

Comparative Analysis of Green Building Codes and Standards Across Different Countries

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Abstract- Environmental degradation is a growing global concern in the face of rapid industrialization and urban expansion. This research explores the integration of smart technologies in green buildings as a practical and cultural solution for sustainable development. By aligning technological advancements with environmental needs, green buildings offer a path to mitigate pollution, reduce carbon footprints, and create healthier living spaces. The paper highlights how India's cultural heritage, particularly Vedic traditions, historically embraced eco-conscious living, and how this legacy can inspire modern environmental responsibility.

Constitutional provisions such as Articles 21, 48A, and 51A further mandate environmental protection as a right and duty of both the State and citizens. The paper emphasizes that integrating smart technology such as energy-efficient systems, solar panels, and intelligent waste management can amplify the impact of green infrastructure. International examples like Singapore's vertical gardens and Finland's clean city models illustrate the effectiveness of such integration. The research also examines the challenges of implementing green policies, including weak enforcement, economic disparity, and urban migration pressures. Solutions include policy reform, public awareness, and basic environmental education. Moreover, the paper evaluates the role of real estate and community design in making green buildings affordable and inclusive. Smart green buildings are not just environmental assets; they are essential for public health, cultural preservation, and economic stability. In conclusion, sustainable infrastructure backed by smart technologies can help restore ecological balance and secure a resilient future. It is time for individuals, policymakers, and industries to act collaboratively, embracing green innovation while drawing wisdom from cultural roots.

1. INTRODUCTION

The multifaceted problem of environmental degradation is on par with the human being's development. But due technological and business orientation human beings are negligent towards the

environment. That is why the human beings are at the swap to get the most important aspect of protecting the environment with the Eco sustainable buildings are the pathway to ECO friendly culture. To help create sustainable development, eco and green buildings are a part of human life. Changing towards the concrete culture to ECO buildings culture will help towards the future generations as compare to the world Indian culture will always in the mode of ECO and sustainable mode of the buildings temples and ancestral roots are the glaring examples for the Eco -friendly buildings significance Vedas also mentioned in the cultural heritage of the India with the environment.

Green and sustainable with renewable energies are the major advantages for conserving the environment with an ecofriendly activity to provide more productive and eco-friendly solutions to the multifaceted environment. Due to the potential loss that've occurred with the environment, human beings are in the danger state that is why they are digging their old to conserve the environment. Green and sustainable cities need to spread throughout the world because it is high time human beings polluted Mother Earth in a destructive mode. By applying the Newton third law motion every action there is an equal opposite reaction. That is why nature will also have the same reaction when human beings are destroying it continuously.

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1.1 HYPOTHESIS

Enforcement of green and sustainable laws are not stringent enough to combat the evil pollution strengthening measures necessary to tackle the problem of environmental degradation. For the protection of the people.

1.2 OBJECTIVES

- To access the historical evolution of the green buildings.
- To review the enforcement challenges.
- To provide the solution for the environmental impact opening the doors to the green buildings.

2. HISTORICAL, CULTURAL, AND CONSTITUTIONAL PERSPECTIVES ON SUSTAINABLE DEVELOPMENT IN INDIA

Green building's is a boon to the environment because of its nature, sustainability and as well as environmentally friendly. The conference which was held in the Rio de Janeiro United Nations conference on environmental and development. Sustainable development goals 11th goal it is mentioned are green and environmental cities. Green and sustainable development takes place at every corner of the world. The world is now opting for sustainable development. Article 21¹ of the Indian constitution deals with the right to environment and health. Polluter pays principles included that the persons who are damaging the environment should bear the costs of the pollution. By applying the above principle, the people who destroy the environment are the ones who are going to repair it. Development steam-lines the entire area smart cities can also be the wealth generators.²

By following the Stockholm declaration India is going to adhere with the principles of Stockholm through 42nd constitution amendment 1976 introducing article 48³ of the Indian constitution, the

state shall endeavour to protect the environment. And also, article 51⁴ deals with the fundamental duties which are mentioned in the Indian constitution: it is every individual duty to make the environment better for tomorrow.

