



## Conference Proceedings / Extract

**Sustainable Built  
Environment  
Conference 2016  
in Hamburg**

**Strategies, Stakeholders,  
Success factors**

**7<sup>th</sup> - 11<sup>th</sup> March 2016**

# Program Overview

	Monday 7.3.2016	Tuesday 8.3.2016	Wednesday 9.3.2016	Thursday 10.3.2016	Friday 11.3.2016
8.00-9.00 a.m.		Registration	Registration	Registration	
9.00-10.30 a.m.		Opening Keynotes	Scientific sessions Housing Industry Day	Scientific sessions Day of Architecture, Planning & Engineering	PhD Session
10.30-11.00 a.m.		Coffee	Coffee	Coffee	
11.00 a.m.-12.30 p.m.		Scientific sessions Day of Municipalities	Keynote Session UN Climate Change Conference	Scientific sessions Day of Architecture, Planning & Engineering	PhD Session
12.30-2.00 p.m.		Lunch	Lunch	Lunch	
2.00-3.30 p.m.	Excursions	Scientific and special sessions Day of Municipalities	Scientific and special sessions Housing Industry Day	Final Session Excursions	PhD Session
3.30-4.00 p.m.		Coffee	Coffee	Coffee	
4.00-5.30 p.m.		Scientific and special sessions Day of Municipalities	Scientific and special sessions Housing Industry Day	Day of Architecture, Planning & Engineering	
5.30-7.00 p.m.	Warm-up and exhibition opening	Welcome and Networking-Reception for all participants (Handelskammer)	Get Together and Award Ceremony (Holcim Study Award)		
					Scientific Session Session in German language PhD Session

# SBE16 Hamburg

## International Conference on Sustainable Built Environment Strategies – Stakeholders – Success factors

7<sup>th</sup> - 11<sup>th</sup> March 2016

### Conference Proceedings

Organised by



## Imprint

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Edited by: ZEBAU – Centre for Energy, Construction, Architecture and the Environment GmbH,  
Große Elbstraße 146, 22767 Hamburg, Germany



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2016

Printed on 100% recycled paper.

Druckerei in St. Pauli, Große Freiheit 70, 22767 Hamburg, Germany

ISBN 978-3-00-052213-0

DOI: 10.5445/IR/1000051699

## Single family home stocks in transition - implications for urban resource efficiency



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### Summary

Single-family homes (SFH) – that make up about 65% of the residential building stock in Germany – have high potential to improve resource efficiency of urban development. At the same time, we observe indications, that demographic change and change in user preferences may lower the demand for such dwellings. In particular, regions with population decline and economic shrinkage are facing the risk of growing vacancy rates in single-family home neighborhoods. Considering the generally given higher resource intensity of SFH stocks, this potentially leads to significant inefficiencies of infrastructures, material and land consumption, which challenges the implementation of sustainability goals of resource efficiency and land use reduction.

**Keywords:** Demographic change, resource efficiency, settlement structures, built environment, Single-family homes

### 1. Introduction

In many countries, single-family homes (SFH) constitute the majority of residential buildings. In Germany, 66% of the residential building stock is made up by SFH. SFH are traditionally in great demand, and in 2011, more than 50% of the population in Europe lived in SFH. For some time already, increasing indications can be found, that this segment of the housing stock is under pressure. Economic and financial crises, demographic and social structural change, and changes in user preferences, are raising new challenges to it. Outside core regions of economic growth, stagnating or dropping prices, difficulties in selling, and even vacancies, are no longer a rarity. Nonetheless, these developments, and the possible consequences connected with them, have hardly been investigated in terms of sustainability dimensions, including *economics* (e.g. loss of equity/capital for the private owners and potentially resulting transfer costs for municipalities), *ecology* (e.g. inefficiencies in terms of energy, land and material use), *settlement-structure* (e.g. the sustainability of residential service facilities or the attractiveness of the residential environment), or the *social* situation (e.g. down-trading of neighborhoods, or loss of relevance for retirement provision). While multi-family residential buildings (MFH) enjoy a high level of attention from residential policy-makers and the

housing industry, the developments in the area of the SFH segment, with its small scale private ownership structures – approximately 90% of these buildings are user-owned – is prominent neither on the academic nor on the political agenda.

