Tackling climate change in residential and building sectors

**Reduce CO_2 emissions.
Enhance comfort.
And promote health.
All at once!**

Our homes and buildings protect us from the rain, wind, sun, and outdoor hazards, and provide us space for living, working, studying and entertaining. But their use causes the consumption of a vast amount of energy. Here we look at how we can address climate change while improving comfort in the residential and building sectors.

1. Housing in Japan: Too hot, too cold

People need proper room temperatures in order to stay healthy, but the reality is that many Japanese homes are too hot in summer and too cold in winter.

During hot weather, the World Health Organization (WHO) recommends that people do what they can to meet a global standard of maintaining maximum room temperatures of 32˚C during the day and 24˚C at night. During cold weather, WHO recommends maintaining indoor temperatures of at least 18˚C in winter, knowing that low indoor temperatures can lead to serious health impacts. However, only 10% of housing in Japan has room temperatures that meet WHO's recommended winter standards, and many Japanese people are accustomed to their homes being cold in winter.

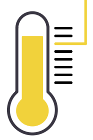
WHO guidelines and the current situation in Japan

WHO recommendations

Indoor housing temperatures of at least 18˚C in winter

Indoor housing temperatures should be high enough to protect residents from the harmful health effects of cold. For countries with temperate or colder climates, 18˚C is a safe and well-balanced indoor temperature to protect health in cold seasons.
(Strong recommendation)

At least 18˚C



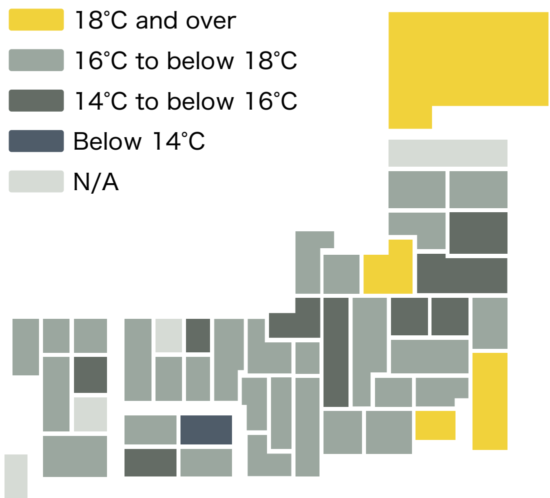
Insulation for new housing and retrofits

In climate zones with a cold season, efficient and safe thermal insulation should be installed in new housing and retrofitted in old housing.
(Conditional recommendation)