Environmental pollution takes place in every part now society is aware about the problem. That is why they are approaching the concept of green buildings and sustainable houses which are part of environmental protection. Sustainable buildings with solar panels which can make sustainable energy which is less pollutant compared to the other forms of energy. Planting more trees within the home can increase the level of oxygen thus it can have the potential to reverse the life expectancy rates in the world.⁵

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2.1 MISSING GOLDEN DAYS IN THE ENVIRONMENT BECAUSE OF POLLUTION

Smart and simple living in the future is the major development of the world. Hut to sustainable design everything will come under the Ambit of sustainable living. If any house is located in front of a tree house or houses are filled with plants it also comes under the purview of smart and sustainable living. Sustainable living is the most important aspect to develop human beings which is good for their wellbeing. Imagine the sparrow's humming with a great noise in the earlier generations. Now it is not having that much impact in present day life. Why

¹ India Const. art. 21.

² Food and Agriculture Organization of the United Nations, *The Future of Food and Agriculture – Trends and Challenges* (2017), <https://openknowledge.fao.org/server/api/core/bitstreams/2e90c833-8e84-46f2-a675-ea2d7afa4e24/content>.

³ India Const. art. 48.

⁴ India Const. art. 51.

⁵ S. Venkatesan, Constitutional Provisions on the Environment, iPleaders, <https://blog.ipleaders.in/constitution-environment-provisions/> (last visited Apr. 24, 2025).

because cell phone towers and other pollutants ruined the life of the sparrows.

Olden days with a great number of birds that are in our premises due to environmental pollution even the birds have also disappeared from the earth. Earth is covered with the highest natural resources but that natural resources cannot be utilized properly through various mechanisms. These days people are watching on the TV how their ancestors spent those days with a good amount of happiness. But due to the bad environment it is highly decreasing these days with the lump sum amount of pollution taking place.

2.2 CULTURAL DIG INTO THE HISTORICAL ORIGINS OF ANCIENT INDIAN VEDAS

Vedic hymns and other kinds of things are in their cultural heritage. Based on cultural moorings in India it is also a part of Indian tradition. Culture is playing a role in every country. To create diversity in the society, culture plays an important role towards the development of the nation. Historical aspect that drives towards the development of the country. Indian villages are filled with the greenery and its village atmosphere is the case study to many countries. Because in villages there is a plant in every house which will increase the oxygen levels it helps the environment world is searching for renewable sustainable energies. But India has its culture itself. Vedic hymns are in India which emphasizes the environment as the instinct aspect of Indian tradition. Culture is playing a role in every country. To create diversity in the society, culture plays an important role towards the development of the nation.

Development is the major thing that will help to increase the job opportunities to the youth but that development cannot overlap the environment which is a serious violation of article 21 of Indian constitution. Balance between both development as well as the environment that will be called heaven. People trying to bring olden days kind of atmosphere but it is not possible because degradation of environment is also reach to the far away. Humans are opting for fresh air. This is the example that they've made of how drastically it is going to impact the future generations.

Environmental protection 1986 act includes air, water and other kinds of resources which are closely embedded to nature. But in Indian context the Vedas can play the key role in development of the country in that era. India is considered as the richest country at the time when Indians are preaching Vedas considered them as laws. With full of natural resources floating across the country then the medieval period and British Empire plundered entire Indian natural resources and wealth.⁶

3. COMPARATIVE ANALYSIS OF THE COUNTRIES WITH HIGH GREEN TECHNOLOGIES COMBATING THE FUTURE POLLUTION IN THE CITIES

Sustainable buildings need to be placed in the middle of the buildings which will promote peace in Singapore buildings built with plants which support the environment. We can walk on Singapore buildings covered with gardens. Sustainable building and the structure are also improving the air quality and maintaining the cool temperatures around the cities. Sustainable and green development is the process that is willing to work together with the sustainable model. Sustained green

Development will also contribute towards tomorrow's city. Sustainable cities are being built in the form of a future where the environment degrades at its peaks. Smart buildings can make smart countries. That is why Air Ports are also built in the form of environmentally friendly Mannar Airports are turning into sustainable buildings with the ample number of spaces that are considered to be given by the trees and their development in the future. The future is with the people to shape the environment. They are the ones who invented the wonderful things but they are the ones who are failing to achieve the environmental goals. Slowly the change started to commence in the construction of the buildings.

