CLIMATE ALLIANCE

Sustainable building and the efficiency imperative

Sarah Mekjian
24 February 2025

Photo: Andreas Gücklhorn via Unsplash

Bir binayı sürdürülebilir kılan nedir?

Sürdürülebilir binaları hangi nitelikler, özellikler, terimler ve standartlarla ilişkilendiriyorsunuz?

Photo: PHI

CLIMATE ALLIANCE

The materials

Oil-based synthetics versus eco

Photo: Júlio Riccó via Pexels

Photo: Sharon Waldron via Unsplash


Photo: Alec Orell
Material isn't everything…

The materials

Embodied energy – trickier in buildings than you might think

But aren't ecological materials better?

- Generally, YES.
- But the case is more complex for buildings than for straws and plastic bags and styrofoam cups.
    - On the social side: materials don't protect against energy poverty
    - On the environmental side: insulation saves far more energy and CO_2 every year of its use than "consumed" during manufacture.
- Durability and reusability are the decisive! Need to think circular!

EXTREME CASE

Insulation of old building wall with 20 cm grey polystyrene rigid foam (petroleum-based product).

→ Primary energy required to produce: 40 kWh per m^2 — Once off

→ Heating energy saved per m^2: 85 kWh per m^2 — Every year

Source: passipedia.de

The energy performance

What it takes to heat and cool the building

WHY?

Because most of the energy that goes into a building's life cycle is used to heat and cool it!

Ecological materials? Sure!

..BUT not at the expense of energy savings!

CASE IN POINT

Take a typical German new build from the mid-1980s with gas heating, viewed over a useful life of 80 years

→What percentage of total energy is used to make the building materials?

