



SOLAR ENERGY BUILDINGS INFORMATION FOR POLICYMAKERS

SOLAR ENERGY BUILDINGS = BETTER FUTURE

Globally, the operation of buildings accounts for ca. 40 % of the primary energy consumption and ca. 25 % of the greenhouse gas emissions.

Additionally, large amounts of energy are embodied in the building's construction materials.

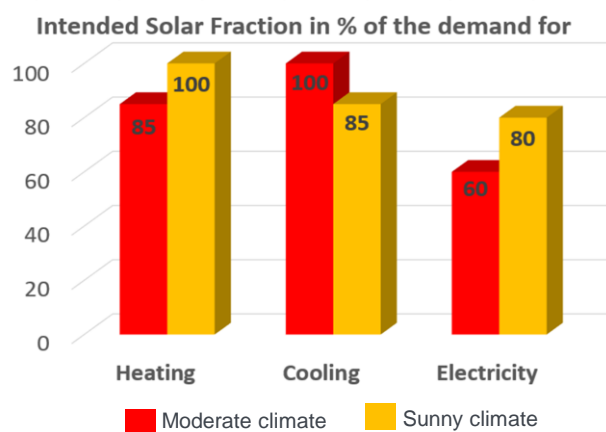
Therefore reducing it is a must for a sustainable development in any country and region. One solution are:

→ Solar Energy Buildings

What is a Solar Energy Building?

A Solar Energy Building is a building with a very high Solar Fraction as shown in the graph, due to the definition of IEA SHC Task 66.

The most important indicator is the **Solar Fraction**. It is the part of used solar energy in relation to the energy demand for heating, cooling and electricity of a building.



Moderate climate: e.g. central Europe, northern China and northern USA

Sunny climate: e.g. southern Europe, southern China and s. USA, Australia, Mexico

Solar energy can be used to produce any kind of energy needed in buildings, such as

- electricity
- heat
- cold

for any building type such as

- single-family buildings
- multi-story residential buildings
- building blocks and communities
- new and existing buildings





Example for an Office Building: Beijing, China

Office building

Average ambient temperature: 12.8°C

Office area: 3,000 m²

Key designs

- PV on facade and roof, 235.2 kWp
- Electrically heated domestic hot water tank
- Split air conditioning
- District heating

Energy consumption, production and solar fraction

- Annual energy consumption for space heating = 78,487 kWh/yr
- Annual electricity consumption = 116,041 Wh/yr
- Annual renewable electricity production = 219,561 kWh/yr
- Annual renewable electricity consumption = 67,744 kWh/yr
- **Solar fraction for electricity = 58,4 %**



Example for a Residential Building: Cottbus, Germany

Residential multi family building^{1,2}

Average ambient temperature: 10°C

Living area: 605 m²

Key designs

- Solar thermal collectors, 100 m²
- Geothermal collector system for cooling
- Solar PV modules, 29,6 kWp
- Heat storage, 24.6 m³
- Battery, 46.8 kWh
- Gas boiler for back-up, 48.2 kW
- Electrical vehicle charging station

Energy consumption, production and solar fraction

- Annual energy consumption for space heating and domestic hot water = 75,800 kWh/yr
- Annual energy consumption for space cooling = 3,850 kWh/yr
- Annual electricity consumption = 18,000 kWh/yr
- Annual renewable energy consumption for space heating, - cooling and domestic hot water = 56,250 kWh/yr
- Annual renewable electricity production = 27,500 kWh/yr
- Annual renewable electricity consumption = 13,500 kWh/yr
- **Solar fraction for heating = 56 %**
- **Solar fraction for cooling = 100%**
- **Solar fraction for electricity = 73%**