Development of the buildings is not enough due to severe pollution that is why green buildings are an option to change the future cities with the new building structure. Smart and sustainable buildings are the ones whose cities have the great potential to increase the size and the number of buildings in the

⁶ Article 21 of the Constitution of India: Right to Life and Personal Liberty, Lawctopus,

<https://www.lawctopus.com/academike/article-21-of-the-constitution-of-india-right-to-life-and-personal-liberty/> (last visited Apr. 24, 2025).

future. The future is being with the most beautiful and innovative process that will help towards the betterment of the future.⁷

3.1 SUSTAINABLE DEVELOPMENT IS THE FUTURE TO THE ENVIRONMENT

Environment protection act streamlines the process of development in the manner of achieving the environmental upgradation through green buildings. Green buildings will play a role in exploring the new areas in the future development. The environment will play the part in upcoming generations. Green buildings in different places have been built through different areas and are successful models that've introduced in different countries to uplift the sustainable development and the way to create a good living. Sustainable development is the path of the society which is the best and greater policies of work. Green buildings are the oxygen to many pathetic lives that are ruined by the people.⁸

Assume the situation where the people living in the areas of slums in the fields of the cities their sustainability cannot get in the high levels, we cannot expect that kind of living but they are also entitled to right clean environment under article 21 of Indian constitution of India categorically stated that right to health also included under the ambit of article 21 of Indian constitution.⁹

But slums are also having the chance to clean and safe the environment but due to lack of awareness this will be having a glaring impact on the premises. Environmental protection is the part of the most important and sustainable kind of cities. Environmental impact is there at large now the slums are needed to be part of sustainable living. Environmental protection act needs to strengthen the sustainable development of their need to improve the facilities with a good level of surroundings that are placed in the environment. Environmental

pollution at its peak leading towards climate change and global warming.

Environmental buildings must be cost productive not only for the rich, it has to be balanced both to establish a sustainable kind of living for the individuals. Environmental goals are to be created by the sustainable development goals also it is mentioned that green buildings are the part and parcel of sustainable development. Sustainable development will make the people more attractive and live in better living spaces.

Smarts and sustainable buildings will play the role In the future construction wide range of cites with the green environment for suppose they've introduced the cycles to the youth which will protects the health also but the people are being lazy to go the nearby places with Scotty they needs to be habituated to the cycles for going to the nearby places because it is less polluted compare to others.¹⁰ Smart cities are meant to be improved in the form of new technologies which are available for the future. Smart and sustainable cities also make our grandparents comfortable with the old level architecture. They are at the swamp to adjust the conditions in the cities. Our ancestors used to live in a cleaner and safer environment. But with the increasing trends they are migrating to the new Clear family's era they aren't even adjusting to the Conditions.

4. CHALLENGES, CULTURAL CONTEXT, AND STRATEGIES FOR SUSTAINABLE ENVIRONMENTAL DEVELOPMENT

Environmental protection is the basic rights of human basic responsibility of the human beings. Environmental conservation they can have to create awareness regarding the green and sustainable houses with a good level of posters. Firstly, real

⁷ DETECON, <https://www.detecon.com/en/journal/smart-cities-cities-future-are-sustainable-and-liveable>, (last visited Apr. 25, 2025).

⁸ Arijit Sinha, Rakesh Gupta & Andreja Kutnar, *Sustainable Development and Green Buildings*, 64 DRVNA INDUSTRIJA 45 (2013), <https://doi.org/10.5552/drind.2013.1205>.

⁹ Dominika Czerwinska, *Green Building: Improving the Lives of Billions by Helping to*

Achieve the UN Sustainable Development Goals, WORLD GREEN BUILDING COUNCIL (Jan. 1, 2016), <https://worldgbc.org/article/green-building-improving-the-lives-of-billions-by-helping-to-achieve-the-un-sustainable-development-goals/>.