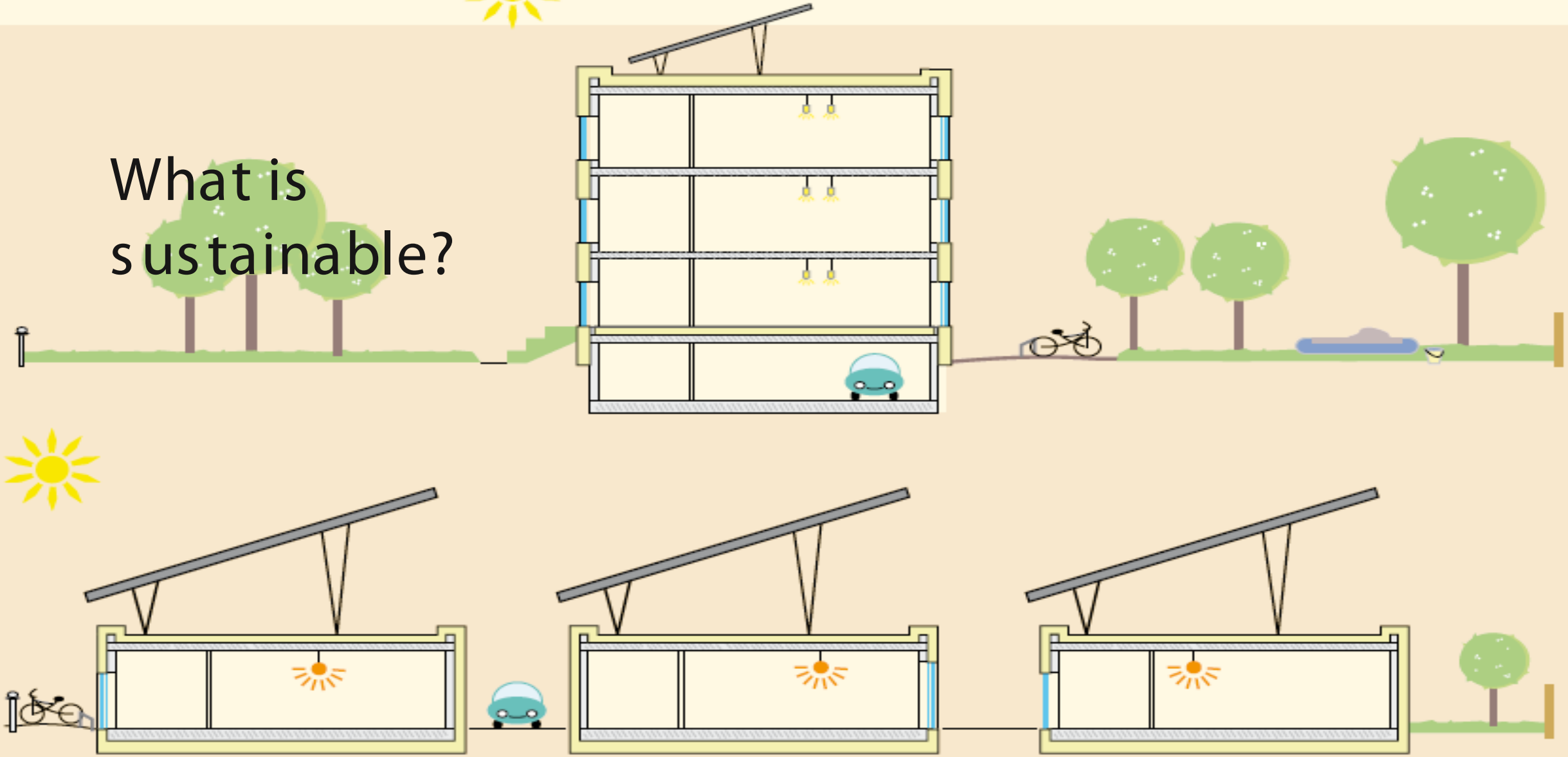
only 5%

..even in low energy houses, the manufacturing energy makes up only about 10% of the total primary energy

Source: passipedia.de

Photo: Andreas Gücklhorn via Unsplash

What is sustainable?

