

The Energy Sufficiency Path: Basics for Residential Buildings

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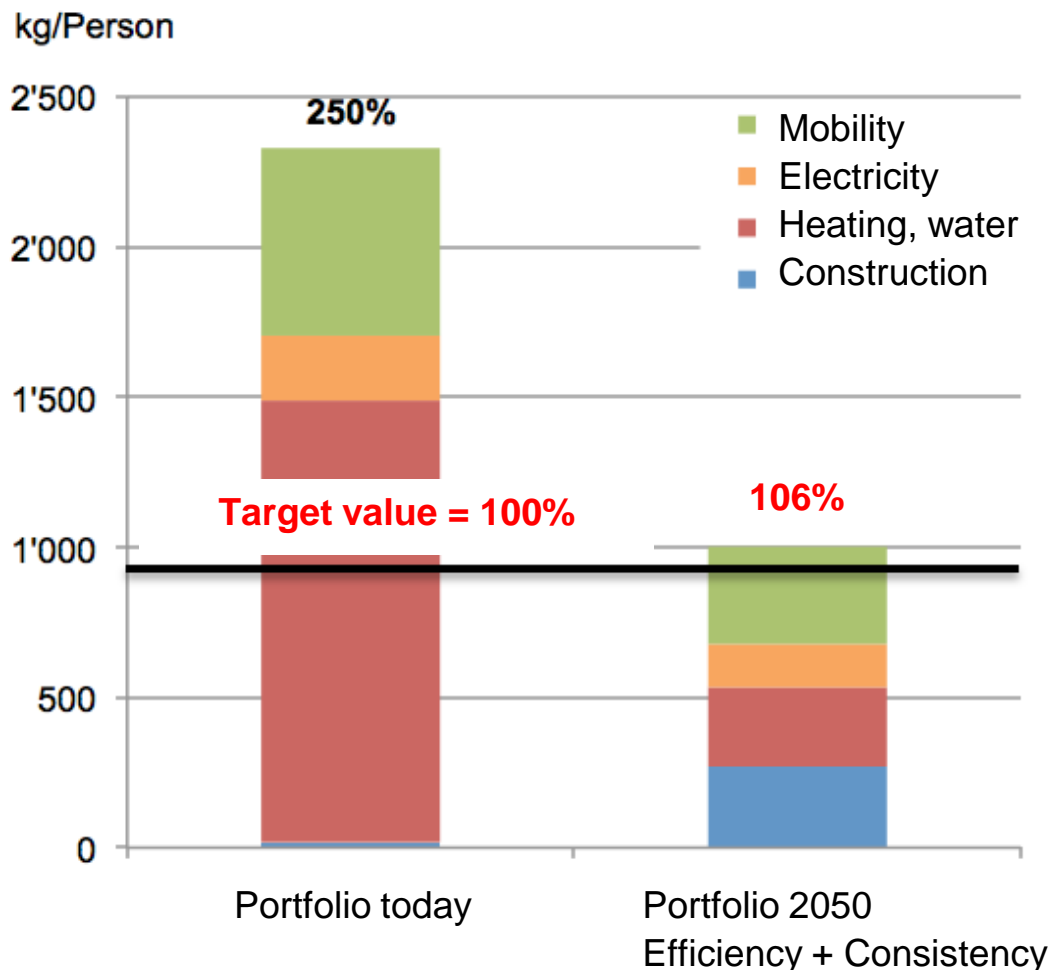
Stadt Zürich
Amt für Hochbauten