¹⁰ Constantin C. Bungau et al., *Green Buildings as a Necessity for Sustainable Environment Development: Dilemmas and Challenges*, 14 Sustainability 13121 (2022), <https://doi.org/10.3390/su142013121>.

estate can provide this kind of services with the ample amount of resources that there are in India.¹¹

Buildings were built in the form of the carved stone and will change the paradigm of the whole building's sustainable living embraces the ideology of good life. These carved stones with all the furniture can be long lasting and it will increase the sustainable living in the world. These can be very hard to afford for the poor but in the same hut is also a form of sustainable living because even though it lacks luxury. But the most common features will develop the sustainable living in the society. Trend is shaping towards the sky scrapers to green buildings. Sky scrapers are the buildings which are built for the construction purpose by showing their styles by promoting that they've built that much big structure but it will cause a huge harm to the environment which is happening in the world right now. Trend will have to go to the reverse by making a huge impact in the country.

Trends are always chasing the future with the new generation that are adopting different kinds of green and sustainable buildings as part of the environment. Sustainable living is the future that will create an eco system to live in the world. Environmental imbalance has made the global impact on the future living and its cities that have emerged in the world to create the future cities.

4.1 MIGRATION FROM VILLAGES TO CITIES

Indians are highly obsessed towards nature but some of them have been thinking of jobs and other activities which human beings will prefer for their bread winning perspectives because of lack of agricultural lands which is leading to migrating to the cities. Greenery in villages is also decreasing because they are migrating from the cities. India is the land of cultural heritage many more monuments that are built in India still has their significance for example Taj Mahal it is built with the white marble due to the pollution *Mc Mehta vs union of India* taj Trapezium case in this instant case court opined to

relocate the polluting industries away from the Taj Mahal.

Many more good resources are built in the India Red Fort India gate is the glaring example of many more temples which are going to be built in the green and sustainable manner. Because of this nature friendly activities only still the hundred years of temples were placed in the like monuments still. That is the power of sustainable development.

Temples in India have great significance. There are hundreds of ancient temples in India that symbolise the cultural heritage of our country. Temples used to be constructed at high altitudes with long gopurams. There are no architects and technologies in olden but temples were built with the strongest level with the great pillars. Lepakshi temple in Andhra Pradesh is built of stone with beautiful architecture.¹²

We are in the era of air conditioning due to the severe increase of temperatures. Human beings cannot even survive without the AC. Why are we like that? The main thing here is we adopt the culture of instant reliefs because these human beings cannot even survive in the world. If we grow plants in our homes, it will be enough to produce good air. Why humans are becoming the machine oriented rather than the believing in their hard-work for example olden days people will be having the great scope for the hardworking. They wash the clothes they are having the chance to go to the vegetable market buying some vegetables for the families. These acts will be done in the olden. Then they will generate some physical activity then it will have the chance to improve their health.¹³

Sustainable development also satisfies article 47¹⁴ of the Indian constitution that states shall endeavour to protect the good number of resources that are there in the constitution itself. Article 21 of the Indian constitution deals with the right to life and personal liberty includes right to health and right to a good

¹¹ Justice Mensah & Sandra Ricart Casadevall, *Sustainable Development: Meaning, History, Principles, Pillars, and Implications for Human Action: Literature Review*, 5 Cogent Soc. Scis. 1653531 (2019), <https://doi.org/10.1080/23311886.2019.1653531>.

¹² United Nations Development Programme, *Human Development Report 2023/2024: Breaking the Gridlock—Reimagining Cooperation in a*

Polarized World (2024), <https://hdr.undp.org/system/files/documents/global-report-document/hdr2023-24reporten.pdf>.

¹³ Cherishma Mehta & Lerona Moses Waskar, *Block-1*, Indira Gandhi National Open University (2024), <https://www.egyankosh.ac.in/handle/123456789/106284>.

¹⁴ India Const. art. 47.

amount of life. But governments are failing to protect natural resources.