Against this background, the research presented here aims to systematically describe and analyze the situation for different SFH stocks along the above sketched dimensions and to shed light on potential future development scenarios. The paper presents initial results from baseline research which was undertaken on development trends described in existing literature and preliminary assessments of possible implications for resource use.

## **2. Methodology**

The ongoing research was started with a literature review on development trends for the SFH stocks. In addition, statistical analysis of census data and generic resource intensity data [1] as well as case study visits were combined into an explorative description of the status quo and to generate initial estimations of resource consumption implications.

## **3. Results**

### **3.1 General issues and trends of change in the field of building and housing**

Under the notion of demographic change, usually a quantitative change of the number of population, a changing age structure and migration issues are discussed (e.g. [2]). Particular challenges for Germany arise from the envisaged overall decline of population, the ageing of the population (people getting older and less children born) and from regional imbalances in population caused by regional out migration. The latter in particular in East Germany. In addition to the demographic factors socio-cultural factors like changing user preferences and patterns of consumption apply, which partly are closely connected to demographic changes as for example accessibility demands of ageing home owners. Structural effects, like the reduced number of school years or the abolition of mandatory military service may cause further changes, e. g. in terms of a peak of students competing on housing markets. Finally socio-economic context conditions contribute to changes on the housing market, such as changes in working conditions and cultures but also the crisis on real estate and financial markets.

### **3.2 Drivers and trends for the development of single family home stocks in Germany**

Focusing on the SFH stocks, a growing number of indications can be derived from literature for potential relations between general trends and the development of this sector. Such indications for change can be structured along three possible general trends: 1. a decrease of demand for existing SFH, 2. the abandonment of the use of SFH by the former users and 3. the stabilization of demand for existing or new built SFH.

#### **3.2.1 Decrease of demand for existing SFH**

Looking at the demographic development the traditionally main user group for SFH – households in the life-phase of family formation and ownership acquisition between 30 and 45 years of age –

must be expected to decline due to the entrance of cohorts with low birth rates to the market [3; 4; 5; 6].

This trend is at least regionally enforced by a general decline of demand due to population shrinkage as a result of out-migration (e. g. [7; 8; 9]). Occasionally even abandonment of whole settlements – “de-settlement” – is discussed [10; 11]. The trend for smaller households with one or two persons [12; 13] also challenges traditional expectations for SFH demands, and seems to rather enforce the demand for ownership in apartments in particular in metropolitan centers [14]. This is driven further by insecure employment conditions and high demands on professional mobility [6; 15], which will lead to critical reconsideration of the ownership of property. Another relevant issue is framed by the notion of re-urbanization. Even if this cannot be considered a general trend [16; 17; 18], there are indications for a lower attractiveness of suburbia in particular for younger households and also for a growing orientation towards the urban centers by the elderly [19]. Heirs of aged households often are not interested in moving into the SFH themselves when receiving their heritage because – being 50+ of age themselves – they usually already built their own home [8; 20] – if they are opting for SFH at all. The experience of SFH real estate property considerably losing value during the real estate crisis relativizes the long unquestioned motive to build SFH ownership as part of retirement provision [21; 22]. In addition changing life styles like the “25-hours-society” [23] go along with changing user demands for example with respect to the availability of services and facilities in the housing environment [18; 24; 25; 26; 27] which may not be available in typical suburban SFH neighborhoods. To the contrary in ageing neighborhoods the relation of the life cycles of the users and refurbishment cycles may lead to a downward spiral of devaluation of the neighborhood if the users “wear out” their property instead of undertaking necessary maintenance [28; 29]. This problem is increased by the often outdated technological standards of such SFH – for example in terms of energetic properties – that lead to considerable costs of refurbishment measures [5; 20; 30]. This may cause a situation where cities are confronted with a rising supply of SFH with considerable market disadvantages juxtaposed by an ever lower level of demand by traditional user groups.