The residentials of the City of Zurich



Portfolio 2050: Efficiency and consistency



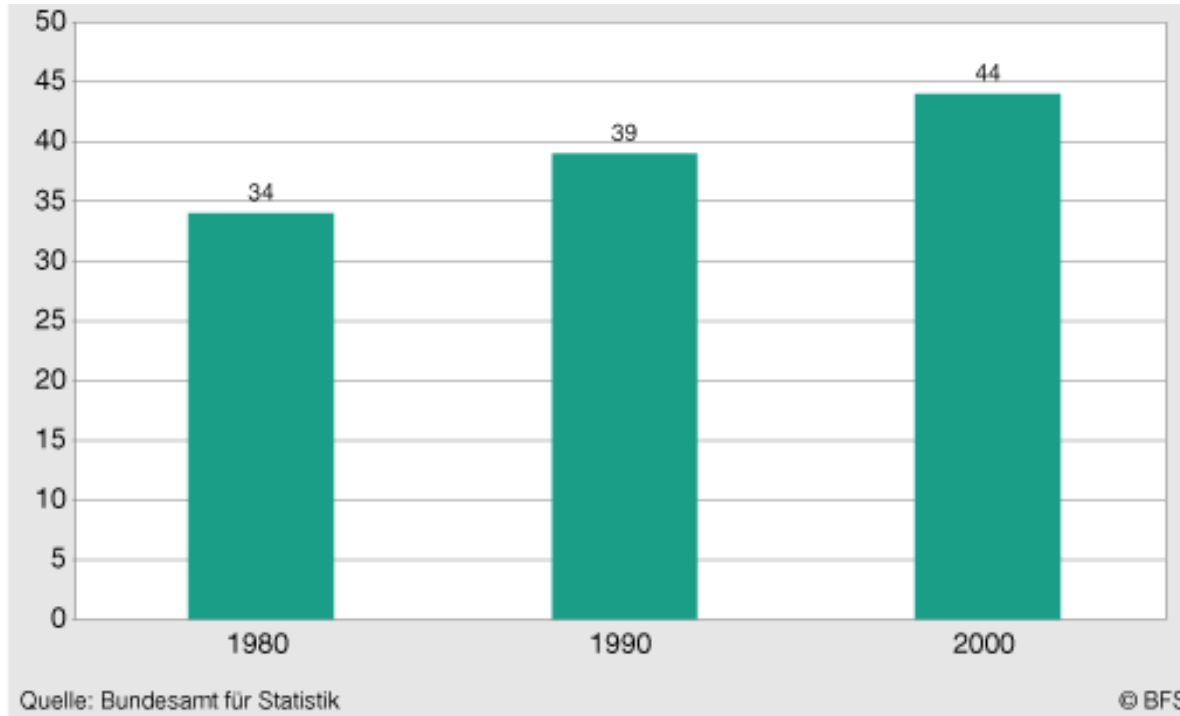
To reach the targets only with efficiency and consistency means e.g.

- Insulate all buildings
- No fossile fuels
- Efficient equipment

- Large investment
- Rising rents
- Loss of cultural heritage

Average living space per person in Switzerland

m²



Principles to implement the objectives



1. Sufficiency

Reducing the demand for energy-relevant goods and services.



2. Efficiency

Reducing the consumption of energy by increasing the energy efficiency of buildings, processes, devices and mobility.



3. Consistency

Priorising the use of renewable energies (substitution) and closed substance cycles.

Scope

- **Show the potential of a moderate sufficiency** to reduce primary energy and greenhouse gases, differentiated into areas of operation, construction and mobility
- To identify **the influence of involved persons**
- Show the impact of moderate **wasteful behaviour**

