroepfer & Hee, 2007).

1 Description of the Innovation

Vauban has mostly been innovative in the fields of energy, traffic/mobility, building and participation / social interaction and public space. Its holistic approach resulted in sustainable city development concepts to be implemented on a remarkable scale. Besides innovative technologies such as passive houses (e.g. the first four-story building in Germany) and new sewage systems with vacuum pipes, Vauban's other innovative aspects are to be found in the culture of planning and participatory processes (including the 'Baugruppen' or 'Co-housing' concept).

Most interesting innovative features and outcomes include:

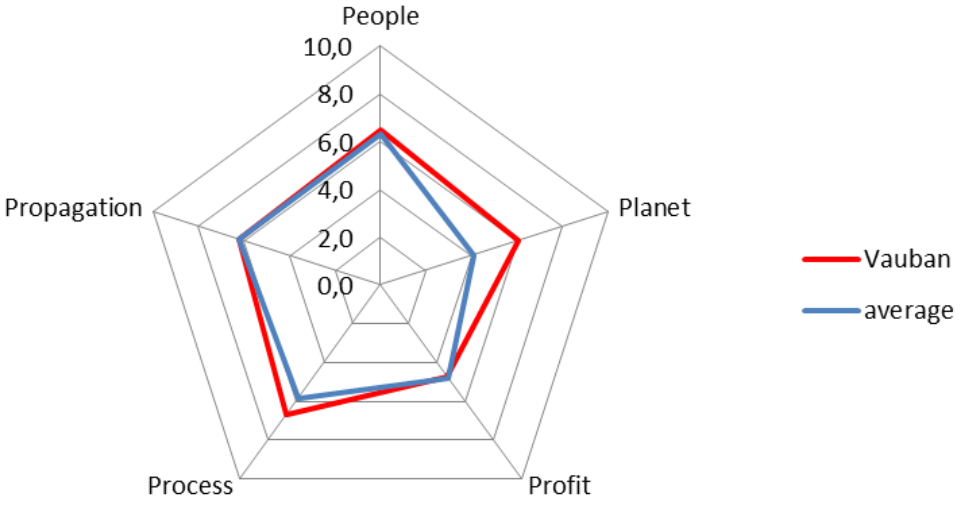
- The far-reaching participation and social work that was organized by Forum Vauban gave voice to the people's needs and supported their initiatives, invented innovative ecological and social concepts, and increased the communication and participation in the development;
- Baugruppen (about 40 joint building projects were initiated by future residents, providing the fertile ground for ecological awareness and a stable/social community). About 30-40% of the housing stock in Vauban has been built using this concept;
- All buildings were built with stringent low-energy standards (65 kWh/m^2/y), yet most buildings go beyond that standard;
- Large share of renewable energy sources in the overall energy demand (>90%);
- The ecological traffic/mobility concept led to a reduced number of private cars (40-50%), effective public transport, a convenient car sharing system, and an overall high quality of life.

Co-housing

"A concept gaining popularity in Germany and the United States, co-housing provides an opportunity for individuals to pool resources to develop medium density housing, rather than purchasing 'off-the-shelf' housing products. Bypassing a traditional developer allows the groups to build their needs into design, create a sense of community and, for some projects, achieve capital cost savings"
(MEFL, 2011, p. 22)

2 Impact overview

Quartier Vauban performed well on all indicators in the Eurbanlab B4U assessment method. The project performed above average on the Planet & Process categories.



2.1 People

The project performed well on most indicators in this caterogory. The applied concepts in Vauban have resulted in a district that was created by- and for its residents.

▲ DESIGN FOR A SENSE OF PLACE

The Baugruppen in Vauban have been largely successful to create a living environment in which they feel comfortable. The focus on decreasing car-dependency and creating a green, walkable neighbourhood adds to the creation of a sense of place. Moreover, different building heights & colors add visual and architectural interest.

▲ AFFORDABLE HOUSING

The co-housing concept resulted in a marked reduction in the individual construction costs for Vauban residents at the time of development (between 57% and 81% of the price of dwellings bought on the open market). Being transformed from a brownfield site to a vibrant district that can only be described as a middle-class district[1], the homes in Vauban have risen in price since their construction, but have remained affordable. Pioneering residents have seen their homes rise in value, going from an average construction price of €1800 per m^2 in 2006, to €4000 per m^2 on the open market to date. The latter is comparable to other middle-class neighborhoods in Freiburg.

