PASSIVE HOUSE - FUTURE OR PRESENT

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Abstract: The idea of harmony between nature, society and the economy is best achieved through full implementation of the principles of sustainable development. Through them achieve improved quality of life while minimizing the consumption of natural resources, so that next generations have enough opportunities for better life. One of the areas in which business, public needs, traditions and cultural beliefs with environmental protection is necessary to integrate these principles in deciding to build housing for the population. From the selection of construction decision today determines the quality of life of residents for a relatively long period of time. The international Energy Agency shows that buildings consume nearly 30% of final energy and is responsible for more than 40% of greenhouse gas emissions worldwide. The application of the principles of sustainable development is an extraordinary importance to the construction sector.
This work is considered some of the concepts for the development of a new type of construction by building the so-called passive buildings where energy saving and minimizing greenhouse gas emissions is the most significant. The concept of passive houses is based on a strict energy-saving heating, cooling and ventilation, and can be reduced to such an extent that solar sources are sufficient to ensure a comfortable climate in buildings.Thus, passive houses become the basis for the development of sustainable architecture and construction by helping to reduce the use of non-renewable energy resources, reducing climate change, maintaining natural ecosystems, use 12% less potable water, generate 39 percent less carbon and 69 % less waste and consume 71 percent less electricity. This work presents data on the development of this type of construction in many countries where the share of passive houses of the total housing stock is already significant. On the basis of the analysis presented recommendations for concrete actions for the development of this direction.

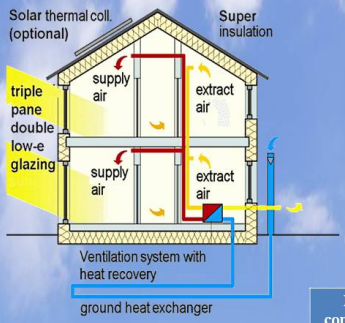
The first passive house

The first passive house is the ship "Fram" built by the Norwegian designer Colin. In September 1996 created the Institute of passive houses also in Darmstadt to promote and control standards. From then until now were built approximately 20 000 such houses worldwide.

Passive houses in Bulgaria

The first passive house in Bulgaria is already a reality. Built by a company Megaman Ltd. and is located near the center of Bulgaria's sea capital - Varna. There are three more drafted, two in the city of Sofia and one to the village Ravnishte, the town of Pravetz
In Bulgaria, only now are projects by a single house that is located on the territory of Blagoevgrad is made Blower Door Test, and it can be argued that meeting the criteria for passive. However, no small achievement, constant attempts in this direction and results in the form of real-built buildings, they will first begin to appear.
Bulgaria also has a non-profit-IG Passive buildings Bulgaria, whose main goal is to achieve higher standard of life and environmental sustainability.

First passive house in Bulgaria -Varna



What is passive house?

- Annual energy consumption for heating per square meter - 15 [kW h].
- Heat recovery ventilation with over 80%.
- Facing windows in most of the south, and U - 0,8 [W / m2K].
- Dense gas, with air flow from 0,6-h.
- Energy saving over 90%
- Healthy microclimate throughout the year
- Independence from the market of energy - gas, oil, coal, etc.

How saving energy passive houses?

- Super insulation and compact form of the passive house
- Southern orientation and no shading, and windows and glass high-end
- Air leakage through gaps untight not exceed 0.6 times the internal volume of house per hour.
- Passive preheating of fresh air by its passage through underground pipes. Using the warm exhaust air through recuperate
- Supply of hot water using renewable sources - solar collectors or heat pumps provide energy for hot water.
- Use of energy saving household appliances

The building is not considered that cover the parameters of the standard if one of these criteria is not fulfilled. All these indicators are calculated using the methodology of Passivhaus Institut - Dr.Wolfgang Feist, Germany.

Comparison of power consumption in different types of buildings

Energy consumption for heating and air conditioning	kWh/m²year 300 -250	kWh/m²year 150 -100	kWh/m²year 50 -30	kWh/m²year under 15
Construction standards	Without insulation	Insufficient insulation	Low energy buildings	Passive buildings
Energy consumption in liters of oil per m² per year	60 kg/m² year	30 kg/m² year	10 kg/m² year	2 kg/m² year
Carbon emissions		6 cm	16 cm	~ 30 cm

How far is economically justified a passive house?