### 3.2.2 Abandonment of the use of SFH

In an ageing society the most natural reason for the abandonment of the use of SFH is the death of the former users without devolution of the use to heirs or other new users. This is a scenario that becomes particular relevant with the ageing baby boomer generation [31]. In addition there are also indications for a growing number of seniors – including such owning SFH property – that opt for a change in residence even at a higher age [23; 32] either to live with their children [33], or to move into the city centers [19; 34] although the latter cannot yet be considered a major trend [35; 36]. Elderly SFH households may even leave their homes and opt for a new built SFH which then might be smaller, closer to the city and better accessible as for example a bungalow style building without stairs (oral communication from case study visits).

### 3.2.3 Stabilizing SFH demand (existing and new built)

Despite of the above described trends and although this attractiveness may slightly decline [26], the housing model SFH generally is still highly attractive for large groups of households [13; 14; 18; 37] with used buildings gaining importance [13; 38]. For the inhabited stocks the growing risk of poverty of seniors [23] may force poorer households to stick to their property and “wear it out” [28]. Also the financial instrument of reverse mortgage may play an increasing role [39]. In addition, lower prices and the additional factor of low interest rates may enable new user groups to enter the market, thus contributing to ease the situation. Examples are e.g. low income households [40; 41], elderly two

person and single households [32] even building a second time as already mentioned above, and better off heirs looking for (comparably safe) investment options [42; 43]. In particular in metropolitan regions also larger family households, that have a hard time to compete on tight rental markets [33], may opt for suburbia and there increase the demand for comparably affordable SFH property. Among these also migrant households may gain importance as SFH demanding user groups since they adopt traditional life styles, form larger families and catch up in terms of home ownership [5; 26; 44]. Furthermore and although currently 90% of these buildings are user-owned, the use of SFH is not restricted to ownership. Renting in the SFH segment is still a niche-product [5], but may gain importance in particular with investment groups buying larger SFH portfolios and renting them out.

### 3.2.4 Vacancy rates: Status quo

Based on German census 2011 data for the single family home stocks an average vacancy rate of 2,2% can be calculated (market mobility reserve not included), ranging from 0,7% to 5,3% for different construction periods and compared to 5,4% vacancy in multi-family houses (Fig. 1).