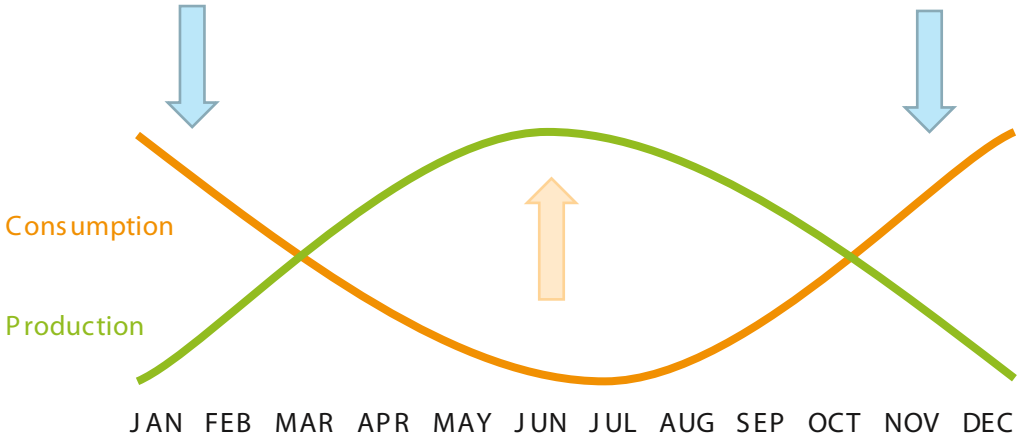


Graphic: PHI

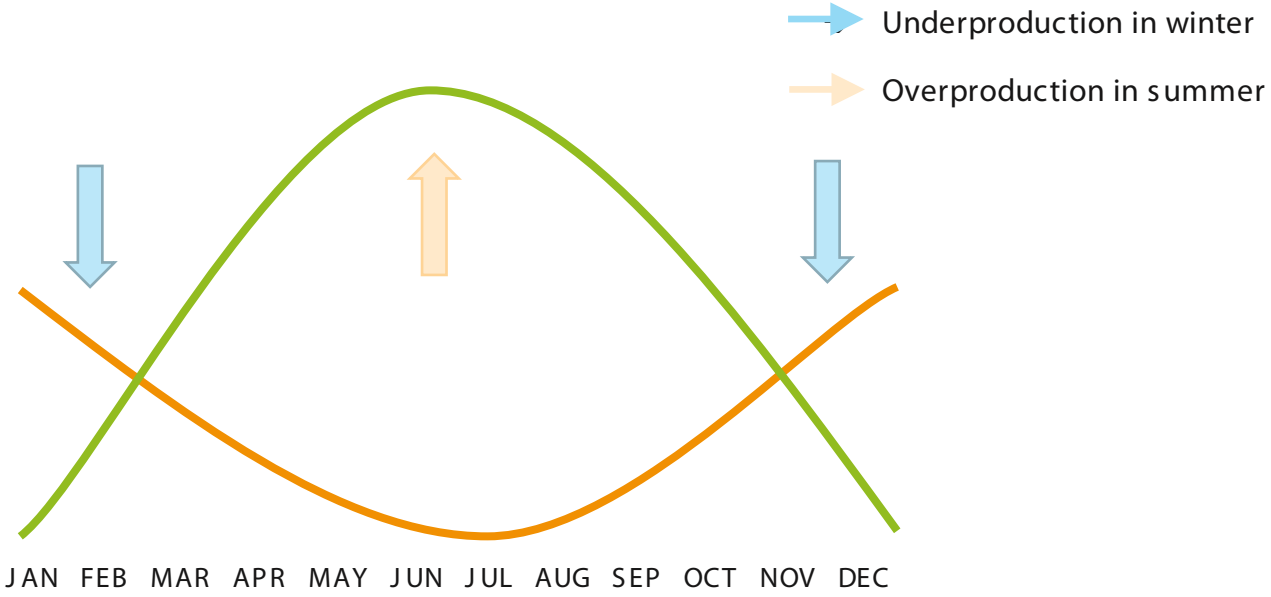
Carbon neutral buildings

Produce what they consume (on balance!)

Zero energy building

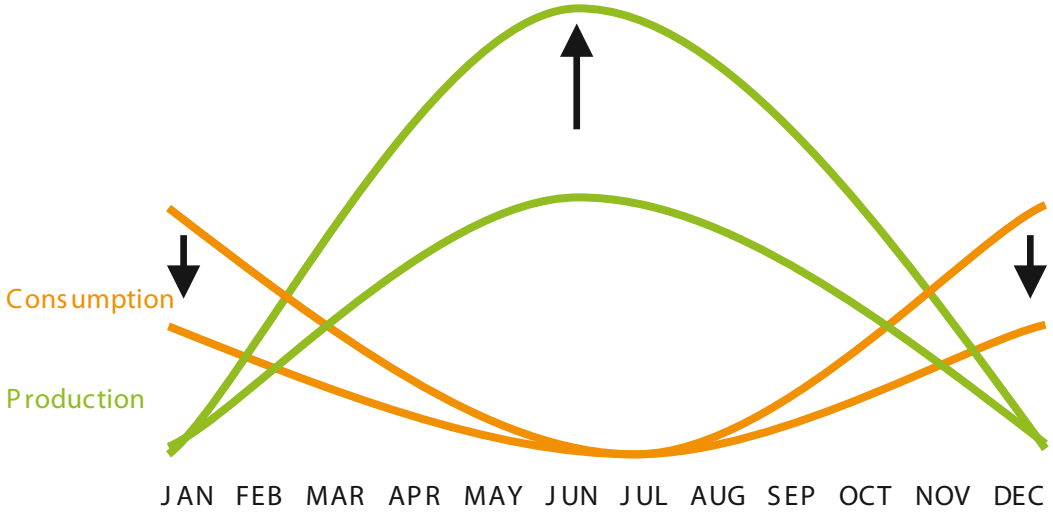


Plus energy building



Sense and solidarity

Energy efficiency first with renewables to cover the rest ..and feed the grid



Why not sufficiency?

- Possible, but still extremely expensive.
- Surplus electricity generated onsite can be fed into the network – better for the environment, your neighbours and your pocket book.

Goal:
Reduce what we can, produce what we can

Sharing is caring! Lighten the grid's load with lowered energy demand and produce more for those in need!

