



GREEN ARCHITECTURE

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Image Source:- <https://www.re-thinkingthefuture.com/2020/12/05/10-facts-about-green-buildings-that-architects-must-know/>

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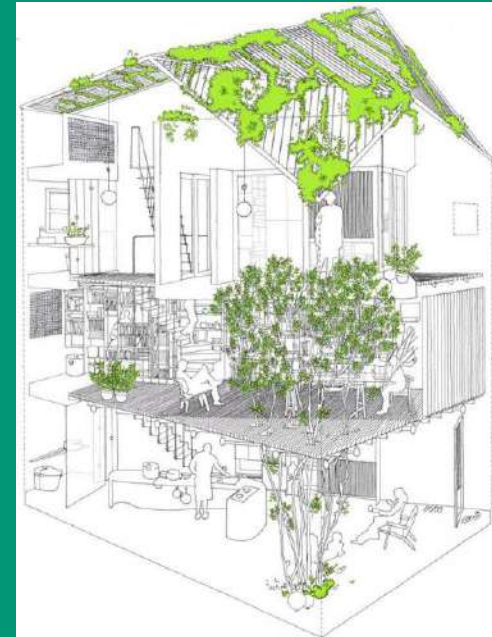
A BRIEF HISTORY OF GREEN ARCHITECTURE

- Basic green architecture has been around since the time of ancient civilizations.
- Without the convenience of modern technology, these civilizations had to work with the earth to build livable structures.
- Without air conditioning, structures had to be built with natural ventilation to control the interior climate, and buildings were placed intentionally to maximize natural light.
- But as the years passed, technology advanced and communities rushed to urban centers, leading to less focus on living with the land and more on modern convenience.
- Unfortunately, that modern convenience came at a price – rapidly increasing energy consumption has had a tremendous impact on our carbon footprint.



INTRODUCTION

- Green architecture, philosophy of architecture that advocates sustainable energy sources, the conservation of energy, the reuse and safety of building materials, and the siting of a building with consideration of its impact on the environment.
- In the early 21st century the building of shelter (in all its forms) consumed more than half of the world's resources—translating into
 - ✓ 16 percent of the Earth's freshwater resources,
 - ✓ 30–40 percent of all energy supplies, and
 - ✓ 50 percent by weight of all the raw materials withdrawn from Earth's surface.
- Architecture was also responsible for 40–50 percent of waste deposits in landfills and 20–30 percent of greenhouse gas emissions.



INTRODUCTION

- Green building is the **practice of creating structures and using processes** that are **environmentally responsible** and **resource-efficient** throughout a **building's life-cycle** from **siting to design, construction, operation, maintenance, renovation and deconstruction**.
- Green building is also known as a **sustainable or high performance building**.
- Green buildings are **designed to reduce the overall impact of the built environment on human health and the natural environment by:**
 - ✓ **Efficiently using energy, water, and other resources**
 - ✓ **Protecting occupant health and improving employee productivity**
 - ✓ **Reducing waste, pollution and environmental degradation**



Image source:- <https://www.archdaily.com/976437/how-singapore-is-pioneering-the-way-to-creating-a-greener-urban-environment>

INTRODUCTION

Impacts of the built environment:

Aspects of Built Environment:	Consumption:	Environmental Effects:	Ultimate Effects :
<ul style="list-style-type: none">• Siting• Design• Construction• Operation• Maintenance• Renovation• Deconstruction	<ul style="list-style-type: none">• Energy• Water• Materials• Natural Resources	<ul style="list-style-type: none">• Waste• Air pollution• Water pollution• Indoor pollution• Heat islands• Storm water runoff• Noise	<ul style="list-style-type: none">• Harm to Human Health• Environment Degradation• Loss of Resources



Image source:-
<https://www.construction21.org/articles/h/built-environment-measuring-climate-change-impact.html>
<https://www.fairobserver.com/more/environment/peter-isackson-climate-change-news-global-warming-covid-19-coronavirus-pandemic-world-news-76810/>
<https://www.shutterstock.com/search/dirty-environment>

GREEN BUILDING COMPONENTS

Aluminum

Weather Resistant Insulated Access Panel

Aluminum panels help **regulate indoor temperature** and **prevent moisture** and pests from entering. It is essential to use an aluminum weather-resistant insulated access panel to **create a tight seal** that will keep the inside of your building comfortable and dry.



