



VELS



INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM, THIRUVANMIYUR - CHENNAI



CLIMATE ACTION ROADMAP

Vels Institute of Science, Technology and Advanced Studies
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Background

This document describes the Vels Institute of Science, Technology, and Advanced Studies' (VISTAS) energy conservation objectives and procedures. This includes initiatives for the coming years as well as a look ahead to 2050. The institution will prioritize energy conservation and sustainability. The university intends to achieve carbon neutrality by 2050. By then, the majority of the energy on campus will be sustainable.

Global Scenario of Climate Change

Climate change refers to long-term shifts in temperatures and weather patterns, primarily driven by human activities like burning fossil fuels that release greenhouse gases. Earth's climate relies on greenhouse gases (CO₂, methane, water vapor) acting like a blanket, trapping sun heat. Human activity (burning fossil fuels, deforestation) has thickened this "blanket," leading to global warming (Fig.1).

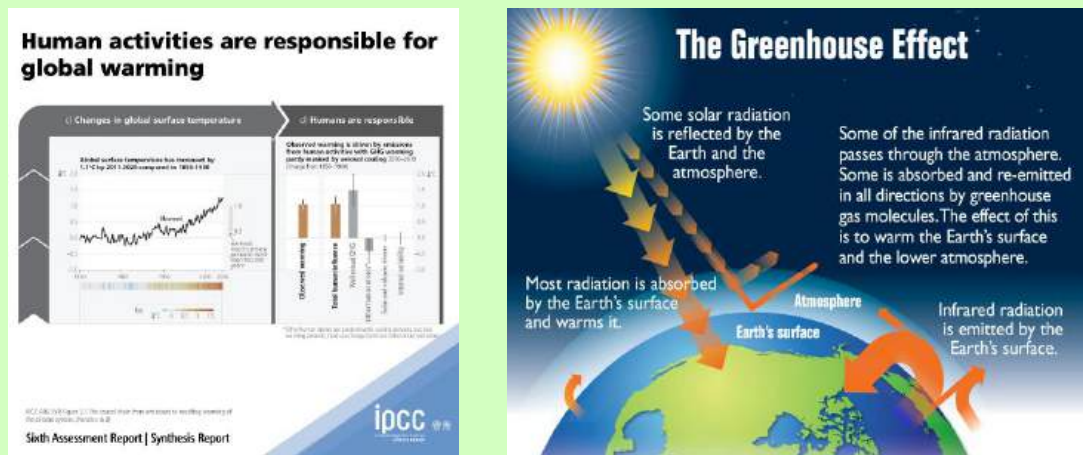


Fig.1. The greenhouse effect helps trap heat from the sun, which keeps the temperature on earth comfortable. But people's activities are increasing the amount of heat-trapping greenhouse gases in the atmosphere, causing the earth to warm up

Global warming has reached critical levels, with 2024 confirmed as the warmest year on record at approximately 1.35°C to 1.55°C above pre-industrial levels, driven by record greenhouse gas emissions. The past decade (2015–2024) is the hottest on record, with warming accelerating to 0.2°C per decade since 1981 (Fig.2).