Reducing demand

Passive House – doing more with less

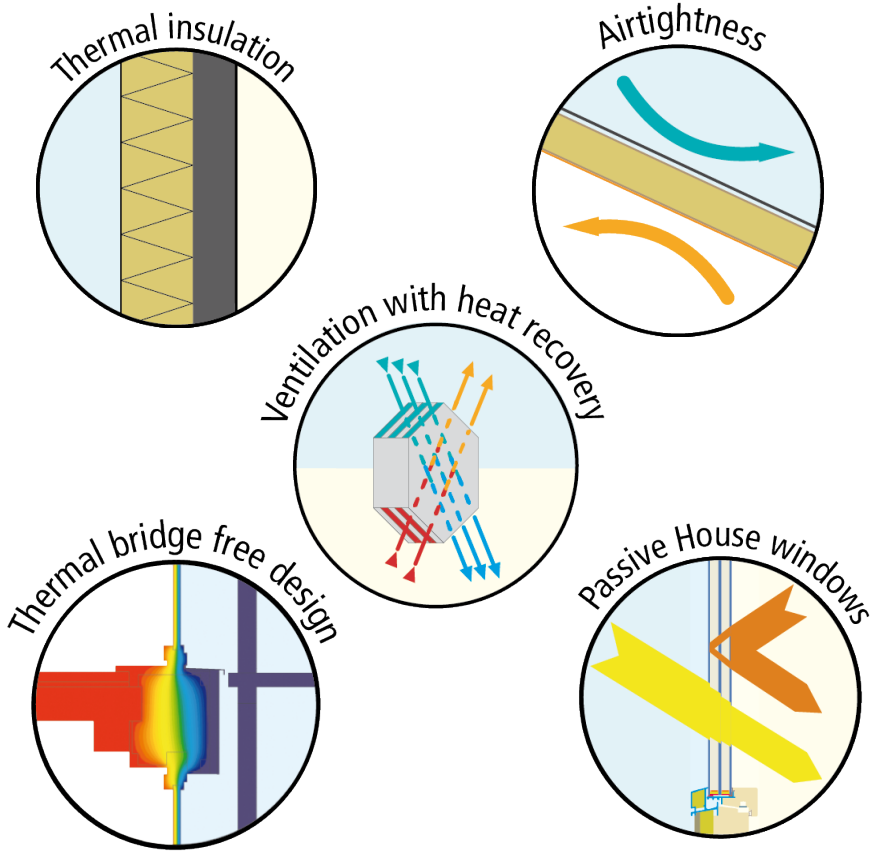
Passive House

- **Keeping it low-tech and simple**
- Sets stringent performance goals for final energy use, not prescriptive goals on how to build.

The result

- Construction and renovation in accordance with physical principles
- Up to 90% energy savings compared to older buildings and 75% compared to low energy buildings

What about renovations?
EnerPHit!



Passive House principles | © Passive House Institute

CLIMATE ALLIANCE

Passive House & EnerPHit criteria

Space Heating Demand	not to exceed **15 kWh** annually OR **10W** (peak demand) per square metre of usable living space.
Space Cooling Demand	roughly matches the heat demand with an additional, climate-dependent allowance for dehumidification.
Primary Energy Demand	not to exceed **120 kWh** annually for all domestic applications (heating, cooling, hot water, and domestic electricity) per square metre of usable living space.
Airtightness	maximum of **0.6 air changes** per hour at 50 Pascals pressure (as verified with an onsite pressure test in both pressurised and depressurised states).
Thermal comfort	must be met for all living areas year-round with not more than **10%** of the hours in any given year over **25°C.**

For renovations:

25 kWh/m2a (Central Europe)
20 kWh/m2a in Turkey

or consistant use of
Passive House Components

Reducing demand

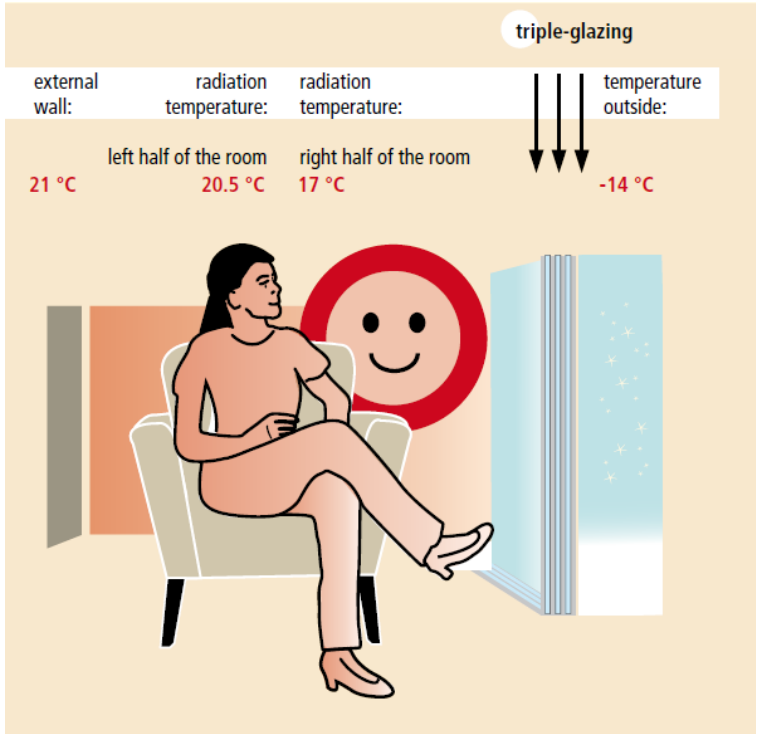
Passive House – doing more with less

Fun Passive House facts

- You could heat it solely using fresh air from a ventilation system (no need for a heating system).
- You could heat a 130 m^2 house with the power used to run your hairdryer (1300 watts)

→So how many tea lights would it take to heat a 24 m^2 livingroom?

