

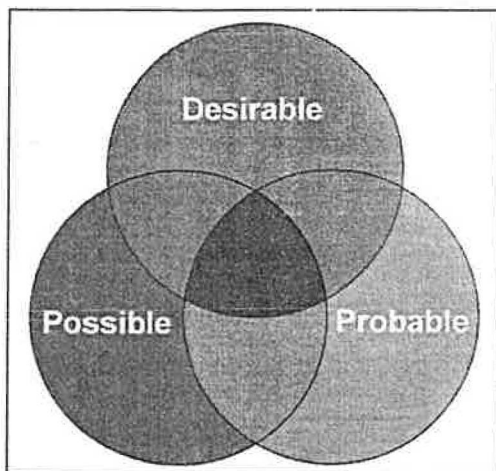
Long-Term Trends in the Swiss Building Sector

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Since about 1960 the Swiss building sector has been consuming more resources than any other part of the Swiss economy. About 10 % of building sector energy consumption is accounted for by construction and a further 50 % by the operation of the building stock. The second largest energy consumer, with nearly 30 % of total consumption, is the transportation sector. During the last decade building energy consumption has stabilised despite the continued growth in building stock. But transportation requirements are still growing.

Setting optimism aside, we still need to ask how the building sector will develop in future. Is there further potential for improvement? What are the long term trends in the building sector?

Buildings are normally constructed for the next 30 to 100 years. Although it is difficult to forecast what will change during this time, looking ahead to the future and trying to understand future needs is never a wasted exercise. When looking ahead, we have to distinguish between desirable, feasible and likely developments. Unfortunately not every desirable development is also likely to come to fruition. A sustainable society with a sustainable construction sector is certainly a desirable scenario. Yet we cannot say to what extent a sustainable building sector will be achievable over forthcoming decades. Nevertheless, it is still important to push developments in the right direction.



Unfortunately only a few scenarios are desirable, possible and also probable at the same time.

Future changes will be strongly influenced by social and economic conditions.

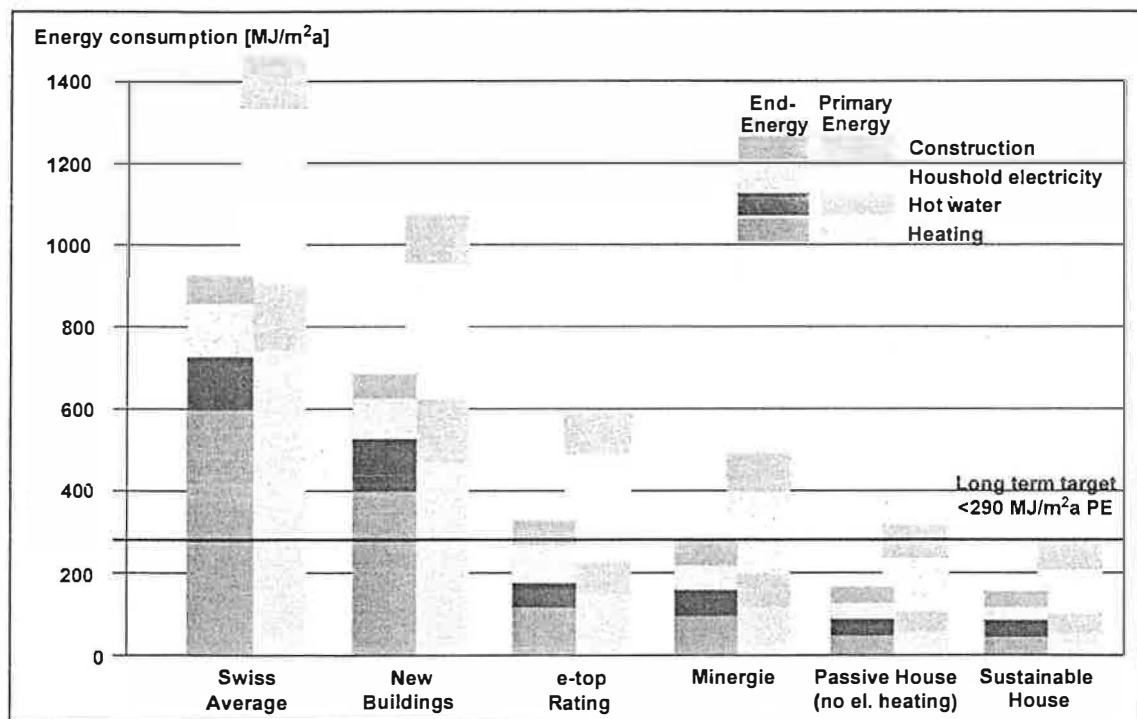
- The economic situation will change much faster than in the past. Versatility and flexibility will become important characteristics of buildings. The final installations and finishes will be increasingly left to the tenants, especially in the commercial sector. This could often hinder integrated solutions.
- Building retrofit will of necessity gain in significance. The question of whether demolish and reconstruct rather than continuously retrofit will become increasingly important. Demands