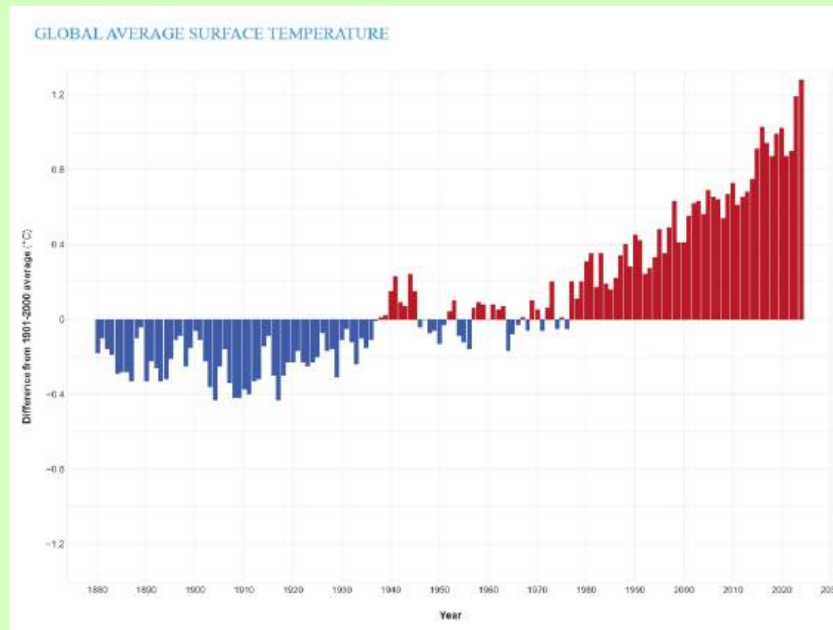


Fig. 2. Blue bars indicate cooler-than-average years; red bars show warmer-than-average years. NOAA Climate.gov graph, based on [data](#) from the National Centers for Environmental Information.

According to the annual report from NOAA National Centers for Environmental Information, 2024 was the warmest year since global records began in 1850. The following are the current key status indicators-

- **Temperature Rise:** Earth is roughly 1.42°C warmer than the 1850-1900 average.
- **Record Heat:** The 10 warmest years on record have all occurred in the past decade.
- **Accelerated Rate:** Warming since 1982 is over three times faster than in previous years, at 0.36°F (0.20°C) per decade.
- **Emissions Peak:** Global greenhouse gas emissions reached a new high of 57.7 gigatonnes in 2024.
- **Ocean Impact:** Around 90% of excess heat is stored in the ocean, causing accelerating sea-level rise and ocean heating, leading to widespread coral bleaching.
- **Ice Melt:** Arctic sea ice and global glaciers are retreating at alarming rates; Antarctic sea ice reached its second-lowest extent in 2024.
- **Sea Level Rise:** Global mean sea level reached a record high in 2024, rising at a rate of 4.7mm per year over the last decade—more than double the 20th-century rate.

Current Trajectory: Based on existing policies, the world is currently on track for approximately 2.5°C to 2.9°C of warming by the end of the century

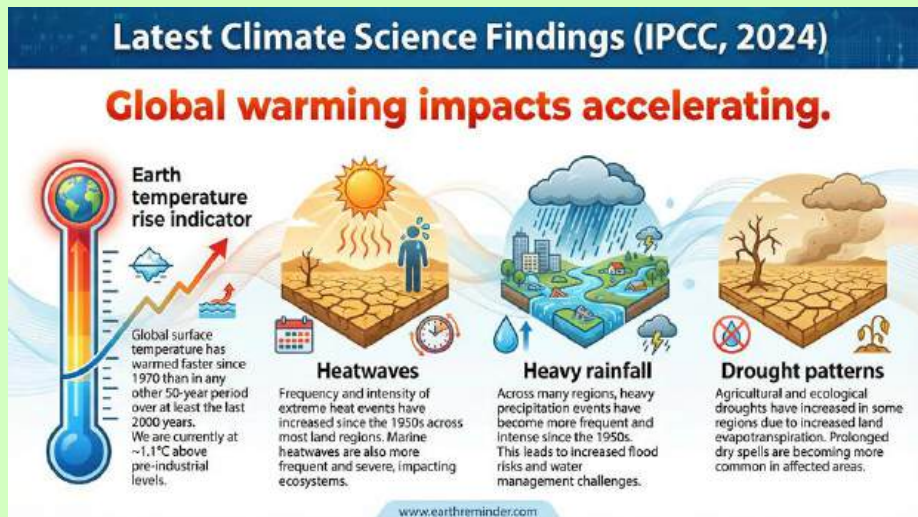


Fig. 3. Impacts of Global warming.

The Paris Agreement is a legally binding international convention addressing climate change. It was adopted by 195 Parties at the United Nations Climate Change Conference (COP21) in Paris, France, on December 12, 2015. It came into effect on November 4, 2016. As of January 27, 2026, there are 194 parties to the Paris Agreement. Its main goal is to keep "the increase in the global average temperature to well below 2°C above pre-industrial levels" and to work "to limit the temperature increase to 1.5°C above pre-industrial levels." However, in recent years, world leaders have emphasized the need to restrict global warming to 1.5°C by the end of the century.