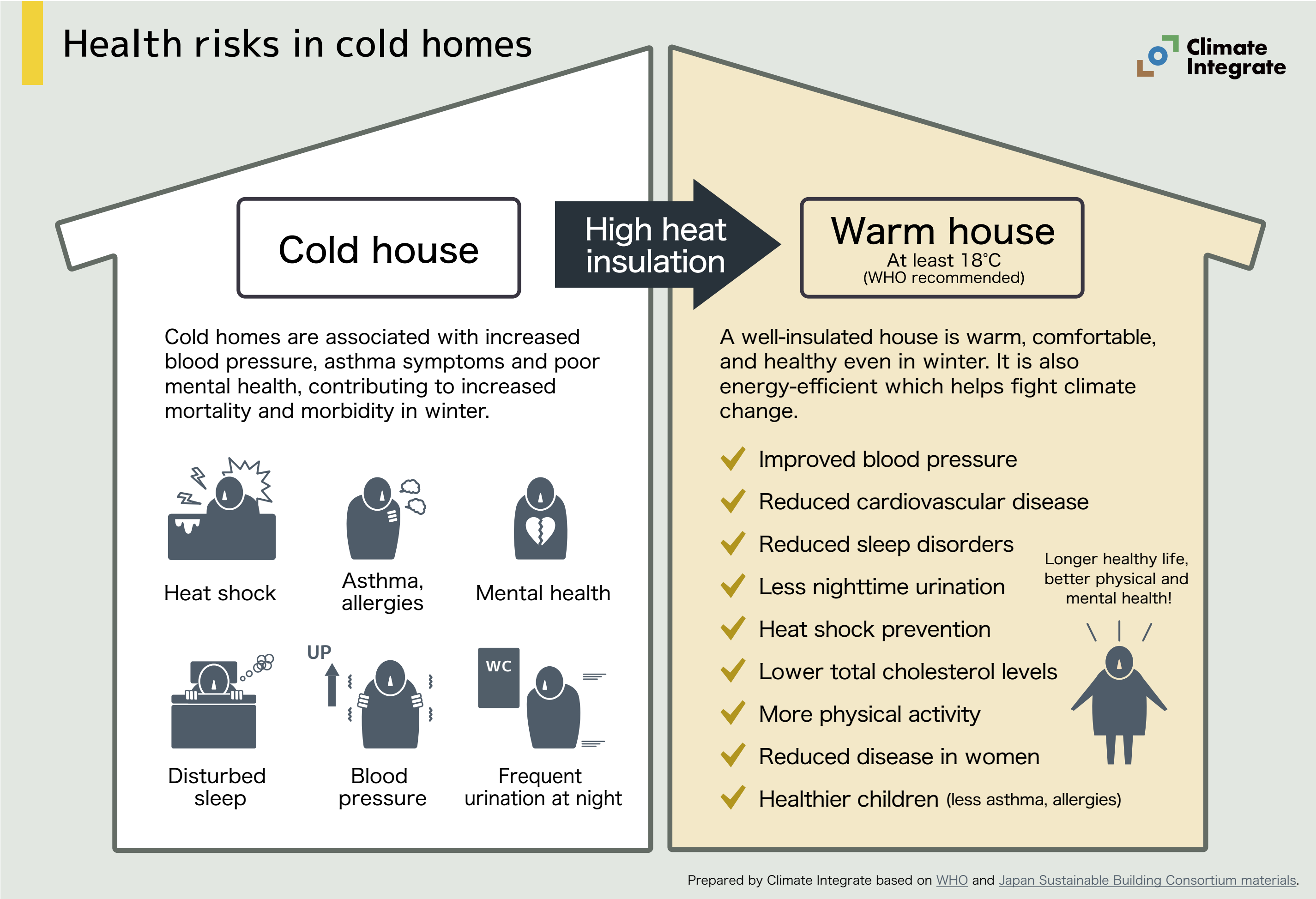
Measures against indoor heatstroke in hot seasons

Develop and implement strategies to protect people exposed to high indoor temperatures.

Average room temperatures during winter in Japan



Prepared by Climate Integrate based on WHO(2018), WHO(2018) and Japan Sustainable Building Consortium materials.

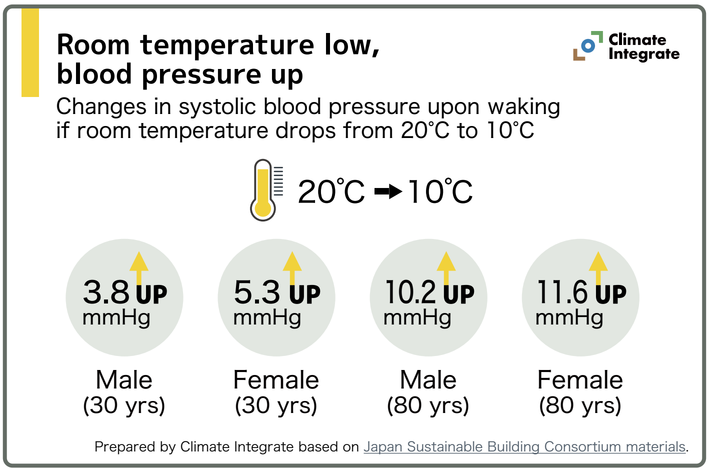


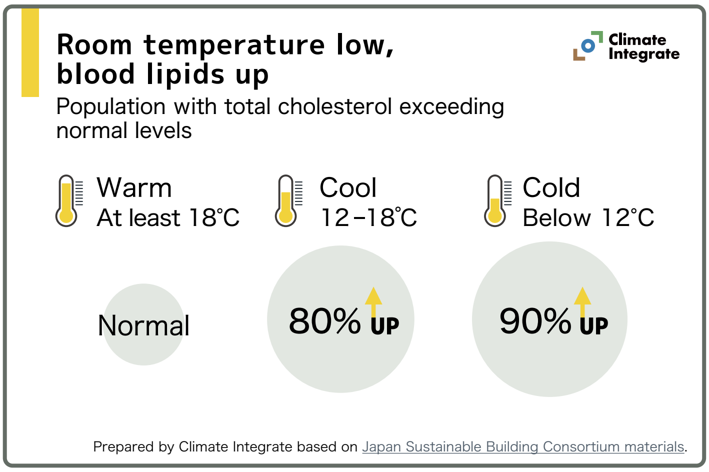
2. Health risks in cold houses

A person living in a cold house faces elevated health risks from higher blood pressure, asthma, poor mental health, and other impacts. Moving from a warm to a cold room to change or take a hot bath can increase the risk of heat shock, resulting in a cerebral hemorrhage, heart attack, or stroke.