[1] http://www.secureproject.org/download/18.360a0d56117c51a2d30800078420/Vauban_Germany.pdf

▲ REDUCTION IN ENERGY BILLS

Vauban residents benefit from a reduced energy bill by as much as 85% on a yearly basis. Some of the pioneering blocks in Vauban have built PassivePlus buildings, generating more energy than they consume, effectively reducing their energy bill even more.

▼ FAILED TO REACH THE SOCIAL MIX TARGET

Quartier Vauban failed in some respects to meet its ambition to create a balance in social groups within the district. With a considerable attraction to families, over 75% of Vauban households have children under the age of 18 years old (Scheurer & Newman, 2009). Moreover, if Vauban suffers from anything, it would be the middle-class monoculturalism as its residents are largely European, young and wealthy.
Moreover, due to cancelled governmental subsidies, the project failed to reach its target of 25% social housing for rent. About 10% of the neighbourhood are social rented dwelling, with the remainder of the housing stock primarily being owner-occupied dwellings, with some homes for private rent.

▲ WALKABLE URBAN SPACE WITH GOOD PUBLIC TRANSPORTATION

The aim of the district was to reduce car-use and increase the walkability of the area. Pedestrian and bicycle paths in Vauban create a well-connected, efficient and green transportation network throughout the district. Twelve car sharing vehicles are available across Vauban, five of which are located in the solar parking garage. Car use in Vauban is around 50% of that recorded in the city of Freiburg, with non-motorized-transit accounting for almost two thirds of all trips. Across the city as a whole, the bicycle accounted for 34% of commuter trips in 2002, compared with 61% and 91% for Vauban's car-owning and car-free households respectively.

2.2 Planet

The new residential district in Freiburg performs exceptionally well on the indicators in the Planet category. Mainly due to the low consumption of final energy and its share of renewable energy sources.

▲ REDUCTION IN ENERGY CONSUMPTION

Most homes in Vauban have been built according to the progressive energy standard of 65 kWh set by the Freiburg government. Most Baugruppen in Vauban went beyond this target, leading to a reduction of 53% in energy consumption compared to the reference scenario.

▲ RENEWABLE ENERGY SOURCES

The CHP-plant in Vauban operates on wood-chips from the nearby forest and provides in 73% of the total renewable energy supply, and in 100% of the heating demand in the district. Over 90% of the total energy consumption in Vauban is produced by renewable energy sources, of which the CHP-plant provides the biggest part.

▲ REDUCTION IN CARBON DIOXODE EMISSIONS

The measures that were applied in Vauban have resulted in a reduction in CO_2-emissions of 40.000 metric tonnes per year.

▲ RESILIENCE TO CLIMATE CHANGE

There has also been considerable attention to adaptation measures in the district. Although most measures were implemented to make the district more sustainable and attractive, they have a dual purpose in the future. The area allows for rainwater to be infiltrated in the ground and an excess to be retained. The high density of green vegetation throughout the neighbourhood (including green roofs, rain gardens etc.) will provide the area with shade during warm summer days and increase the aesthetics of the neighbourhood.

2.3 Profit

In the profit category of the Eurbanlab B4U assessment method, Quartier Vauban performed well on economic indicators for its residents, but underperformed on its business case.

▲ ECONOMIC BENEFITS FOR RESIDENTS

Given the fact that electricity bills in Germany are amongst the highest in Europe, the economic benefits for residents of passive- to low-energy houses in Vauban are substantial. The average German household spends €2500 per year on energy costs[2]. The average resident in Vauban spends around €366 on energy, annually.

▲ WORTH THE INVESTMENT

The additional sustainability costs for the average Vauban residence are €12.500. Taking the annual economic benefit from these measures, the simple payback period of the additional sustainability investment for households would be around 6 years.

▼ GOVERNMENT INVESTMENT

Quartier Vauban was primarily a municipal development project, meaning that the project was funded mostly by the local government, but received subsidies from, the national government, from the German Environment Foundation, EU's LIFE-Programme, and other institutions.

▼ CO_2 REDUCTION COST EFFICIENCY

The overall costs to reach the achieved CO_2-reduction of 40.000 metric tonnes per year is, with €625 per tonne of CO_2 saved, quite high.