That's because the UN Intergovernmental Panel on Climate Change (IPCC) warns that beyond the 1.5°C barrier could result in significantly more severe climate change impacts, such as more frequent and severe droughts, heat-waves, and rainfall (Fig.3). To keep global warming to 1.5°C, greenhouse gas emissions must peak before 2025 and fall 43% by 2030. The Paris Agreement represents a watershed moment in the multilateral climate change process because, for the first time, all nations have agreed to battle climate change and adapt to its consequences.

Initiatives taken globally to control Climate Change:

Climate finance, including \$300 billion that developed countries have agreed to provide to developing countries each year, is crucial for mitigation and adaptation actions that address climate change, such as investing in renewable energy and resilient infrastructure. In 2024, developed countries agreed to provide at least \$300 billion to developing countries each year and to step up efforts to secure \$1.3 trillion in climate finance from public and private sources by 2035.

Renewable energy is rapidly gaining ground. In 2024, renewables collectively accounted for one-third of electricity generation, led by hydropower (14 per cent of total electricity generation), wind (8 per cent), solar (7 per cent) and bioenergy and waste (3 per cent). Over the next five years, several renewable energy milestones are expected to be reached. In 2025, renewables-based electricity generation is set to overtake coal-fired generation. In 2026, wind and solar power generation are each poised to surpass power generation from nuclear. Then, in 2029, electricity generation from solar photovoltaic is set to surpass hydropower, becoming the largest renewable power source globally — with wind-based generation expected to surpass hydropower in 2030. Global renewable electricity generation is forecast to climb to over 17,000 terawatt-hours (TWh) by the end of this decade, an increase of almost 90 per cent from 2023. It is estimated that 90 per cent of the world's electricity can and should come from renewable energy by 2050.

Transport

Most cars, trucks, ships and planes run on fossil fuels, such as gasoline, diesel and kerosene, which release carbon dioxide, a greenhouse gas. Road vehicles account for the largest part, but emissions from ships and planes continue to grow. The transport sector accounts for roughly 15 per cent of total greenhouse gas emissions, making it the fourth largest source of global emissions after the power, industry, and agriculture-forestry-land use sectors. Without action, greenhouse gas emissions from transport could grow by up to 65 per cent by 2050. Alternatively, successful action to tackle greenhouse gases could reduce transport emissions by 68 per cent. Decarbonizing the transport sector will require a variety of transformative measures, including demand and efficiency strategies, electromobility, and alternative fuels for shipping and aviation. Options for decarbonizing shipping and aviation still require more research and development, but advanced biofuels, ammonia, and synthetic fuels are emerging as viable options.

Food and Agriculture

The unsustainable use of land, soil, water and energy for food contributes to greenhouse gas emissions that cause rising temperatures. The largest chunk of food-related greenhouse gases comes from agriculture and land use. Without intervention, food system emissions will likely increase by up to 40 per cent by 2050, given rising demand from population growth, more income

and dietary changes. Over 19 per cent of food is wasted, and up to 10 per cent of global greenhouse gas emissions are associated with food that is not consumed. Many practices can advance climate adaptation in food systems, such as erosion control, grazing land management, genetic improvements for tolerance to heat and drought, heterogeneous diets, and reduced food loss and waste. Pilot climate-smart agriculture initiatives in a number of countries have boosted productivity, lowered emissions, improved soil quality and water efficiency, and increased incomes and climate resilience.

Current scenario of climate changes in India.

Global warming in India is causing severe, rapid impacts, with average temperatures rising nearly 0.9°C in the last decade (2015-2024), leading to frequent heat waves, erratic monsoons, and extreme weather. Over 80% of the population lives in climate-vulnerable districts, facing risks like drought, flooding, and agricultural distress. Heat waves are becoming more intense in India, with hottest day temperatures in Western and Northeast India rising by 1.5-2 degrees Celsius since the 1950s. Heat waves have become increasingly common, posing considerable public health hazards and straining power supplies. Likewise, the climate crisis has caused significant monsoon variability, leading to increased floods in some areas and severe, widespread droughts in others. Erratic rains and heat in India are harming agriculture, with studies indicating a 6% reduction in rice yields and a potential decline of 4–5 million tonnes in wheat production. Agriculture-dependent populations are experiencing high levels of vulnerability. The Himalayan region is witnessing retreating glaciers, which directly impacts the flow of major rivers like the Ganga and Brahmaputra. Coastal regions are facing increasing threats from cyclones and rising sea levels.