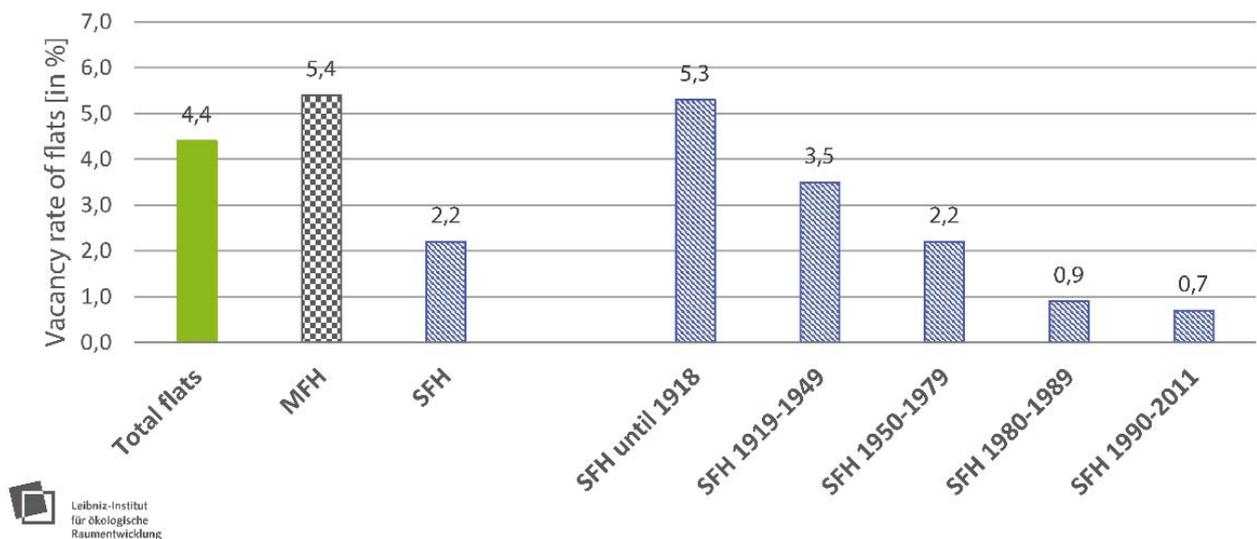


Fig. 1: Vacancy rates for flats in MFH and SFH in total and for different construction periods based on German census 2011 data (without market flexibility reserve)

On the first glance, a vacancy rate of 2,2% seems moderate, compared to 5,4% vacancy of flats in multi-family houses. However, vacancy of SFH can locally already today reach up to 10% in less dynamic regions. Also, due to the generally considerably higher resource intensity of single family homes even lower vacancy rates can add up to higher waste of resources. This is discussed in more detail in the next paragraph (resource intensity calculations based on [1]).

### 3.3 Implications for resource use

It is no secret that the single family home itself is a resource intensive type of housing, in particular from an urban development perspective with the related infrastructure considered. Besides an up to 5 times higher specific material input for the building itself, SFH neighborhoods tend to have a considerably lower urban density (calculated as FSI = gross floor space in m<sup>2</sup> per net residential land in m<sup>2</sup>) spelling out into much higher land uses and less efficient infrastructure in terms of costs as well as materials used. Assuming an average household size Fig. 2 shows the material intensity per resident (“material rucksack”) for different building types and settlement structures for synthetic neighbourhoods with 100 buildings. It is one striking result, that for detached SFH roughly 50% of

the material input used for the building has to be added in order to take the related infrastructure into account.