for high building standards will rise. Low quality buildings will not be able to satisfy these demands and are therefore better demolished.

- Retrofit and demolition will cause a growing number of waste problems. Reparability and building waste recycling will become an important issue that has to be thought of before construction. Increasingly, component replacement will replace repair work.
- Our economy is heavily dependent on the availability of cheap fossil fuels. Within the next 30 years, demand will outstrip supply and a large increase in energy prices is to be expected. While this will not cause any problems for energy efficient buildings, it will have a severe impact on our the economy and especially the energy supply to third world countries.
- Traffic will continue to increase in all sectors (public and private, short- and long-distance).

Apart from these economic and social boundary conditions, some clear technological trends are emerging:

- Immense progress has been made in the field of energy efficiency. Heating energy consumption has been reduced from an average of about 25 litres per m^2 a year to about 1.5 litres of oil equivalent. The Minergie and the Passive House Standard have established the basis for broad use of this technology. It is possible to reduce heating energy consumption to 10 times lower than average not only in experimental houses but also in normal new buildings. In such buildings, the heating systems is no longer a central installation.



Energy consumption of different building energy standards. The Passive House comes already very close to sustainability, as far as primary energy consumption is concerned (Basis: 2000 Watt Society).

- The trend towards heavily glazed building envelopes that allow transparency and brightness will continue. This trend is also driven by innovative new technologies (such as electrochromic glazing, integrated photovoltaics etc.). The need for optimal sun protection will increase.
- Mechanical ventilation will become a standard technology, offering both comfort and energy efficiency thanks to efficient heat recovery. Air handling units will include intelligent energy management systems and will guarantee optimal air quality. They will replace traditional central heating systems.
- Renewable energy – such as solar energy for hot water and heating support or efficient and clean wood stoves – will be standard technologies in future homes. Other technologies like photovoltaics or transparent insulation will still need further development.
- Electricity consumption will further increase. Electronic networks, wireless communication and powerful information technologies in particular will undergo as yet unforeseeable further development. The number of installations and performance gains will outpace the savings generated by technological advances. Photovoltaics, fuel cells and electricity management systems will therefore play an important role in future new buildings and retrofits.

Overall, building technical systems will become smaller but more versatile. The low heating requirement will necessitate a reappraisal of the need for traditional central heating systems. With heavily glazed facades, comfort problems will tend to occur in summer rather than winter, and cooling will become as important as heating. Reversible systems that can both heat and cool buildings will dominate. Small electrical heating pumps will become more common. The COP will improve greatly and a COP of about 6 will be achieved for both heating and cooling. The use of ambient heat and cold will grow, especially using ground-coupled air systems and ground pipes. Electricity will be partially produced on site, using PV cells during the day and fuel cells at night and in winter. Intelligent energy management systems will optimise the use of the available electricity. These complex energy systems will increasingly be available as complete energy centres. "Plug and play" combined with minimum engineering will also become the rule in building equipment. Increasing globalisation will limit the development and maintenance of such systems to a few international companies only. Customised solutions will only be possible for very large systems.

Domestic hot water supplies will become an important energy consumer. Solar hot water systems and hot water pumps that recover waste heat, will become standard technologies. There will be little change in hot water consumption.



	Ø CH	New building	Renovation Magnusstr.
Heating	600	400	35 MJ
Hot water	130	130	11 MJ
Electricity	120	100	60 MJ
Total	850	630	106 MJ

Example for an advanced renovation in Zurich. Also old buildings can achieve the Passive House Standard if a complete retrofit is possible.

In 30 years time there will also be conventional buildings that are basically unchanged from today's buildings. In particular, many existing buildings will only change slightly because retrofit measures are expensive. However, such buildings will need other qualities if they are to compete against increasing comfort expectations. Unless they are well situated, architecturally outstanding or they of high historical value, they will have difficulty justifying their high energy cost and low comfort levels.