Green Roof

Green roofs have become more popular because they **help insulate a home and reduce the amount of heat lost** through the roof. They also help **reduce stormwater runoff** and provide **additional living space for plants** and animals.



Solar Power

Solar power is **a renewable energy source** that heats and cools a home and provides electricity. Solar power is **becoming increasingly affordable**, and it is a great way to reduce **carbon footprint**.

Image Source:- <https://www.asiapropertyawards.com/en/buildings-under-construction-esg-principles-environmental-and-social-awareness/>
<https://essentialsiteskills.co.uk/blog/post/environmental-awareness-construction>

Water Conservation

Several ways to help conserve water at home include **installing reduced showerheads and toilets, collecting rainwater** in barrels, and **xeriscaping** the landscaping. Water conservation is important because it helps reduce the amount of water, saving money on water bill.



Recycling

Recycling is an excellent way to **minimize the amount of waste generated** in the home. It is also a great way to **reuse materials**.

Landscaping

Landscaping can help **reduce the amount of heat absorbed** and it can also **allow cooling of the air around a building**. **Trees and shrubs** can provide **shade and windbreaks**, and they can also **help filter pollutants**.



Image Source:- <https://www.boldbusiness.com/infrastructure/green-construction-environmental-impact/>
<https://www.safetystrategies.com/mental-concerns-for-construction-workers/>

BENEFITS OF GREEN BUILDING

Low operation and maintenance costs

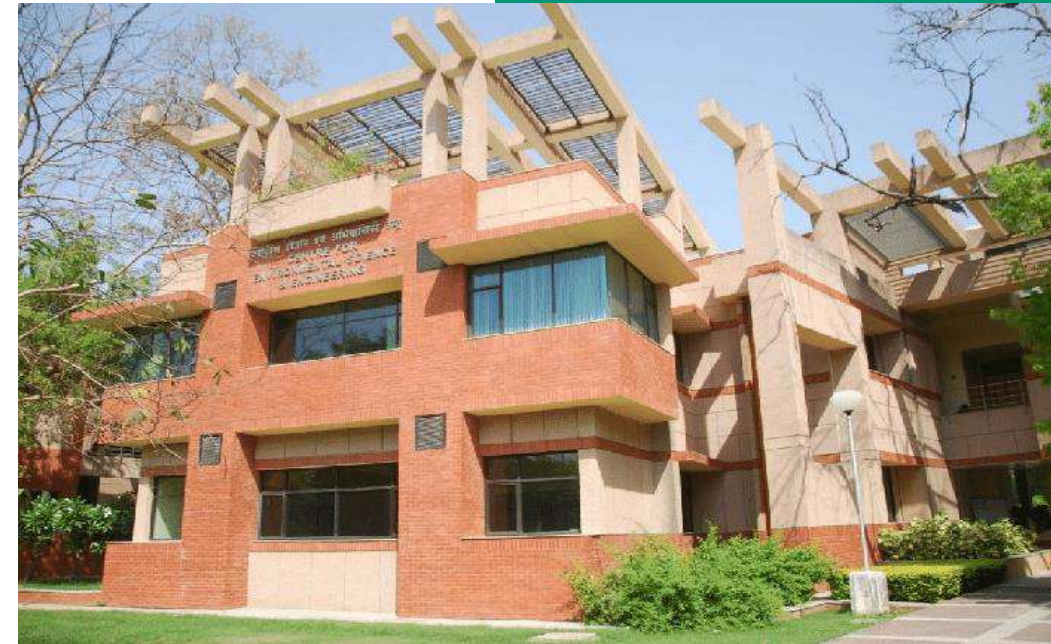
- The utilization of specially engineered materials **may cost a lot more money, but they do not harm the environment** in the **long run** and allow efficient use of energy and water, which results in paying less for bills.