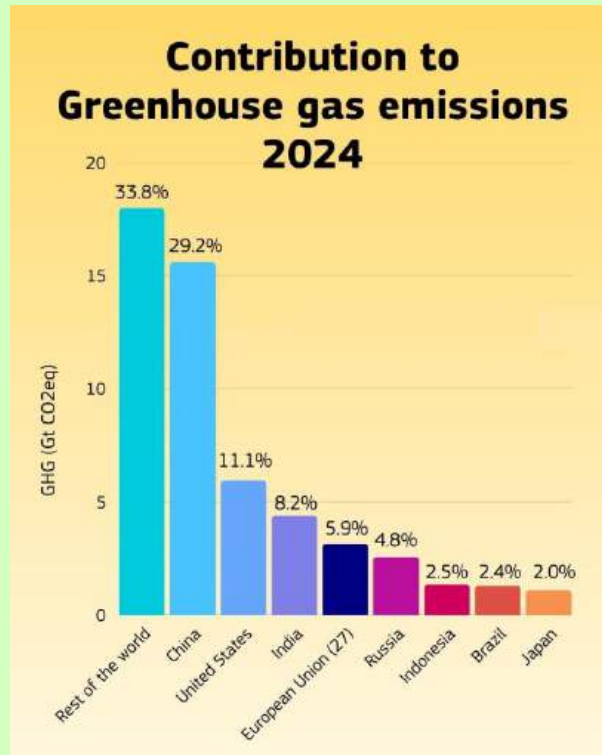


Fig. 4. India leads for GHG emission in 2024.

In 2024, India saw the highest absolute growth in greenhouse gas emissions globally, making it the third-biggest emitter behind China and the United States (Fig.4). Despite this, India's per capita emissions remained less than half the global average, indicating a comparatively low emission intensity. The surge was mostly caused by the use of fossil fuels in power generation, industry, and transportation, as well as methane emissions from agriculture and deforestation. This emphasizes the difficulty of balancing economic growth with climate responsibility.

Initiatives taken by India to control Climate Change:

India pledged to achieve net-zero emissions by 2070 at the 26th Conference of the Parties (COP 26) in 2021. India's CO₂ emissions have been growing rapidly for decades, with annual increases averaging 4.9% per year since 1990 and 4-11% during 2021-24. However, the recent pace of growth has been slowing down, as shown in the figure 5. The 0.7% rise in 2025 was the slowest since 2001, excluding the impact of Covid in 2020. This demonstrates India's commitment to a sustainable, climate-resilient future.

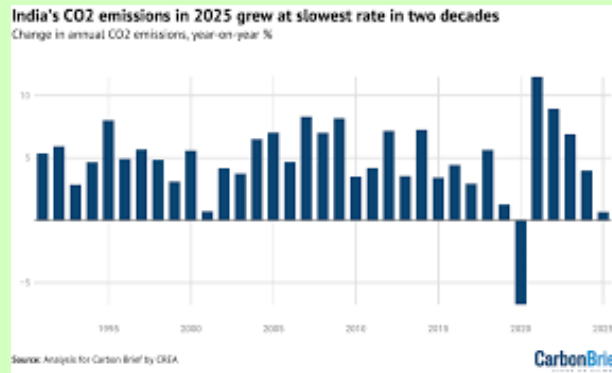


Fig. 4. India's CO₂ emission in 2025\.

India is combating climate change through the **National Action Plan on Climate Change (NAPCC)**, targeting net-zero emissions by 2070. Key initiatives include expanding renewable energy (203 GW+ capacity), the **International Solar Alliance (ISA)**, Mission LiFE for sustainable living, and the **FAME scheme** for electric mobility. India has reduced its emission intensity by 36% between 2005 and 2020, aiming for 45% by 2030

While shifting towards renewables, India's energy demand is rising, and coal capacity remains a major factor. The government is focusing on solar energy and international collaborations to mitigate these impacts.