About 7 tea lights



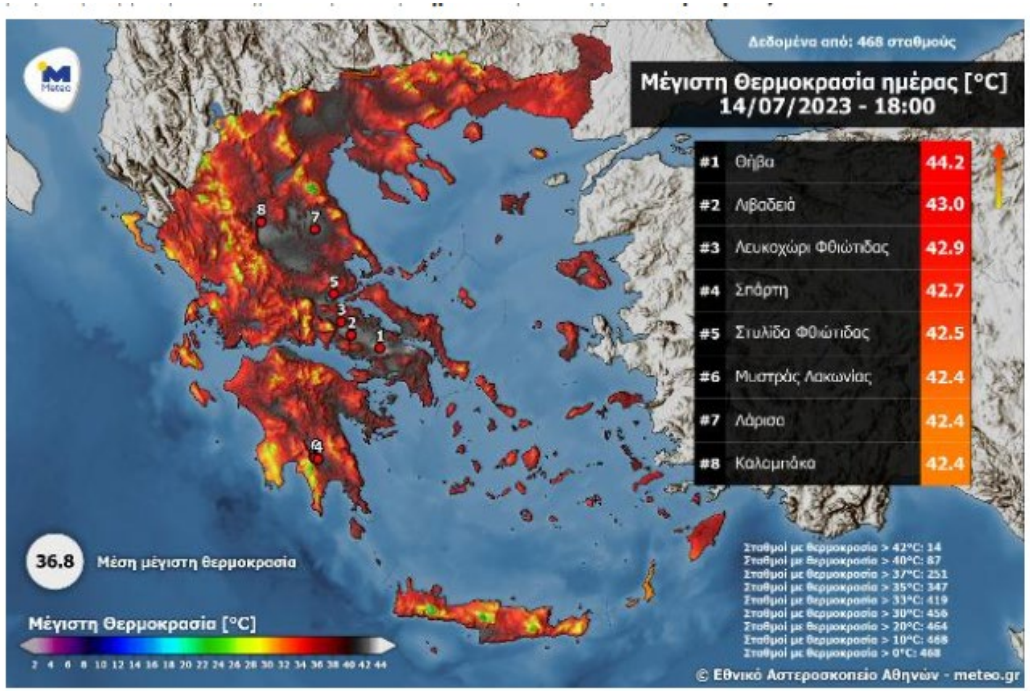
Graphic: PHI

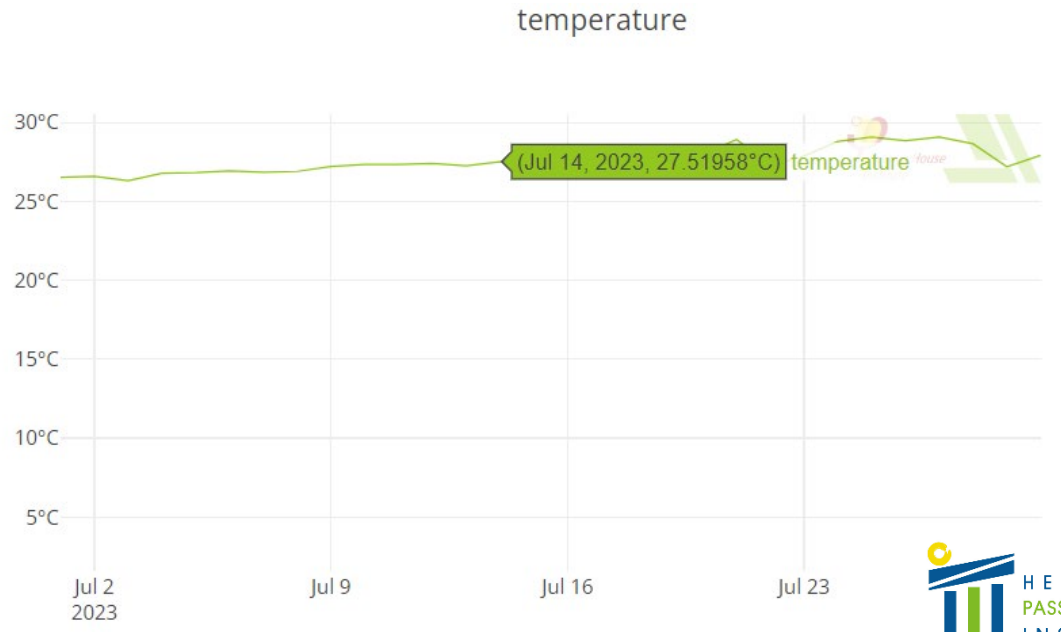
Passive House not only reduces demand…

By keeping indoor surface temps above 17°C, comfort is improved and mould prevented

Not just for the cold

Example of a renovation in Greece on the hottest day in 2023





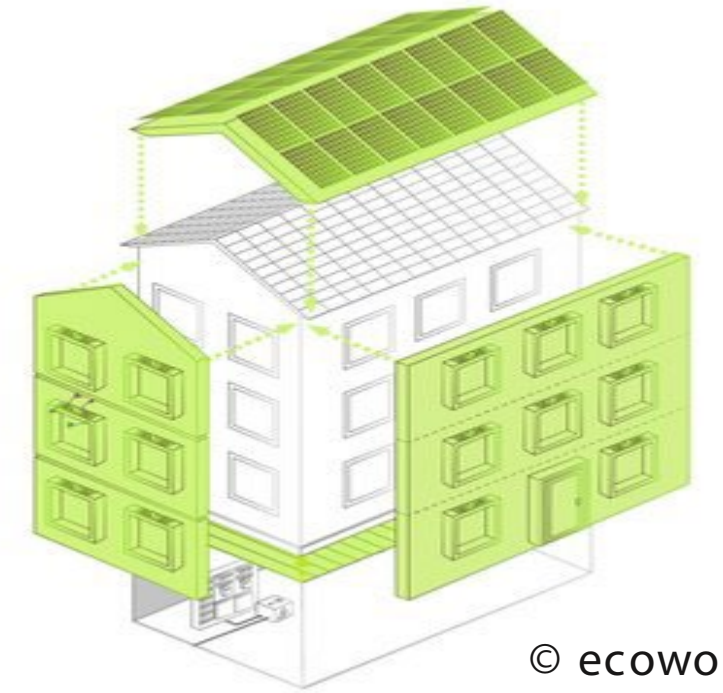
Before & After | EnerPHit Retrofit (Greece)

HELLENIC PASSIVE HOUSE INSTITUTE

Photo: Aris Stavropoulos

Renovation done fast?

With prefabricated modules, deep renovation is possible in days



© ecoworks

CLIMATE ALLIANCE

And in Turkey?

Human Resource Center
Gaziantep Metropolitan Municipality

GAP Energy Efficiency & Consultant Incubation Center
GAP Regional Development Administration