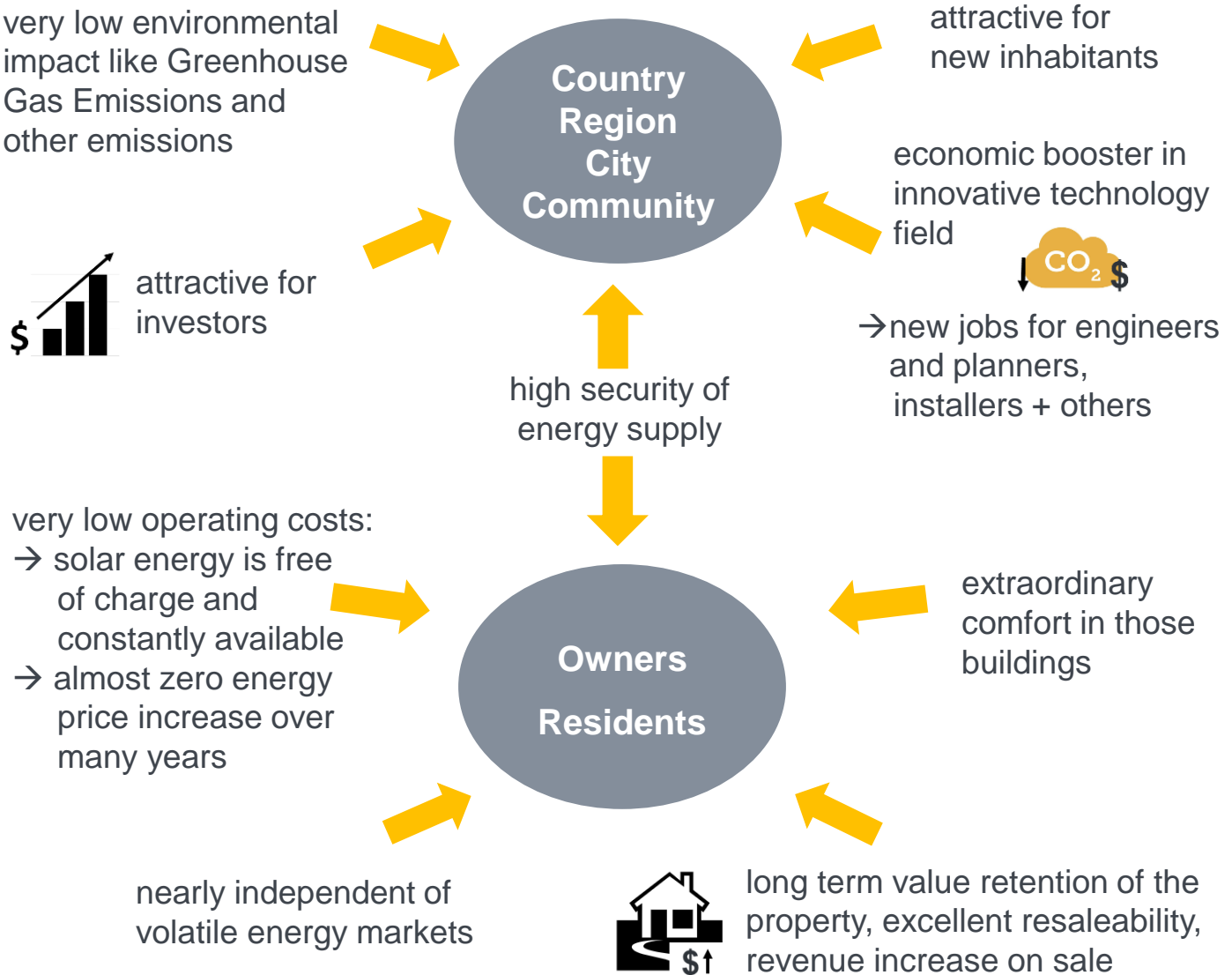
¹L. Oppelt, T. Storch, A. Gäbler, T. Fieback: [Monitoring results of the energy consumption behaviour of two highly solar-powered apartment buildings](#)
EuroSun2022 Proceedings, 2023,
DOI: 10.18086/eurosun.2022.01.09

²L. Oppelt, T. Storch, A. Gäbler, P. A. Junge, T. M. Fieback: [Technisch-wirtschaftliche und soziologische Evaluierung vernetzter hochgradig solar versorgter Mehrfamilienhäuser bei Einführung eines Pauschal-Mietmodells - Eversol \(PDF\)](#)
Freiberger Forschungshefte A 948 Energie, Freiberg, 2024,
ISBN: 978-3-86012-708-7

The solar fraction is equivalent to the CO₂ savings!

Assuming solar energy replaces energy generated by fossil fuels as solar energy is almost CO₂-free

Benefits of Solar Energy Buildings



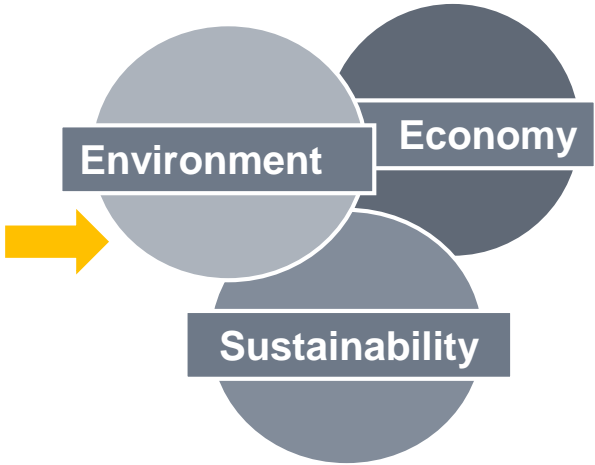
Create a Solar Energy Building Strategy

A governmental / regional policy strategy has a broad base of stakeholders and promotes

- ✓ a livable environment
- ✓ an economic growth
- ✓ a sustainable future

and contains of

- middle-/long-term goals
- a plan of measures (next page)
- a time schedule



Possible Measures

Form a **committee** to initiate, watch and control the activities and to communicate with the “players” such as other policymakers, industry, citizens, building owners, residents etc.

Kick-off of a **Solar Energy-Building-Campaign** followed by regular information events and workshops to raise awareness about the benefits, dispel myths and address concerns involving all stakeholders

Establish a **construction area exclusively for Solar Energy Buildings** with clear definitions and regulations as a pilot project

Establish respective **standards and regulations** for new buildings, building blocks and communities and also for the renovation of old buildings

Team up with **stakeholders** e.g. from industry, ecological associations, Solar Energy Building specialists, research institutions and also taking Public-Private-Partnerships into consideration

Provide (financial) **incentives** such as discount for building sites, tax reductions, one time grants for an investment in Solar Energy Buildings, performance based grants or similar

Initiate the conduction of **training programs**, workshops and education to create self-employment and encourage start-ups to create new jobs

Provide **funds for R&D** of Solar Energy Building technologies to make them more reasonable and effective

Promote Solar Energy Buildings and move towards FUTURE!

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