The study

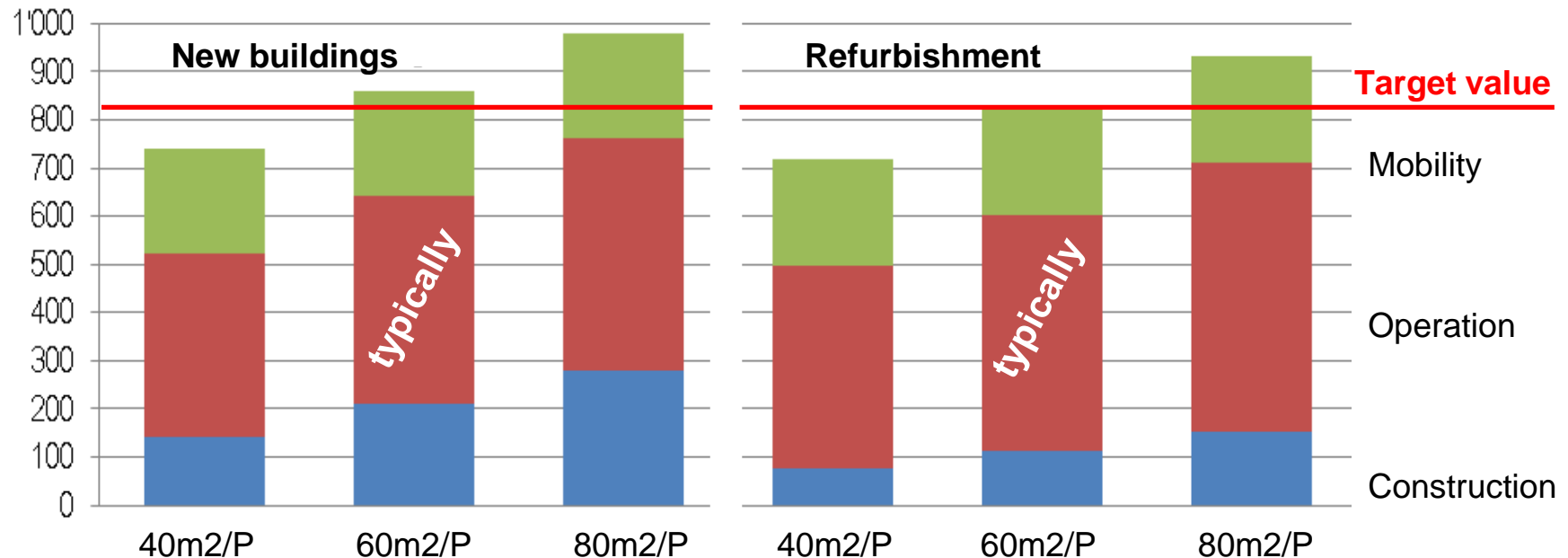
- Considered new and refurbished residential buildings
- Assumes that sufficiency is implemented in addition to efficiency: in efficient buildings with efficient operating facilities and equipment.

What is sufficient? Scenarios for typically, moderate sufficient and moderate wasteful

	Examples	Moderate wasteful	Typically	Moderate sufficient
Living Space	Energy related floor area	80 m2 / person	60 m2 / person	40 m2 / person
Operation	Room temperature	24°C	21°C	20°C
	Showering	15 in / person daily	4 min / person daily	2.5 min / person daily
	Lighting	Always everywhere	Often everywhere	Only where necessary
	Fridge	280 liters	230 liters	200 liters
	Washing machine	5x / week	4x / week	3x / week
	Appliances ICT	8 appliances	6 appliances	4 appliances
Mobility	Commuting	100% by car	50% by car	Bicycle, feet, public transport