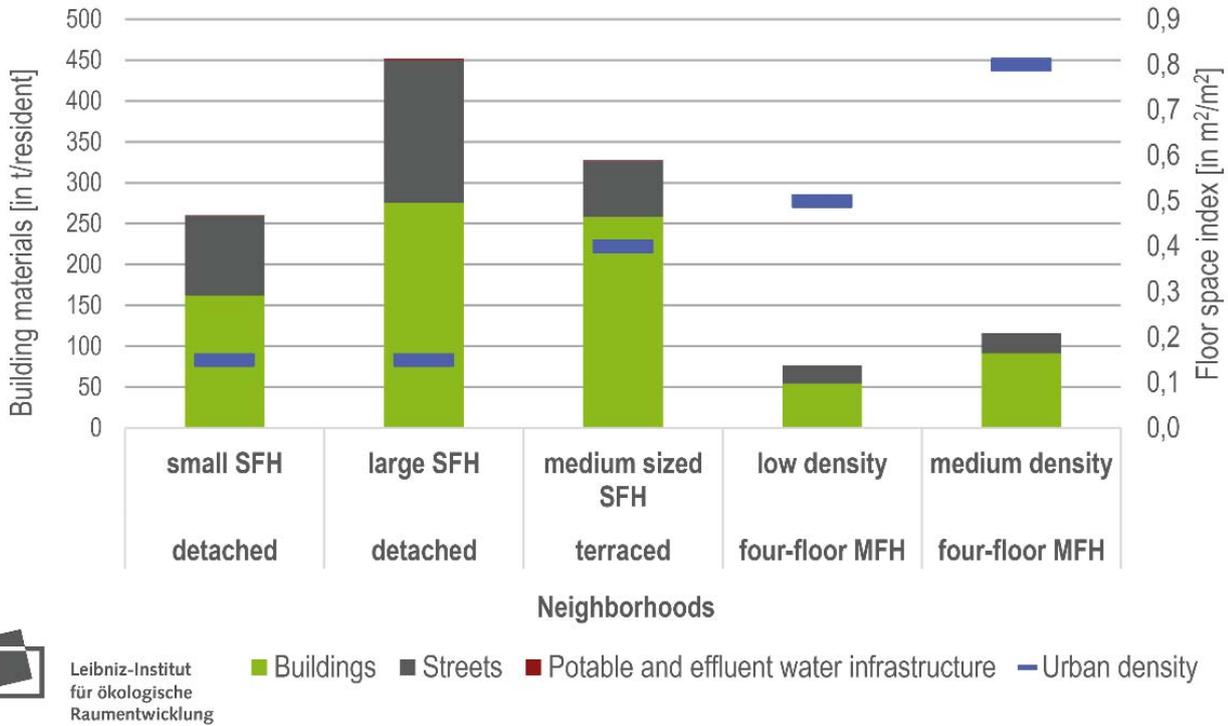


Fig. 2: Specific material input and floor space index for different SFH and MFH neighbourhoods

Having these particularities in mind, it becomes clear, that SFH neighbourhoods in terms of resource efficiency react more sensitive to changes in vacancy rates, than MFH districts. If we assume an average household size, the vacancy induced increase of per capita material intensity (“material rucksack”) for the remaining residents – despite the lower vacancy rate for MFH and SFH as given above – tends to be similar or even higher in the SFH neighborhoods (Fig. 3)

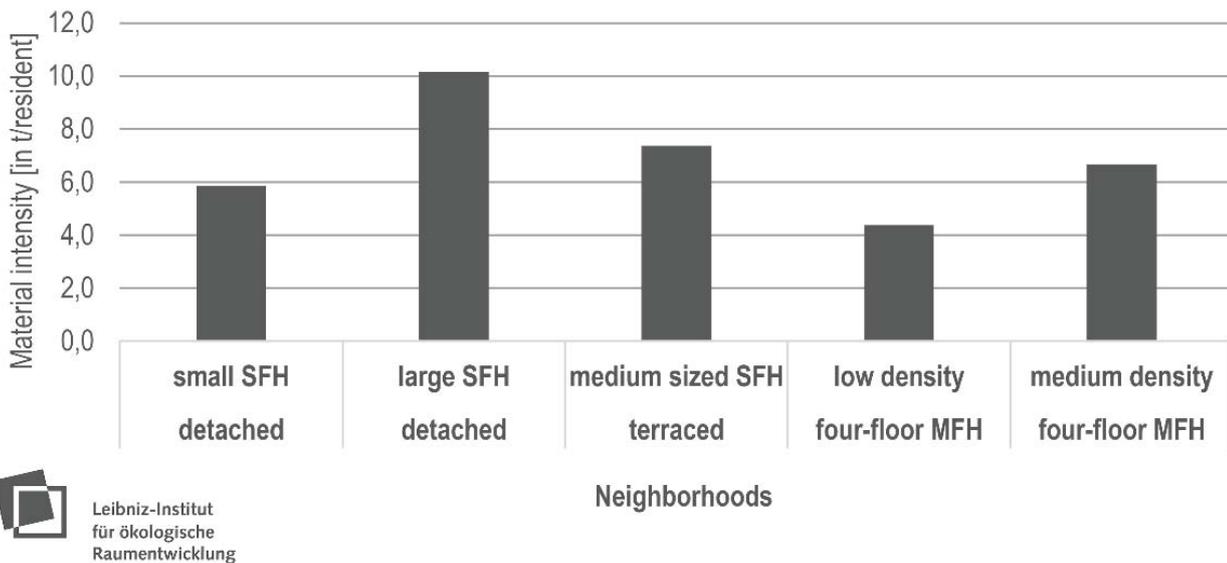


Fig. 3: Calculatory vacancy induced additional material rucksack per resident for different neighborhood types.

In other words: If we assume a synthetic neighborhood with 96 SFH equally mixed along the three types above, the resources “wasted” by 2,2% vacancy in these buildings in absolute figures clearly exceed the amount of unused resources induced by the 5,4% vacancy in a synthetic neighborhood with 96 flats in a 50/50 mix of the calculated MFH types (Fig. 4).