Japan's Consumer Affairs Agency advises people to warm their bathrooms and changing areas before bathing. A sudden change in blood pressure due to temperature differences can reduce blood flow in the brain and cause fainting. A person could drown if this occurs while bathing. Many more people die from heat shock than from traffic accidents.

As a measure against cardiovascular disease, the Ministry of Health, Labour and Welfare has declared a goal of reducing systolic blood pressure by an average of 4 mmHg among the population aged in the forties to eighties. It estimates that this could reduce annual stroke deaths by about 10,000. It has also been shown that poor insulation performance can lead to increased blood pressure and blood lipids (cholesterol levels). Conversely, studies have shown that better insulation can have beneficial effects regarding these conditions. The point is that we can be healthier if we live in warm homes.





3. The need for strong policy: 90% of housing stock in Japan has minimal or no insulation

Poor insulation performance is the reason Japanese houses are hot in summer and cold in winter. This results in increased use of air conditioners and heaters, as well as higher utility costs. Unfortunately, air conditioning cannot compensate for poor insulation. Even today, about 90% of housing stock in Japan has little or no insulation (Fig. 1), and 70% of windows still only have single-pane glass, which allows heat to escape. Insulation is also often insufficient in commercial buildings, hospitals and hotels, as well as public facilities such as kindergartens, nurseries, schools, and seniors' facilities.

In addition, only about 6.3% of housing (as of FY2021) has solar panels on the roofs. Likewise, solar panels are being installed on some factories, commercial buildings, and schools, but such cases are still rare.

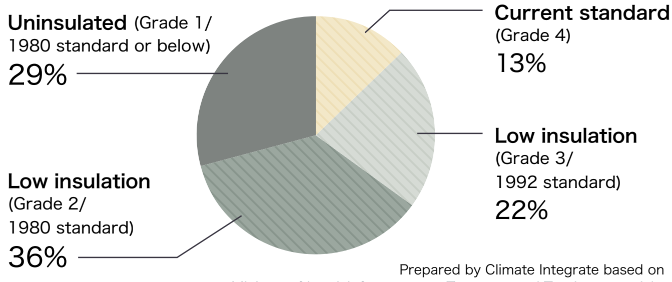
The government has set targets to achieve energy efficiency performance in Net Zero Energy Houses (ZEH) and Net Zero Energy Buildings (ZEB) levels (Table 1), and mandatory energy-efficiency standards for housing and buildings, going into effect starting in 2025. However, standards (Grade 4 in the residential sector) are lax relative to other countries (Figs. 2 and 3). To achieve greater energy-efficiency benefits, Japan needs to raise the standards to ZEH and ZEB levels or higher.

Table 1. Government targets toward carbon neutrality

Target year	Details
2030	**New construction**: Aim for energy-efficiency performance at the ZEH and ZEB levels. Aim to install **photovoltaic power generation equipment** in 60% of new-build detached homes.
2050	**Stock average**: Aim for energy-efficiency performance at the ZEH and ZEB levels

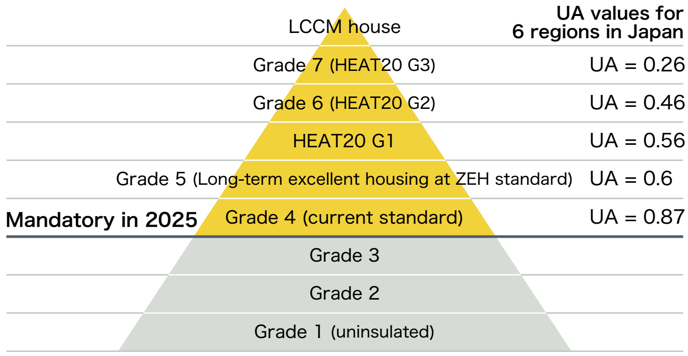
Prepared by Climate Integrate based on excerpts of Japan's Sixth Strategic Energy Plan.

Figure 1. Thermal insulation performance of housing stock in Japan (approx. 50 million homes, estimates for FY2019)



Prepared by Climate Integrate based on Ministry of Land, Infrastructure, Transport and Tourism materials.