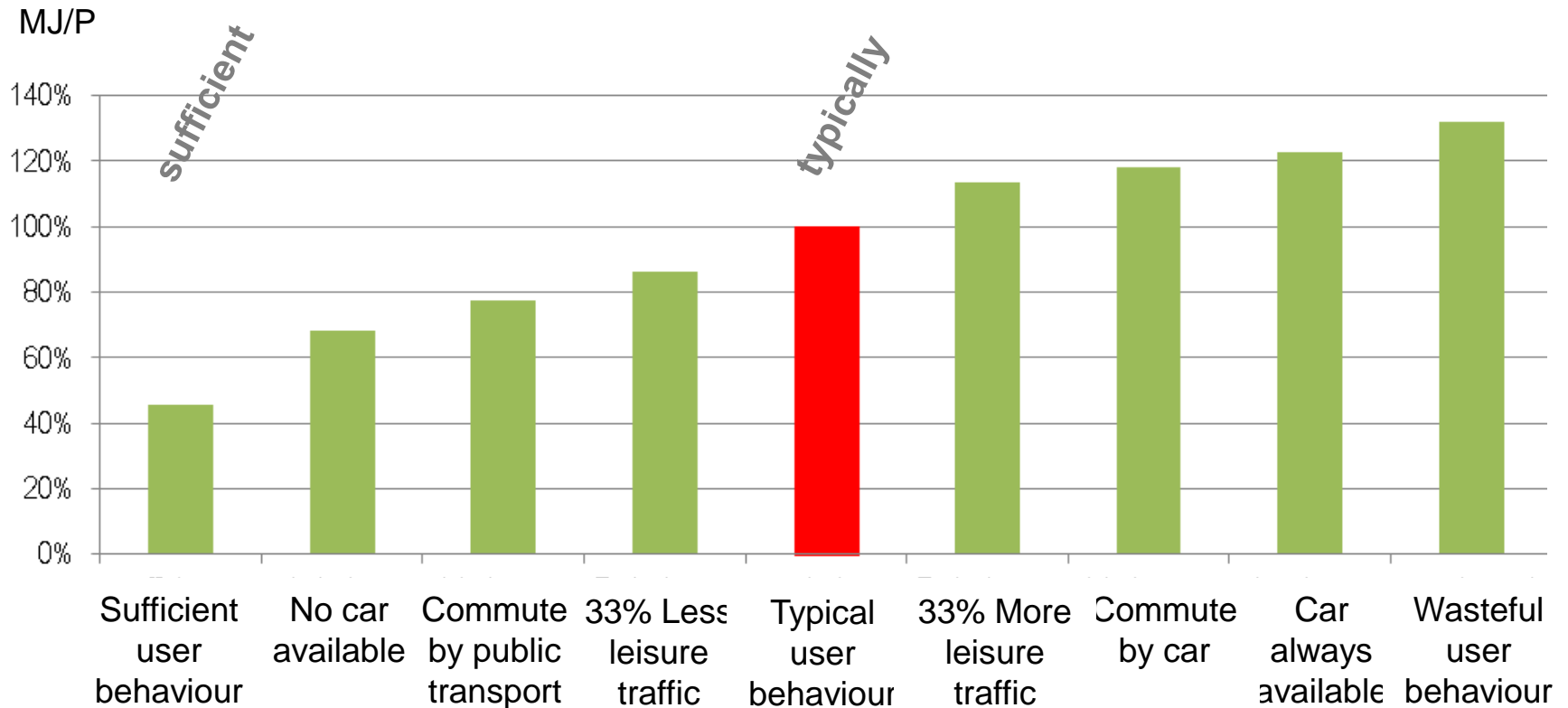
Living Space: Variable energy related floor area per person