Increased efficiency

- Due to overpopulation, **resources are getting depleted across the globe**. Green buildings have **optimum utilization of natural resources** such as water. This results in **less burden on the environment**.

Improved public health

- As **all construction material used in a green building is sustainable**, it *does not emit harmful chemicals, compounds, or fumes*.
- Eco-friendly products **reduce the risk of respiratory disorders and allergies**.
- So sustainable materials **improve public health due to improved architectural practices**.



BENEFITS OF GREEN BUILDING

Energy-efficient construction

- Optimum utilization of natural resources like **water, sun, and wind** helps in mitigating the use of non-renewable sources such as coal.
- The practice of **rainwater harvesting** and **solar lighting** can help **protect the ecosystem** and reduce pollution.

Upcycling

- **Repurposing old structures** can save natural resources.
- Green buildings enable optimum energy expenditures and **reduce waste by reusing and recycling**.

Promotes sustainable architecture

- Green buildings **encourage the use of innovative designs and methodologies** for the effective design of buildings.
- These designs **cater to space planning and lighting needs as naturally** as possible.
- Green buildings **create awareness on efficient urban planning** and encourage **sustainable architecture** for social, environmental, and **economic benefits**.

GREEN BUILDING PRACTICES:

SOCIAL BENEFITS

- 1 Increased Water Preservation Efforts
- 2 Improved Environmental Product Market
- 3 Fewer Wastewater Treatments Plants
- 4 Fewer Power Plants and Power Lines
- 5 Equitable Access to Transportation Infrastructure
- 6 Better Comfort and Productivity



WHY DO GREEN BUILDING COMPONENTS MATTER?

1.	Green building components refer to the various elements that make a structure environmentally friendly .
2.	It includes everything from the materials used in construction to how it operates .
3.	Utilizing green building components can have some benefits, both for the environment and for the people who occupy the space .
4.	The most vital benefit of green buildings is that they help reduce pollution .
5.	Facilities are responsible for a significant portion of air pollution , and by using materials and designs that limit emissions , green buildings can make a big difference.
6.	Green buildings also tend to be more energy-efficient than traditional structures , using less electricity and generating fewer greenhouse gases .
7.	It can have a significant impact on climate change .
8.	These spaces are more comfortable and healthier , with improved air quality and natural light .
9.	It helps save energy costs too.



EXAMPLES OF GREEN ARCHITECTURE

The Magney House: Energy-conserving home by Australian architect Glenn Murcutt

Use Simple Materials

- Forget the polished marble, imported tropical wood, and costly brass and pewter.
- He uses **inexpensive materials** that are **readily available** in his native Australian landscape.
- Conceived as **a response to location and climate**, the structure offers **protection against the southern winds**, and **opens to the north** in response to the solar angles.
- The **valley shaped roof** acts as a downspout that **collects rainwater** to be used later, and also *delineates a separation between the southern water service spaces, and the northern open spaces.*



Image source: - <https://www.thoughtco.com/magney-house-by>

EXAMPLES OF GREEN ARCHITECTURE

US Coast Guard Headquarters, Washington, DC

- The **1.2 million-square-foot** United States Coast Guard (USCG) Headquarters is located on the St. Elizabeths' **National Historic Landmark Campus**, which resides along the eastern rim of the “**green typographic bowl**” that encompasses Washington D.C.
- The **building's height, siting, materials: red brick and schist stone, and landscaped roofs and courtyards relate, in scale and texture, to the historic campus** and will **blend in with its natural surroundings**
- Shaded brick & glass perimeter and interior facing curtainwall facades **maximize natural light** and provide **visual connections to the courtyards**.



Image source:- <https://www.architectmagazine.com/project-gallery/united-states-coast-guard-headq>

EXAMPLES OF GREEN ARCHITECTURE

Katrina Kernel Cottage II: Low-cost and energy-efficient emergency pre-fab housing

- The evolution of what became known as the Katrina Cottage is a study in the **design and construction of affordable housing**.
- A **300-square-foot** home she called the "**little yellow house**" became the iconic Katrina Cottage, a **prototype** for rebuilding after the devastation caused by Hurricane Katrina in 2005.
- Constructed with **decay-resistant steel framing and steel-reinforced wall board**.
- The house is constructed from **factory-made panels and could be assembled in two days**.