[2] http://www.instituteforenergyresearch.org/2012/10/30/germanys-energy-policy-man-made-crisis-now-costing-billions/

3 Lessons learnt and further propagation

3.1 Context

The case of Vauban has some specific contextual factors that were external to the planning approach, which helped to expedite the development of an ambitious low-carbon neighbourhood.

Ambitious government & a green oriented population
The development of Vauban greatly benefitted from a progressive government whose green-oriented program opened the doors for ambitious projects such as Quartier Vauban. Over the past decades, Freiburg has been pushing the sustainability theme rather succesfully in the area. This green-oriented vision has been largely due to the highly educted populace, public transportation policies in the 1970s that set the stage for green transit options, and a planned nuclear power plant some 40km from Freiburg which caused an uproar and a surge in environmental awareness. The *'sympathetic political climate'* for environmental measures and a continued presence of green parties in the city council has aided its development and created the context to achieve sustainability outcomes through community property development and a unique transport system.

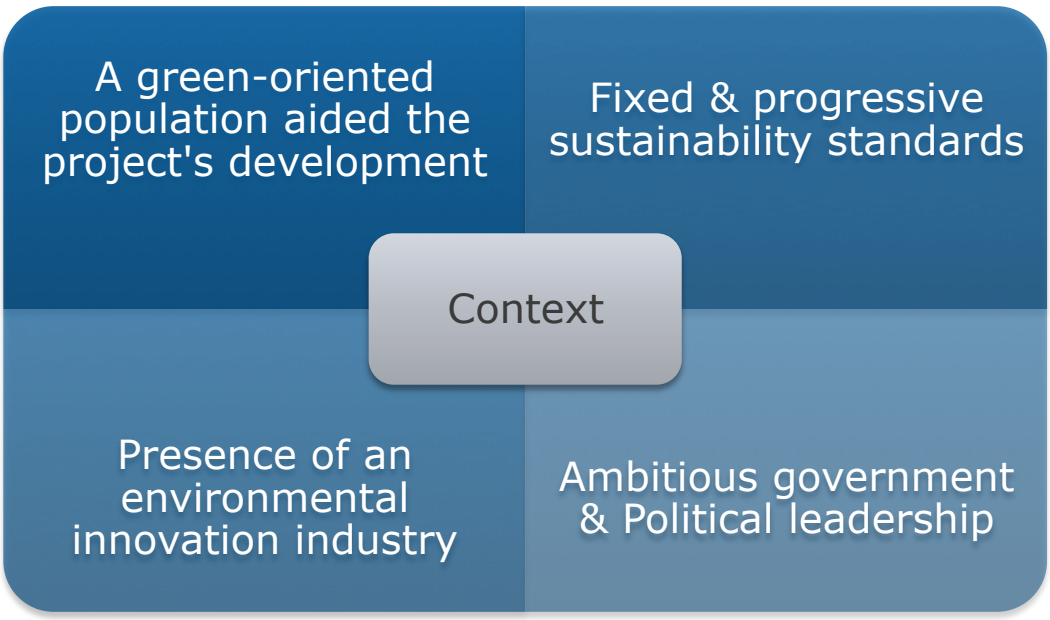
The city government is run by a coalition of conservatives and Green Party councillors, with the Greens holding most of the seats. The green agenda of the City Council started soon after the energy crisis of the 1970s. The regional government had planned a nuclear power station some 40 kilometres from Freiburg in response to an expected shortage of oil. Campaigns against the power station began and, over time, gained wider political support from the city and region, subsequently becoming an example of sustainable development and a stronghold of green politics. As a critical side-effect, it has raised awareness of energy policy issues and marked the importance of participation in political processes (Scheurer & Newman, 2009).
The unusually high degree of community involvement shows that the local authority was open to different viewpoints, is receptive to grass-roots influence over the project and displays the proactive nature of Freiburg's ecology-oriented residents. In this respect, research has shown that 60-70% of Vauban residents vote 'green'. The extensive participatory process has resulted in more ambitious sustainability targets and outcomes.