Watt/P



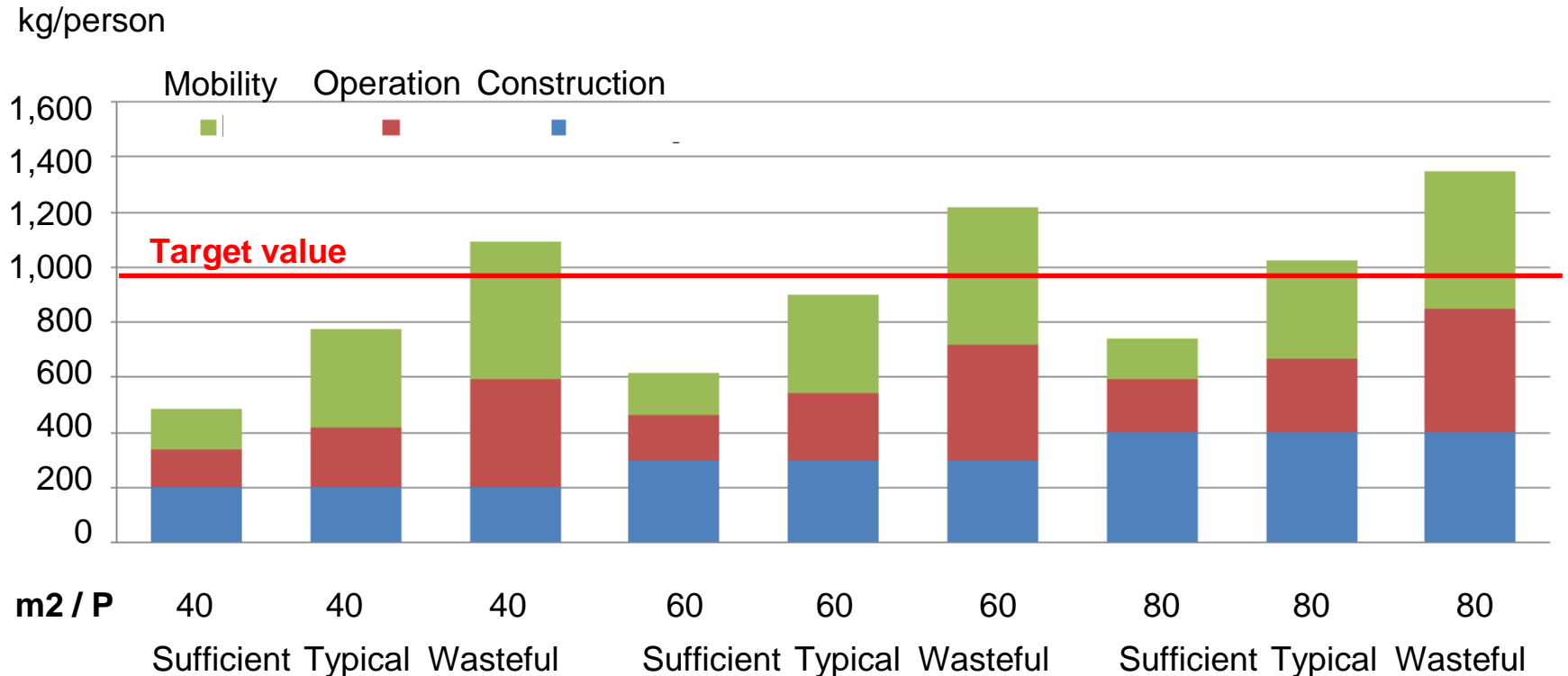
Consumption of primary non-renewable energy for efficient building,
based on average user behaviour

Mobility: Variable user behaviour



Consumption of primary non-renewable energy in everyday mobility in a residential building in the city center with good public transport

Superimposition of areas of influence: Living space, user behaviour in operation and mobility



Greenhouse gas emissions per person for a refurbished living space, city center, efficient operating facilities, equipment and vehicle fleet

Savings from moderate sufficiency by involved persons

100% = target value Initial state according to SIA-Efficiency Path Energy	Living space per person	Operation Heating, warm water, ventilation, light, appliances	Mobility
Initial installation → Building owners	Savings by reducing the standard living space per person by one-third (30m ² instead of 45m ² living space)	Savings from equipment, e.g. smaller fridge, monitoring systems	Savings from equipment, e.g. reduced parking place
Operation → Administration		2–4%	2–4%
User behaviour → Tenants		Savings from equipment and user behaviour, e.g. less consumption of warm water, less ICT equipment	Savings from equipment and user behaviour, e.g. no own car, smaller distances in leisure traffic
	15%	10–18%	12–20%