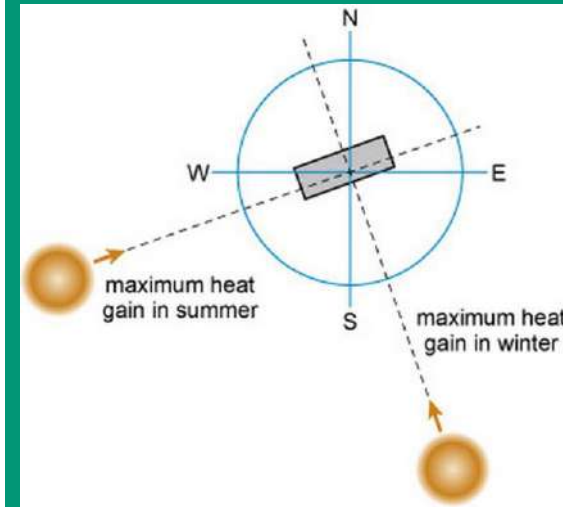
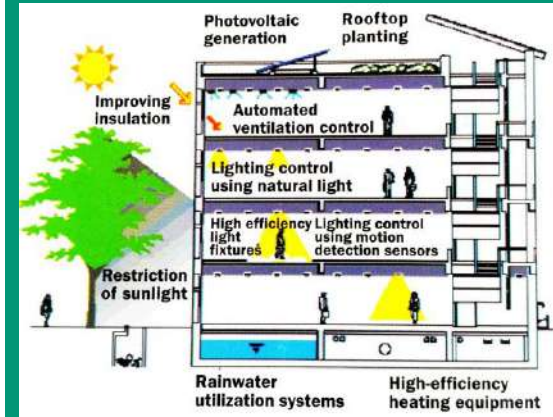
ARCHITECTURAL CONSIDERATION

SUSTAINABLE SITE SELECTION

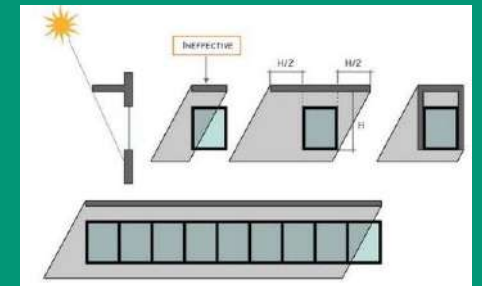
- There should be **easy availability of public transport** and conveniences so as **to cut down energy consumption** for transportation.
- The, **rehabilitation of sites damaged by environmental contamination** is a better option than any new piece of land where **large amount of energy and resource is needed to make the land worthy of building** on.
- Already **existing landscape, soil and natural features should be protected**, for this reason, **hard paving on the site should be avoided** to **preserve top soil** and ease **rain water harvesting**.
- There should be **minimum storm water runoff**.

REGULATION AND OPERATION

- As a result of the **increased interest in green building concepts and practices**, a number of **organizations have developed standards, codes and rating systems** that let government regulators, building professionals and consumers **embrace green building with confidence**.
- In some cases, **codes are written so local governments can adopt them as bylaws to reduce the local environmental impact of buildings**.
- **Green building rating systems** such as **BREEAM** (United Kingdom), **LEED** (United States and Canada), **DGNB** (Germany), **CASBEE** (Japan), and **VERDEGBCe** (Spain) help consumers **determine a structure's level of environmental performance**.
- They **award credits** for optional **building features** that support green design in categories such as **location and maintenance of building site, conservation of water, energy, and building materials, and occupant comfort and health**.