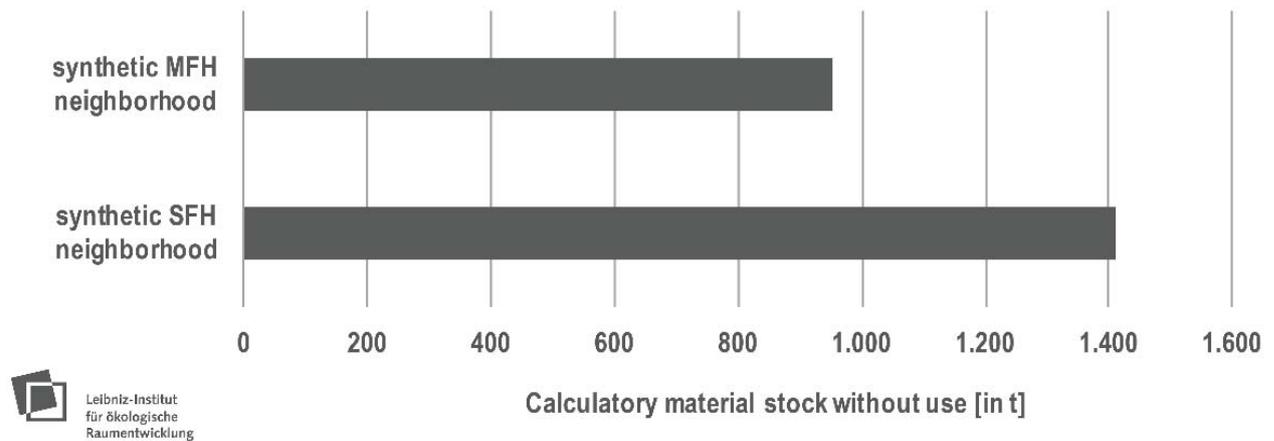


Fig. 4: Calculatory total vacancy induced material stock without use (“wasted resources”) compared for two synthetic neighborhoods (SFH and MFH).

## 4. Discussion

Trying to summarize the quite different impressions from the literature we can follow the authors of “Detached Houses – the Future” [45] for the situation in Switzerland where they highlight the typological diversity of suburban SFH neighborhoods and the need of tailor-made approaches when trying to develop these settlements in a more sustainable manner.

On the one hand the suburban SFH lifestyle still seems to be attractive for large groups of users. In particular metropolitan regions to a large extent seem to face business as usual – including extremely high prices for inner city housing that push less competitive households to the suburbs. On the other hand we find considerable indications for challenging developments. For example, beside the typical homogenous detached SFH settlements of the 1950s to 1970s also older inner city historic centers with small single family houses in smaller cities confront communities with development problems for example in terms of extensive vacancy [30].

With respect to sustainable development issues and resource efficiency in particular, the initial material stock estimates clearly indicate that with dropping demand and increasing vacancy, the efficiency of low-density SFH neighborhoods reacts highly sensitive in the negative sense, resulting in a waste of resources and land. In addition, the technical infrastructure services must be made available to an ever smaller group of consumers leading to higher costs for the remaining citizens. Furthermore, vacant buildings in an SFH neighborhood are much more dominant with respect to public appearance and character of the neighborhood than vacant single flats in a multi-family housing district. Growing vacancy rates in SFH neighborhoods can thus lead to a general down-trading of the whole district which adds a social and economic challenge to the environmental issue.

## 5. Conclusion

The first results of explorative research underline the relevance of changes in the development of SFH stocks for sustainable development at least in terms of resources and costs. Based on this status quo analysis it is now necessary to go deeper into regional differences and to generate reliable projections of future development scenarios as a basis for targeted and tailor-made approaches. At least locally SFH neighborhoods may form the redevelopment districts of the future.

## 6. Acknowledgements

The project "Effects of demographic change for the use of natural resources – scenarios and approaches to action" is funded by the German UBA federal environmental protection agency and will continue until 09/2017.

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ISBN 978-3-00-052213-0  
DOI: 10.5445/IR/1000051699

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