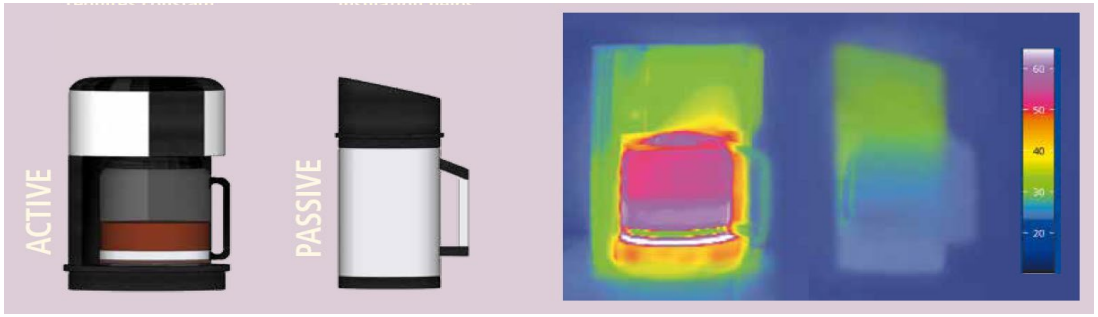
Details on the Passive House Database

Reducing demand

Not all low energy approaches are equal

Passive House: The world's most stringent, performance-based standard, providing

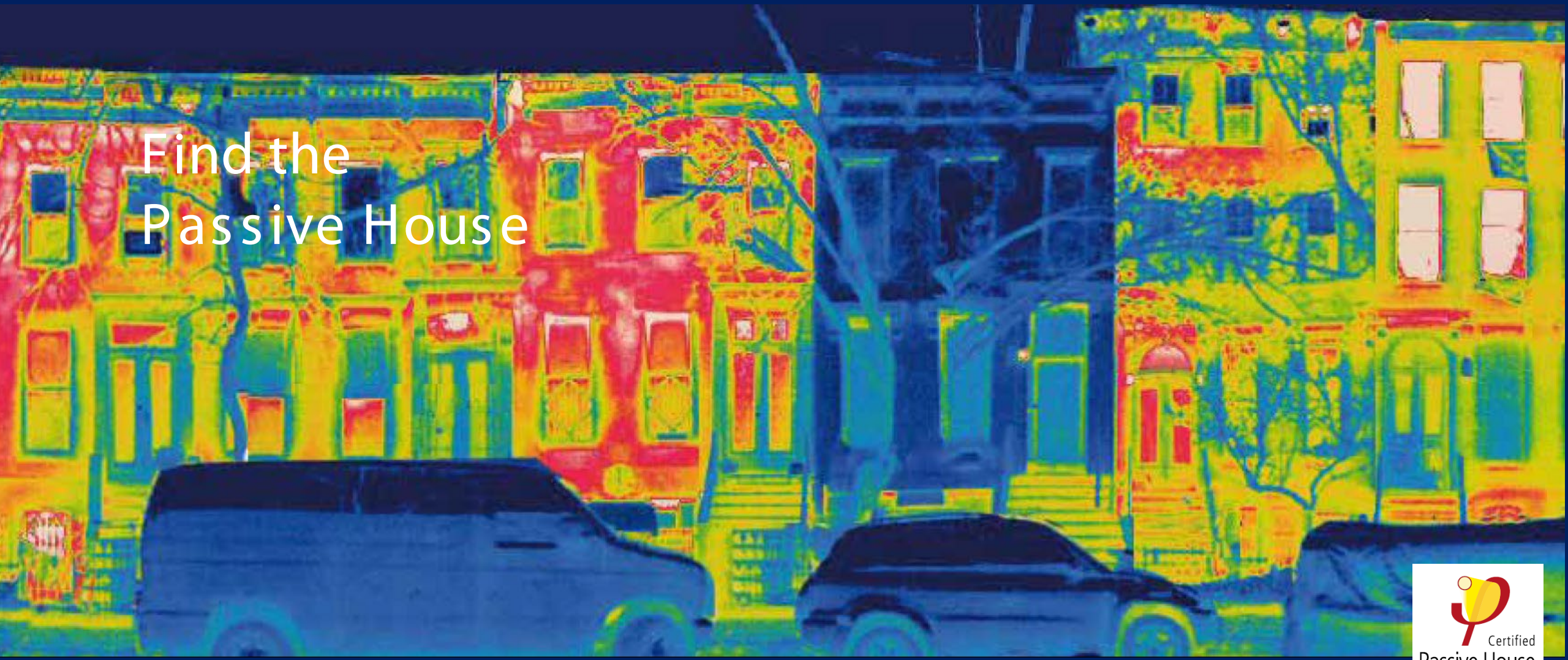
- High levels of comfort
- A radically improved indoor environment
- Structural longevity: free of mould and moisture damage
- Extremely low heating and cooling costs



Graphic: PHI

Photo: Sarah Mekjian

Find the Passive House



Thermal image of a 1899 Brooklyn brownstone renovated to Passive House level on a cold evening I passivehouse-database.org ID 2558 I Fabrica718 I Brooklyn, New York