Presence of an environmental innovation industry
This process led to the adoption of the future-oriented energy policy in 1986 which attracted many research organisations and sustainable industries to the area (Scheurer & Newman, 2009; Kasioumi, 2011). Important organisation or institutes are the Fraunhofer-Institut focusing on renewable energy, the International Solar Energy Society, ICLEI as an umbrella organization for sustainability policy in local communities, and the Öko-Institut, a non-profit environmental research institution (Scheurer & Newman, 2009). It is this mixture of environmentally oriented institutions which provided government-sponsored incentives and innovative projects such as Vauban with a higher value and a sound basis with qualified labour and knowledge (Kasioumi,

2011). The presence of this environmental innovation industry provided the construction of Vauban with many contractors and sub-contractors, who could mainly be chosen according to their quality, past experience and applicability to specific needs (Abdalla, 2012).

Fixed & progressive sustainability standards

The improved environmental impacts in the development of Vauban, has been made possible by a '*mix of stick and carrot measures'* as city engineers controlled building energy performance by instigating binding instruments, such as development agreements to reach energy targets or provided incentives for car-free households (Kasioumi, 2011). Germany as a whole had progressive energy standards for heating, but Freiburg went beyond those standards. At the time of Vauban's development, the national standard was 100 kWh/m^2/y for heating in newly build. In 1996 Freiburg decided that new buildings on city-owned land would be built to meet *niedrigenergie* (low energy) standards (max. 65 kWh/m²/y). Recent laws require new buildings to meet passivhaus standards (15 kWh/m²/y) and renovations to meet *niedrigenergie* standards. The presence of such progressive and fixed standards spurred the sustainable industry in Germany and inspired local developers to go beyond the already progressive standards.



3.2 Process

Political leadership and the managed market approach
The case of Vauban shows the importance of *political leadership* as well as the *'managed market approach'*, seem to be a fruitful approach to the more regulatory and strategic roles in steering urban development into the direction of sustainability. However, the analysis shows that it requires political leadership in the sense that local governments, rather than relying solely on private initiative, should take the lead with innovative ideas, measures and spatial strategies. By doing so, governments provide private and community actors with a stimulating and facilitative framework within which creative solutions and progressiveness for low-carbon urban development have the freedom to develop.

Participatory planning and development
The '*participatory approach*' has had a positive effect on a number of critical aspects for the development of a low-carbon urban neighbourhood. It helped raise awareness on energy, engaged public interest and involvement in the development. Moreover, it has helped to build local social capital, which in turn created the support and social structure needed to encourage pro-environmental behaviour, carbon reductions and the development of collective approaches towards energy generation and conservation. However, as Williams (2012, p. 138) asserts "such an approach works well in localities where the public is already engaged, proactive and supportive of environmental objectives, but of course in many communities this is not the case." Vauban residents were very proactive and were keen to tackle energy consumption and their carbon footprint. For a context in which residents are largely unaware, disengaged and passive, it seems unlikely that this planning approach would bring about the same results.

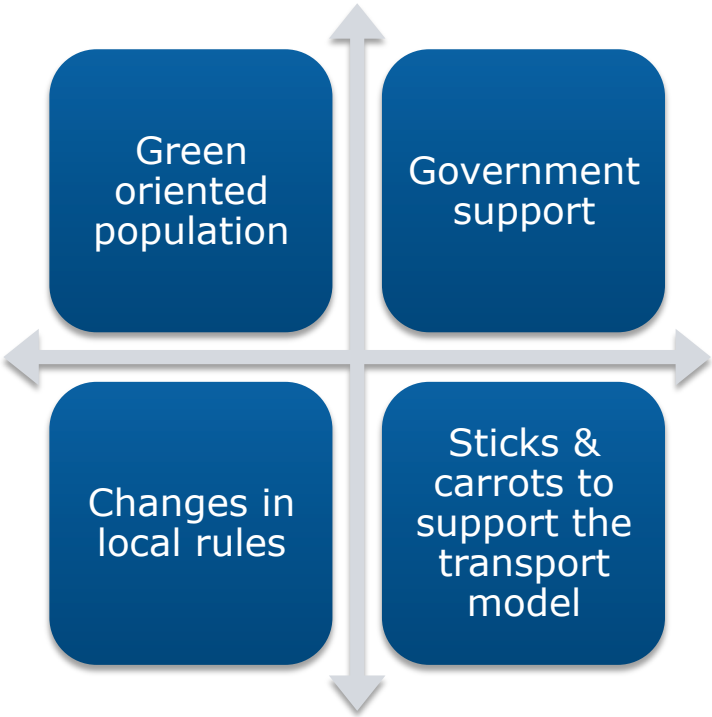
Extra resources needed in support of participatory processes
However, the extensive participatory process that was applied in Quartier Vauban needs *extra resources* to be succesful. Participatory processes are not sufficient and succesful if residents are only able to offer suggestions to city planners. True participatory processes must include both planning and implementation, such as defined in the co-housing model.
Although the approach was resource intensive, Vauban shows that it has significant benefits and did not lead to a substantial increase in the overall costs. As the official body of the particiaption process, Forum Vauban was able to convince city planners of the specific traffic concept of Vauban, which whould not have been established otherwise due to major legal obstacles. "Outsourcing" the responsibility for participatory processes as well as the collection of resident's needs & whishes to Forum Vauban, was one of the major benefits for the project. New solutions were found due to the heavy involvement of residents.