Figure 2. Grading of insulation performance in housing in Japan



- LCCM (Life Cycle Carbon Minus) houses: Houses that have net negative CO_2 emissions calculated across the entire lifecycle including construction, use, and disposal.
- HEAT20 is an abbreviation for the "Society of Hyper-Enhanced insulation and Advanced Technology houses for the next 20 years".

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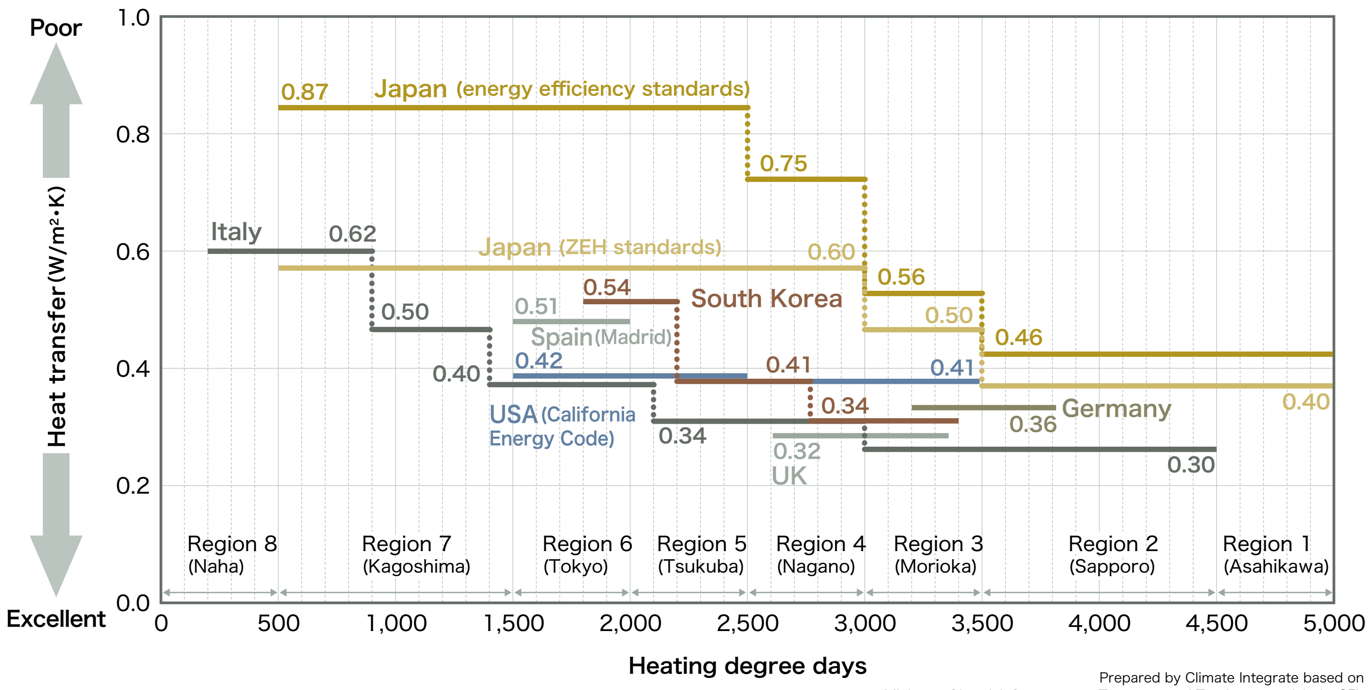
Fig. 3. International comparison of residential thermal insulation standards (average heat transfer coefficient, or UA value) (FY2021)



Prepared by Climate Integrate based on Ministry of Land, Infrastructure, Transport and Tourism materials (p. 35).