Passive building -15kWh/m² annual heating
Building built in today's norm-over 100kWh/m² per year
17.6 st. per KWh degree heat.
85kWh/m² * 17,6 st = 14.96 BGN per m² per year savings.
Assuming an average house of 150 m², we save
14.96BGN * 150 = 2244BGN per year. For 15 years that are 33 660BGN.

Standard vs. Passive House

Comparison	New Construction Home U.S. average	Passive House (since 1995)
Insulating values	R-21 to R-38	R-21 to R-120*
Window glazing	2-pane windows, low solar heat gain	2 to 4-pane windows*, high solar heat gain
Window frames	solid frame	solid or thermally broken frames*
Air Tightness @ 50 Pa	3 - 5 ACH	max. 0.6 ACH (≥ 0.1 CFM per square foot)
Space conditioning energy	36,600 Btu/sf yr. (2007)	max. 4,750 Btu/sf yr. (up to 90% less)
Primary or source energy	(16.6 kWh/sf yr. site energy 2001)	max. 11.1 kWh/sf yr. (up to 75% less)
Sun & Shading	Random orientation, shading not a concern	Near southern orientation, built-in shading
Initial Cost	$300,000 (2007)	$324,000 (estimated)
Ventilation	natural/random, sometimes mechanical	guaranteed air change with mechanical
Comfort	low to high (radiant heat-loss, dry air, stale air etc.)	very high (virtually no radiant heat loss, healthy humidity, fresh air, etc.)
Potential effects on human health	Mold, radiant heat-loss, humidity (leck of), noise, CO exposure, pollutants, VOCs	Significantly reduced exposure to CO, pollutants, VOCs. Virtually no potential for mold, no radiant heat loss, healthy humidity levels, little to no noise pollution
Resale	baseline	sells up to 25% quicker, yields up to 10% more
Opportunity	Incremental "greening". Limited potential for energy and CO^2 reduction	Renewables are smaller, hence more affordable. Zero site, or source energy, carbon neutrality, deep energy retrofit

*) Depending on climate zone

SWOT ANALYSIS OF PASSIVE HOUSE

STRENGTHS	WEAKNESSES
➢ Saving energy over 90% ➢ Healthy microclimate throughout the year. The premises no condensation, mold and mildew. ➢ Independence from the market of energy - gas, oil, coal and others. ➢ Annual energy consumption for heating per square meter - 15 [kW/ h] ➢ Carbon emissions -2kg/m2 ➢ Year for heating, cooling and water heating, counting only 1 EUR per sq.m. ➢ Better sound insulation and fire protection, increased seismic resistance tenfold less weight, 8-10% more effective area. ➢ High resistance and durability of materials	➢ More expensive by 15-25% of conventional home ➢ The larger costs come from the ventilation system, ➢ Shortage of solar energy all year round ➢ Use windows that are twice as expensive than conventional.
OPPORTNITIES	**TREATS**
➢ Improving the technology for obtaining energy from the sun, wind and earth (geothermal). And thus achieving full energy effectiveness. ➢ Possible disposal and treatment of household wastewater and their reuse for irrigation ➢ Utilization of organic waste, composting and reuse as product (compost) fertilizer plant	➢ Missing

CONCLSIONS:

- With increasing environmental problems, increasing global warming and accelerated reduction of exhaustible natural resources interest in these scientific advances slowly but surely becoming larger. Forecast: by 2030 energy demand will soar by 50%, carbon emissions increase by 60%
- All buildings in the EU, whose construction started after December 31, 2018, will have to be zero energy.
- While representing a larger initial investment, the positive sides of a passive house outweigh the high cost.
- Advantages who have these houses are many: better microclimate of living, better sound and heat insulation, higher seismic resistance, durability of materials and last but not least independence from energy market.
- Reflecting locally, we could live in a dream house, which cost our electricity will be reduced tenfold compared with before, and would even be possible to produce their own energy required for our home and are independent of energy to purify our own domestic waste water, facilitating local wastewater treatment plants
- Reflecting global we become part of the world know how to reduce the greenhouse effect, becoming a unique point of maintaining harmony and balance in nature.