Sufficiency Efficiency Consistency

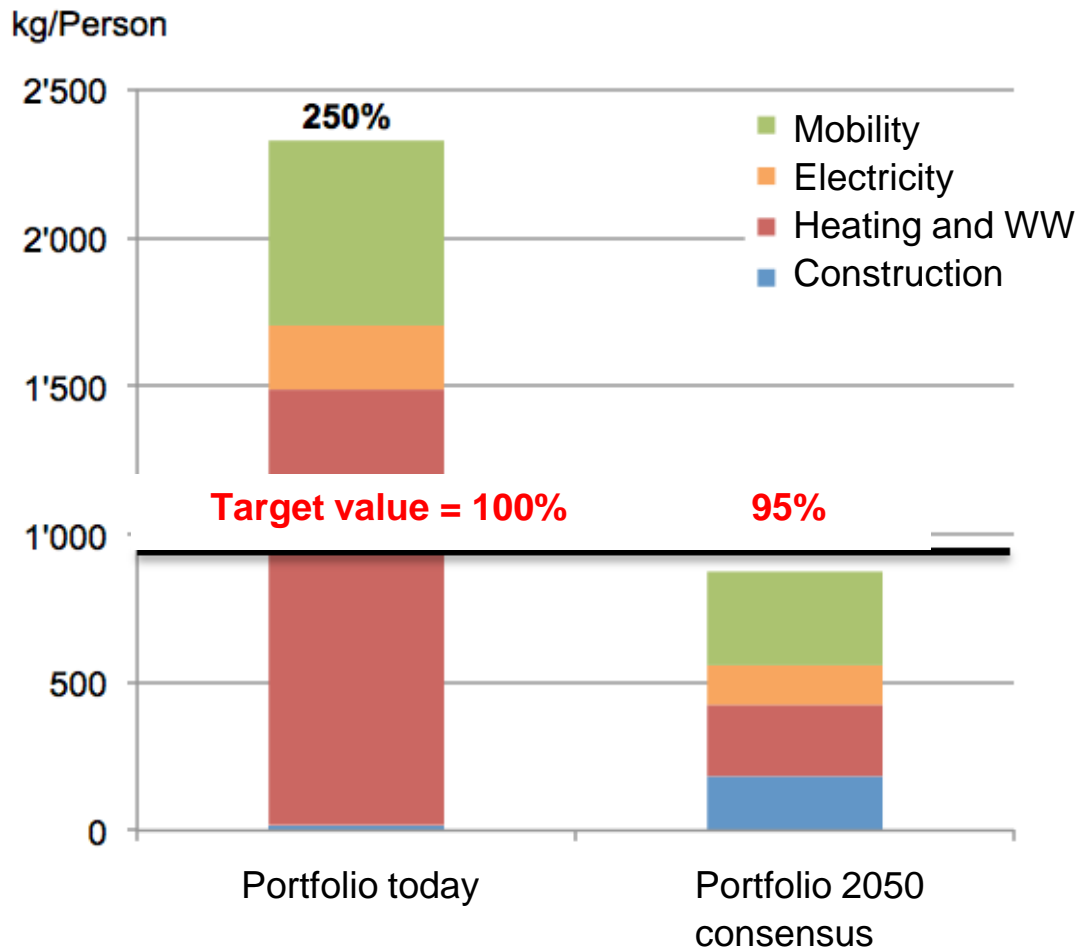
Living space per person in
Switzerland:
45-48m²

Equates to about 60m²
energy related floor area

Living space per person in the
residential portfolio of the City of
Zurich: 32m²

Equates to about 40m²
energy related floor area

Sufficiency Efficiency Consistency



Combination of sufficient living space with reasonable efficiency and consistency is ecological, affordable and preserves the cultural heritage

- Smaller living space per person
- Insulation and renewable energy where possible and reasonable

What influence has sufficiency to reach the tasks of the 2000-Watt society?

Study shows that:

- The potential of a moderate **sufficiency** - in addition to efficiency and consistency - **contributes significantly** to reach reduction goals
- Sufficiency can help to find solution and **raises the freedom of action** in conflicts of goals (e.g. economic, cultural heritage)
- **Wasteful behaviour** and use hinders / **makes it impossible** to reach the reduction goals (2000-Watt society)
- The **biggest influence** have the **tenants**
- The influence of **building owners and authorities** is smaller, but **also significant**

www.stadt-zuerich.ch/nachhaltiges-bauen