Measures to tackle climate change in the residential and building sectors

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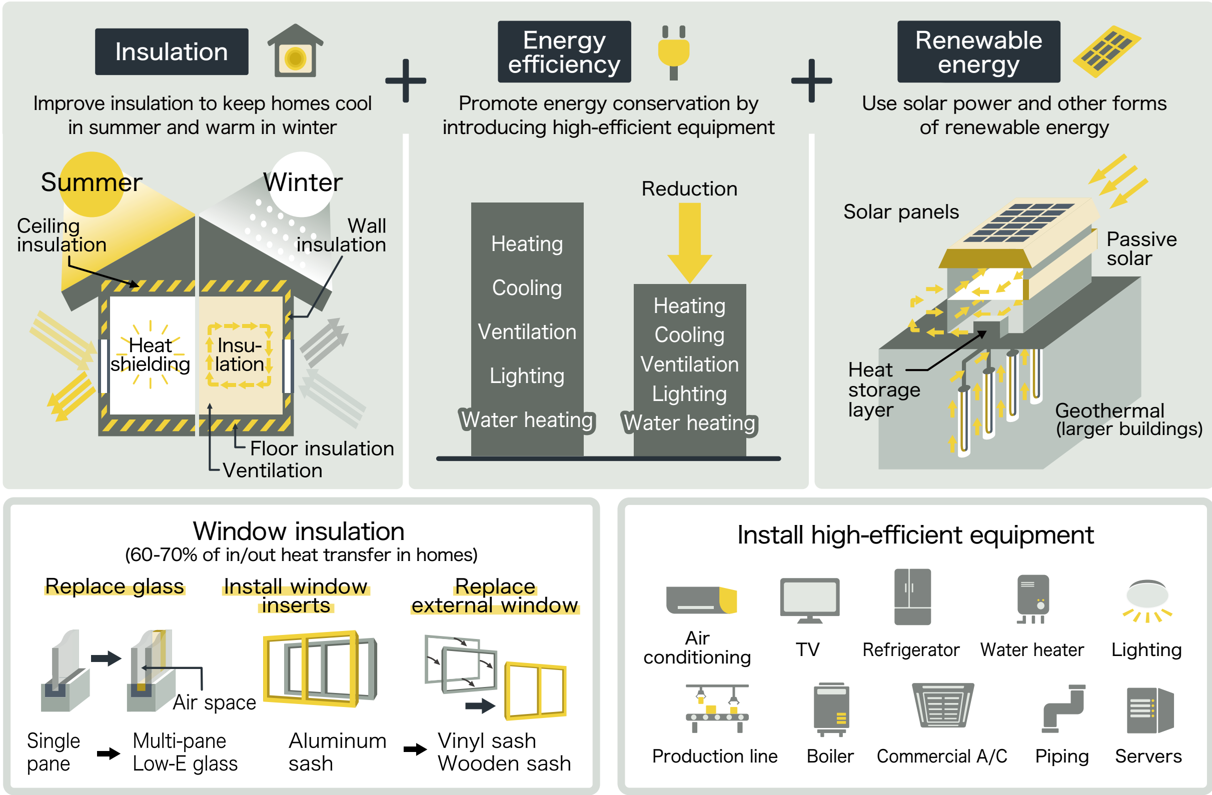
Achieving Zero Energy and Zero Emissions through thermal insulation + energy efficiency + renewable energy



Prepared by Climate Integrate based on Ministry of Land, Infrastructure, Transport and Tourism materials etc.

4. What's next?: Toward zero-emissions

To reduce energy consumption and CO_2 emissions in the residential and building sectors to close to zero, it is crucial to proceed thermal insulation, energy efficiency, and renewable energy.

Actions can help reduce CO_2 emissions, improve comfort, promote health, and lower utility costs. Rather than just putting up with the heat and cold in housing and buildings, let's take effective actions while confirming the benefits.

Toward effective policy in residential and building sectors

Central government

- Improve insulation performance standards to Grade 6 and above
- Standardize renewable energy in new homes and buildings
- Expand support programs for existing homes and buildings
- Regulate excessive large-scale developments
- Prioritize support for socially vulnerable and low-income populations

Local governments

- Promote ZEB for public facilities
- Standardize and incentivize Grade 5, Grade 6 and higher
- Standardize the introduction of renewable energy for new homes and buildings
- Support measures for renovations to better insulate existing homes
- Provide advice to businesses and residents
- Utilize subsidies

Businesses

- Conduct energy efficiency diagnoses
- Promote ZEB for factories and workplaces during expansion/renovation
- Introduce/purchase renewable energy at factories and workplaces
- Utilize subsidies

Individuals

- Renovate to insulate, control insolation (with eaves, shading, louvers, etc.)
- Check household appliance efficiency
- Install renewable energy
- Switch utilities to purchase renewable electricity
- Consider opportunities for effective energy use (storage batteries, EVs, etc.)
- Utilize subsidies

Climate Integrate is an independent climate policy think tank in Japan. Through integrated approaches to connect scientific, political, and social dimensions, we support actions for decarbonization by civil society, business and the public sector.

Climate Integrate
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