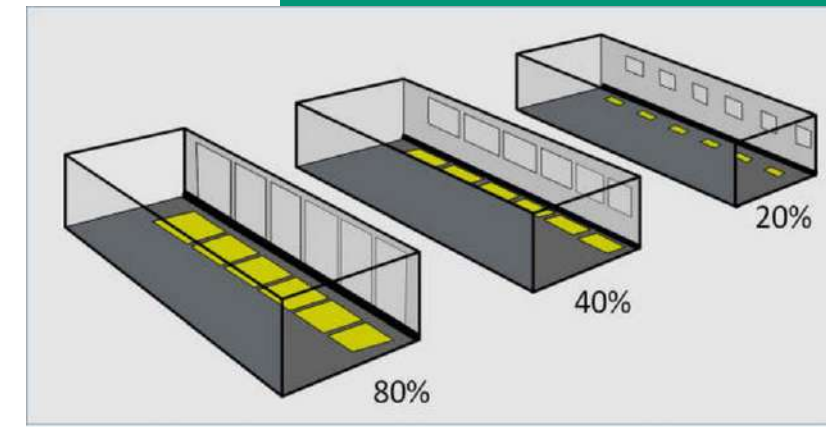
The orientation of the building



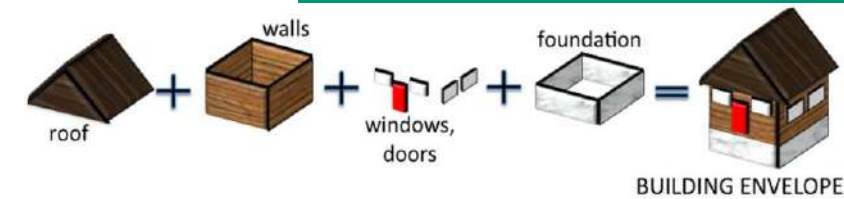
Solar shading

MATERIAL AND RESOURCES

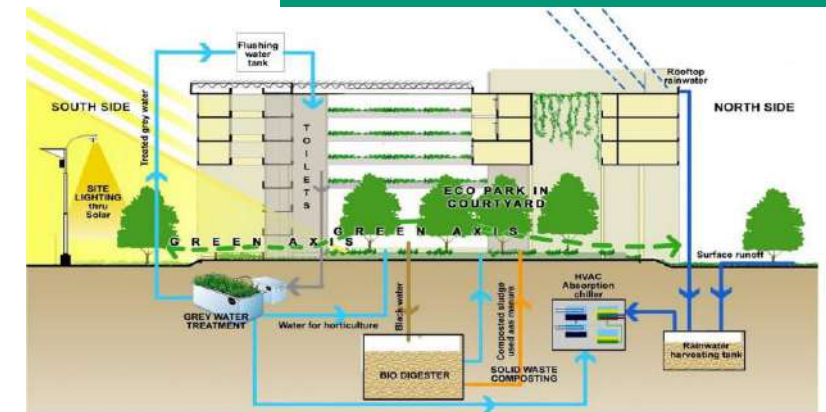
- Sustainable construction material are chosen keeping in mind various characteristics like *zero or low toxicity, high recyclability, zero or low off gassing of harmful air emissions, durability, reused and recycled content, sustainably harvested material*.
- Dimensional planning and other material efficiency strategies are used to **reduce the construction costs**.
- Construction and demolition material can be **reused and recycled** for e.g. inert demolition material can be used as **base course for landfills**.
- Proper planning for managing materials through *deconstruction, demolition and construction* is done.
- Utilization of rapidly renewable materials, such as *bamboo flooring, wool carpets, strawboard, cotton ball insulation (made from denim scrap), genuine linoleum flooring, or poplar oriented-strand board (OSB)*.
- Use of materials that are available locally is preferred over materials that need to be brought from distant places. It **saves transportation costs**. Also, **alternative materials** that can be **generated from waste** with **lesser energy** is used over conventional building materials.
- For example, *alternative materials for timber like MDF board, Mica Laminates and Veneers on composite boards* should be used instead of *natural timber*.
- *Industrial waste based bricks and blocks, aerated lightweight BPC concrete blocks, Phospho-Gypsum based blocks* can be **used for masonry structures**.