India is demonstrating its long-term commitment to climate action through a formal strategy and ambitious renewable energy targets, as well as established efficiency programmes such as Bureau of Energy Efficiency (BEE) appliance labelling since 2006 and the Perform, Achieve, and Trade (PAT) mechanism for industry since 2012. The government has expedited renewable energy deployment through auctions and fiscal mechanisms, as noted by CCPI country specialists, with record auction participation and consistently lowering tariffs. In 2025, India reported achieving 50% of installed power capacity from non-fossil sources, exceeding the 2030 Nationally Determined Contribution (NDC) target. The experts praise the efforts on green finance taxonomy and a national carbon market framework. The major initiative are –

- **National Action Plan on Climate Change (NAPCC):** The Government of India launched National Action Plan on Climate Change (NAPCC) on 30th June, 2008 outlining eight National Missions on climate change. These include:
 1. National Solar Mission

2. National Mission for Enhanced Energy Efficiency
 3. National Mission on Sustainable Habitat
 4. National Water Mission
 5. National Mission for Sustaining the Himalayan Eco-system
 6. National Mission for a Green India
 7. National Mission for Sustainable Agriculture
 8. National Mission on Strategic Knowledge for Climate Change
- **International Solar Alliance (ISA):** Co-founded by India to promote solar energy deployment globally.
 - **One Sun, One World, One Grid Project (OSOWOG):** Aims to link solar energy infrastructure across 140 countries.
 - **Mission LiFE (Lifestyle for Environment):** A global initiative encouraging individuals to adopt sustainable lifestyles
 - **Coalition for Disaster Resilient Infrastructure (CDRI):** An international partnership to improve infrastructure resilience

The key mitigation and sectoral actions taken are-

- **Renewable Energy Expansion:** Rapid growth in solar and wind capacity, with over 46% of power generation now from non-fossil fuel sources.
- **FAME Scheme:** Promotes the adoption of electric and hybrid vehicles to reduce oil dependency.
- **UJALA Scheme:** Distributes LED bulbs to enhance energy efficiency.
- **National Clean Air Programme (NCAP):** Targets up to 40% reduction in particulate matter by 2025–26 in over 130 cities.
- **Green Bonds:** Sovereign green bonds are issued to fund green projects.
- **Mangrove Initiative for Shoreline Habitats & Tangible Incomes (MISHTI):** Aims to protect and restore mangrove ecosystems

The Climate action initiatives in Vels Institute of Science, Technology and Advanced Studies (VISTAS).

The National Education Policy 2020 (NEP 2020) emphasizes sustainability and environmental consciousness as key components of the education system. It integrates education with the Sustainable Development Goals (SDGs) and seeks to cultivate responsible, environmentally conscious citizens through a comprehensive and multidisciplinary approach. NEP 2020 promotes the integration of **environmental education across all levels** of higher education rather than treating it as a separate subject. It emphasizes topics such as: Climate change, Biodiversity conservation, waste management, and sustainable resource use. The policy embeds **Education for Sustainable Development (ESD)** into the learning framework. This approach:

- Encourages critical thinking and problem-solving
- Develops responsible behavior towards the environment
- Connects education with real-world sustainability challenges

NEP 2020 encourages institutions to adopt **sustainable campus practices**, such as Energy-efficient infrastructure, Waste segregation and recycling, Water conservation systems and Renewable energy adoption

Vels Institute of Science, Technology and Advanced Studies (VISTAS), adheres to the NEP 2020 in terms of implementing sustainable practices, not only in the curriculum, but also in preserving a sustainable campus. The University has adopted a comprehensive and sustainable approach toward **energy management and water conservation**, integrating environmental responsibility into campus operations.

The Climate Action Plan of VISTAS, follows the **Greenhouse Gas (GHG) Protocol**, the global standard for carbon accounting. Before beginning the action plan, it is necessary to gather information on the carbon footprint. The phrase "carbon footprint" refers to the amount of greenhouse gases (mostly CO₂, CH₄, and N₂O) produced by our daily activity. Carbon footprints are often presented in tonnes of CO₂ equivalent (CO₂e) emissions per unit of comparison, such as year, person, kg protein, or km travelled. A product's carbon footprint accounts for CO₂ emissions throughout its lifecycle, from manufacture to consumption. The global average CO₂ emissions per

capita is approximately **4.7 to 4.9 metric tons per year**. Many developing nations in Africa and Asia including India have per-capita emissions far below 1 ton.