Social housing mix needs federal support
Without federal support, low-income groups will probably not get the opportunity to be involved in co-housing initatives such as Vauban. On the other hand, it is clear that the well-educated, ecologically-oriented middle-class people were the crucial factor in the sustainable initiative of Quartier Vauban.

Continued monitoring after project completion
Monitoring stopped after the project had been completed. Continued monitoring after project completion would however be helpful to visualize where improvements are needed, and above all if eco-friendly measures and behaviours are maintained through the years.

3.3 Propagation and its requirements

The co-housing model[3], featuring several 'baugruppen', is a concept that could be transferred to future low-carbon districts. The concept could assist in the creation of vibrant and liveable low-carbon communities and help counteract the identical and anonymous new build of contemporary urban development. Because of the green orientation of Vauban residents, the co-housing model resulted in higher sustainability outcomes. The prospect of such benefits and the related cost-savings might well be a stimulating factor for the development of future low-carbon districts, but may be very dependent on an ambitious government or a green-oriented population.



The transport model of Vauban, being spatially and economically decoupled, could be transferred to other low-carbon developments, but will unlikely be accepted when the incentives as can be found in Vauban are poor or absent. Vauban shows that legal barriers can be overcome through participatory approaches such as the **'public-private-partnership'** with Forum Vauban.

[3] Also known as 'collective commissioning' or in Dutch 'Collectief (Particulier) Opdrachtgeverschap (CPO).

Although city planners were receptive to the idea of sustainability, the transport model of Vauban would not have been possible without the parallel working structures of the Forum, offering innovative solutions and a driving force when legal barriers obstructed progression in sustainability. To this day, however, the City of Freiburg does not support the parking-free streets concept, which exemplifies that such progressive initiatives are only likely to be considered "if grassroots campaigns to demand them are mounted by the electorate" (ITDP, 2011, p. 97).

The combination of sustainability measures in Vauban has resulted in significant economic benefits for its residents. The monthly energy bill for Vauban residents has decreased with €180. Moreover, due to the co-housing model, residents have saved significantly on the construction costs. A reduction of about 20% in total construction costs per home was reached because Vauban residents did not buy from from speculators or construction companies. This combination of benefits can be an interesting reason for adopting the co-housing model in other locations.

Conclusion

This specific project is symbolic to the stimulus of Germany's green movement, and the specific cultural context in Freiburg can be seen as integral to the success of developing Quartier Vauban. This approach, together with the concept of co-housing, provides a model that could be used to realise future low-carbon neighbourhoods. However, the ambitious approach taken in Vauban was very much influenced by the cultural and political context, and might not be possible to repeat in deviating contexts. Yet, important lessons can be taken from the development of Vauban. The case exemplifies that, where proactive citizens can be engaged, the bottom-up approach to urban planning & development in conjunction with public funding could help facilitate the transition towards low-carbon urban development. It appears that cooperative local planning formed the basis of the districts' success and could be transferred to other developments. Especially in the initial stages of the project it seems important to achieve a high level of motivation and support for low-carbon development amongst residents, politicians and actors in charge of implementation.

In conclusion, Quartier Vauban can be considered as an unavoidable reference for low-carbon neighborhoods in Europe. There are examples of similar projects such as the Loretto area in Tübingen (Germany) or the Spanish eco-neighboorhood Trinitat Nova in Barcelona.
The co-housing model, as well as the economically and spatially decoupled parking model, are transferable to other developments, although this is unlikely to be accepted in the absence of sticks & carrots of the quality seen in Vauban and the wider Freiburg area.

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