Window-wall ratio (WWR)



Building envelope

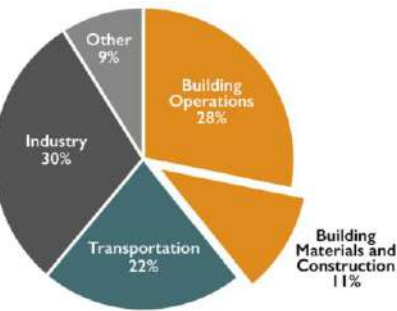


SECTION SHOWING WATER MANAGEMENT STRATEGIES
Recycling of waste water through sewage treatment plant; sensor urinals and dual flow cisterns; rain water harvesting.

Image source:- <https://www.re-thinkingthefuture.com/2020/07/18/a1312-10-things-to-consider-when-designing-a-green-building/>

THE 2030 CHALLENGE:

- Climate change will not destroy the Earth.
- The planet will go on for millions of years, long after human life has expired.
- Climate change, however, will destroy the species of life on Earth that cannot adapt fast enough to new conditions.
- The building trades have collectively recognized its role in contributing to the greenhouse gases put into the atmosphere.
- For example, the manufacturing of cement, the basic ingredient in concrete, is reportedly one of the largest global contributors to carbon dioxide emissions.
- From poor designs to construction materials, the industry is challenged to change its ways.
- Architect Edward Mazria has taken the lead to transform the building industry from a major polluter to an agent of change.
- The goal set for Architecture 2030 is simply this: "All new buildings, developments, and major renovations shall be carbon-neutral by 2030."



Global CO2 Emission by Sector

Image source:- <https://www.sustainable.to/blog/2019/3/5/what-is-the-architecture-2030-challenge>

In 2040, 2/3 of the global building stock will be buildings that exist today. Without upgrades, they will still be emitting GHGs.



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Data Source: IEA Energy Technology Perspectives 2020, February 2021 Revised Edition

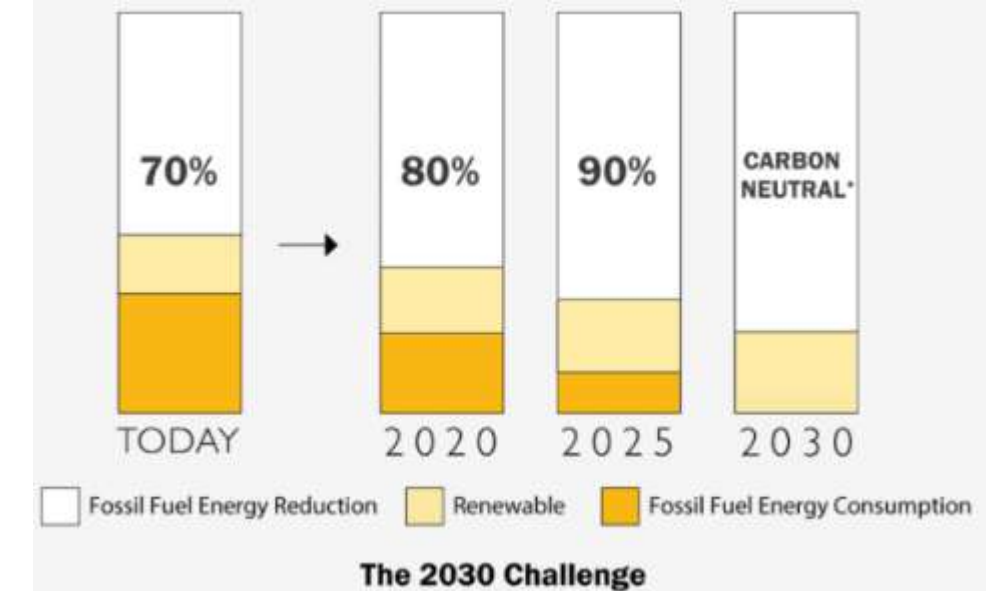


Image source:- <https://www.engineering.com/story/architecture-2030-how-to-build-a-better-world>

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A low-angle, upward-looking photograph of the Willis Tower in Chicago. The building's distinctive wavy, glass-clad facade is the central focus, with the sun shining brightly from behind it, creating a lens flare effect. In the background, the rest of the Chicago skyline is visible under a clear blue sky. Green tree leaves are seen in the upper left corner. The text "THANK YOU" is superimposed in a dark blue, sans-serif font on the right side of the image.

THANK YOU



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