The calculations of the carbon footprints are based on the types of CO₂ emission (Fig.6) as per

Greenhouse Gas (GHG) Protocol-

Scope 1 (Direct Emissions)

Scope 1 emissions are “direct emissions” from sources that are owned or controlled by the company.

Scope 2 (Indirect Emissions)

Scope 2 emissions are the emissions released into the atmosphere from the use of purchased energy.

Scope 3 (Other Indirect Emissions)

Scope 3 emissions include all other indirect emissions that occur across the value chain and are outside of the organisation’s direct control.

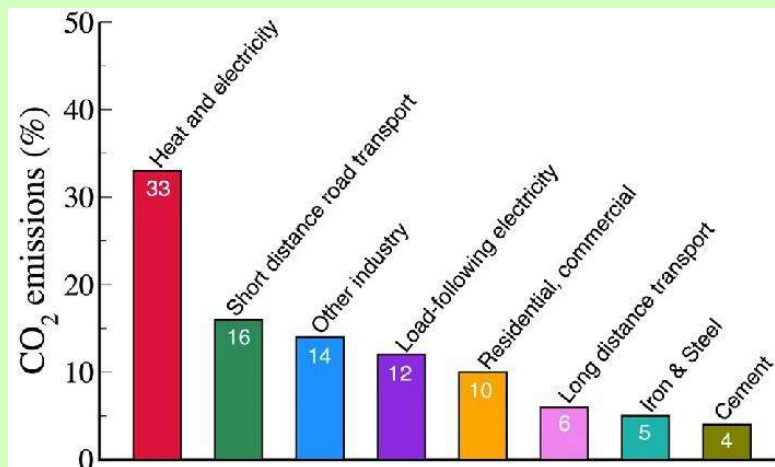


Fig. 6. CO₂ emissions due to various Human activities

The University is committed to get net-zero in the year 2050 and working to achieve the same.

The following are the energy conservation measures taken by the University-

1. Energy Efficiency Initiatives

- The institution has implemented **90% LED lighting systems** across academic blocks, laboratories, hostels, and administrative buildings.
- **Energy-efficient HVAC systems** have been installed and the periodic maintenance ensures reduced electricity consumption.

Renewable Energy Integration

- VISTAS has initiated **rooftop solar photovoltaic systems**, contributing significantly to the campus energy demand.
- Plans are underway to scale solar capacity to meet **50–70% of total electricity consumption by 2050**.
- Exploration of **green power procurement (PPA models)** is in progress.

2. Water Conservation Measures

Rainwater Harvesting

- The campus is equipped with **rainwater harvesting structures** to recharge groundwater and ensure water sustainability.

Wastewater Recycling

- Installation of **Sewage Treatment Plants (STPs)** enables reuse of treated water for:
 - Landscaping
 - Toilet flushing

Water Use Efficiency

- Use of **low-flow fixtures** and regular leak audits
- Awareness programs for responsible water use

3. Green Campus initiatives

As part of its commitment to environmental sustainability and biodiversity conservation, the campus has undertaken systematic plantation and greening initiatives. Along with a diverse range of medicinal plants, have been planted and are maintained across the campus. These initiatives demonstrate institutional responsibility toward ecological conservation, carbon footprint reduction, and the creation of a sustainable and health-oriented campus environment. Apart from planting the trees, the University has the following measures also-

- Reducing emissions from energy and water consumption

- Waste reduction and recycling by Bio-digester, Vermicomposting and Biogas. All the biodegradable wastes are collected and converted into bio-manure and bio-gas.
- Enhancing campus biodiversity
- Banning the usage of plastics on campus

Decarbonization Strategy

Scope 1 Reduction Measures

➤ **Energy & Fuel**

- Replace diesel generators with **solar + battery systems**
- Electrification of campus vehicles
- Use of biofuels (where feasible)

➤ **Refrigerants**

- Transition to low-GWP refrigerants
- Annual leak detection program

Scope 2 Reduction Measures

➤ **Renewable Energy Transition**

- Rooftop solar installation (target: 50–70% demand)
- Solar carports & microgrid systems
- Power Purchase Agreements (PPA) for green electricity

➤ **Energy Efficiency**

- LED retrofitting (100% campus)
- Smart meters and IoT-based monitoring
- Energy-efficient HVAC systems

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