Certified Passive House
Passive House Institute

Reducing demand

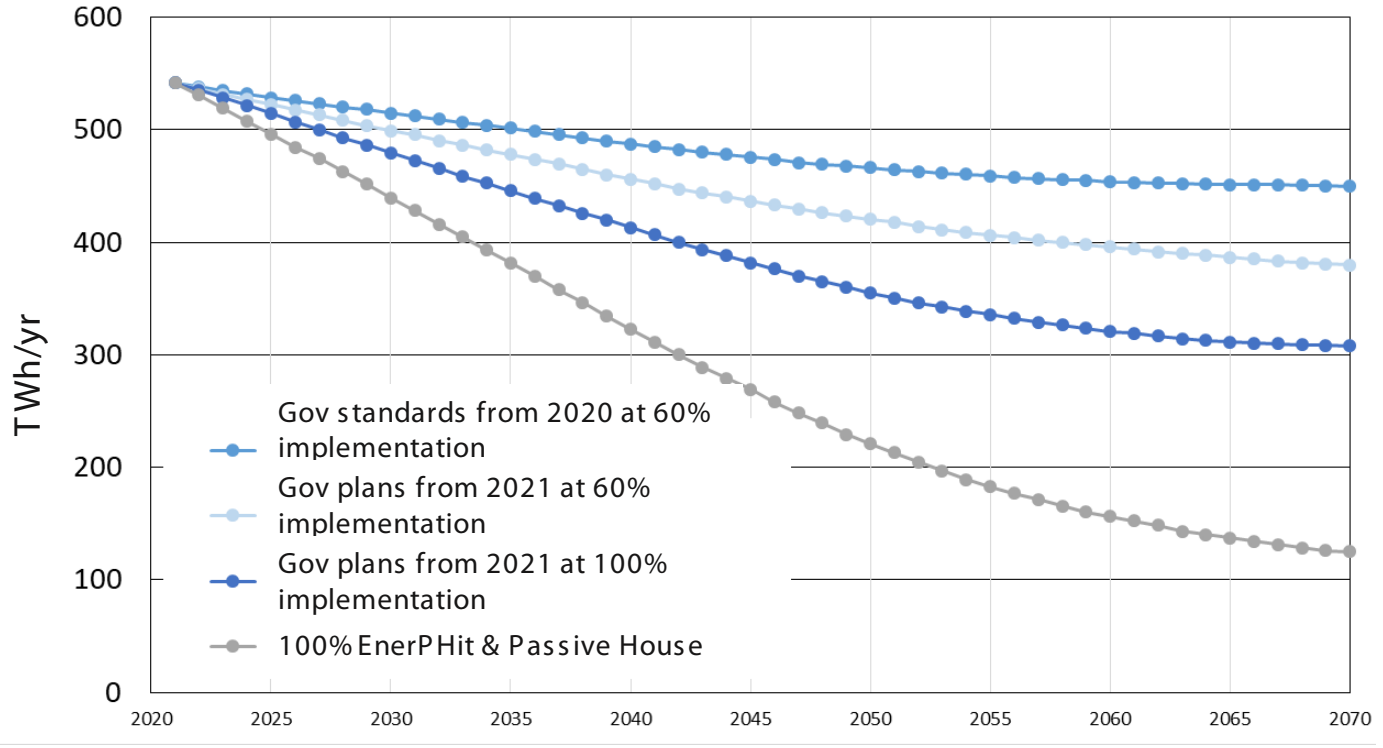
We don't have enough renewable capacity to ignore energy savings

An example from Germany

- In 2070, Germany's potential for renewables will be ca. 1200 TWh/yr – of this, only ca. 400 TWh will be available for buildings
- Business as usual building and renovation to 2020 German standards would amount to an energy demand of ca. 780 TWh/yr by 2070

This is almost twice what is available for our buildings!

- 100% to Passive House principles can get us down to less than 150 TWh – compatible with our goals!



Results of a 2021 Passive House Institute study by Jürgen Schnieders

Sustainable building

..Doesn't lock in inefficiency or energy poverty

- Buildings are responsible for 40% of Europe's greenhouse gas emissions
- 85% of buildings in the EU were built over 20 years ago, up to 95% expected to still be standing in 2050
- In 2020, at least 8% of EU population couldn't afford to heat their homes properly, and the number is increasing

All this points to the need to really focus on high energy perfomance

Buildings last. A component changed today will remain in use for decades if not generations. What we do now matters.


Photo: Beattie Passive Build System Ltd

Want to learn more?

Contact me, Sarah Mekjian, at s.mekjian@climatealliance.org!

This presentation was brought to you in part by outPHit, for deep retrofits made faster, cheaper and more reliable. outphit.eu

The outPHit project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957175. The presented contents are the author's sole responsibility and do not necessarily reflect the views of the European Union. Neither the CINEA nor the European Commission are responsible for any use that may be made of the information contained therein.

Photo: PHI