Sustainable development is the shield to protect the environment in the form of a good level of living standards to the individuals. Sustainable development can make the community grow in a happy living future. Happiness also needs to be bought in the shops. That's why the position is decreasing in the day-by-day activities. Sustainable development is the way to achieve and strive towards a better future.¹⁵

4.2 BASIC ENVIRONMENTAL EDUCATION CAN CHANGE THE WORLD

Education is very much important in the world to get rid of different sorts of things that will be known to the world. It is the things that people will need not to have the pg. level education but they need to have basic education who can write in their own language. Basic education regarding the environment. When the environmental studies have to be inculcated in the studies. Gender equality if you consider India as the country which is embedded in the constitution under article 15 of Indian constitution. Gender equality will play a role in sustainable development. But actually, it pertains to the books itself. Gender inequalities should be vanished from society. Societal influence is at peaks in the world. Because of the advent of inequalities in society. It is part of sustainable Development goals with the goal to achieve in the 2030.

Clean and safe water is the part of sustainable resources for the conservation of the ecosystem and environment. It is the responsibility of every individual to provide clean and safe drinking water in the society. For example, in India the Ganga River has the basic example that it is severely polluted throughout society. Affordable and clean energies are the part of the world which is the most energy conservation of the environment. That is why the solar panels came into the picture with a lot of incentives given by the countries to develop the environmental process for the conservation of future resources. Solar panels will give us good and productive energy.

¹⁵ Thushara Ullas, *Sustainable Development: A Harmonious Concept Between Environment and Development*, Lex Terra, Issue 30 (2024), https://www.nluassam.ac.in/docs/lex%20terra/lex_terra_issue_30.pdf.

Promote sustainability is the process where it can be achieved growth and production. Economic activities will strengthen the role of economic progression in the future. Equal number of opportunities to all will lead to sustainable development in the world. Sustainable development is the major aspect in the development of the future.¹⁶

5. CARBON FOOTPRINTS, AND EMERGING TRENDS IN SUSTAINABLE INFRASTRUCTURE

Environmentally friendly activities have to take place in the world by collecting the plastic wastes that will not be used for the sake of photos and for publicity purposes. It is the responsibility of every individual to make the environment clean and fresh. On weekend days people have to be thinking about environmental issues and how to curb the pollution in the cities. Make necessary advice to the legislators to make laws regarding the environment where the public trust doctrine comes into the picture.

Trees will give oxygen to the people if trees are in the danger mode, then the life of human beings are also in great danger. Because trees and plants are the only sources that human beings have in the world. To improve to create a more eco-system, human beings need to protect the environment. That is why in China, due to the increase of pollution they are planning sustainable cities in the forest regions. Significance in the green and eco buildings are they can use it as the light to create more eco-friendly systems. Imagine the corporate offices with the green walls where they can realise the oxygen to create the sustainable use of natural resources. When pure and fresh oxygen is realised, it is a boon to human beings to experience the fresh air and good quality of oxygen.

5.1 REDUCING OF CARBON FOOT PRINTS

Carbon footprints let us assume it as the individual itself has to be measured. For example, we order pizza in the shop. If we can order with the large quantity then it will waste and throw into the dust

¹⁶ United Nations, *Goal 6: Ensure Access to Water and Sanitation for All*, Sustainable Development Goals, <https://www.un.org/sustainabledevelopment/water-and-sanitation/> (last visited Apr. 24, 2025).

bins which will cause the wastage of food. For example, we can consume the tea in the plastic cup thrown into the bus then it will also increase the pollution. Diwali is considered as the triumph over evil but it is the festival lights not the festival pollution. If we burnt down the crackers it would also increase the carbon foot print. Let us take the company's perspective. The government has allotted the land to the company for the aim of generating jobs to the youth. But in the company's factory large amounts of chemicals are mixing into the river then the river is polluting. Under the river there can be fishes and the other organisms they can die. Then the foot print of the company will increase.

Increase in carbon footprint will lead to the loss of the environment in which it can grow the impact on climate change that is why climate change is happening across the world. Carbon footprint is the most major impact on the changing trends of global warming and other important aspects. Increase in carbon footprints will help with the pollution. Making the way in the country's eco-friendly activities will help to close the doors of pollution.

Carbon foot print will also be dangerous to the future environmental disasters. It will lead to enormous pollution in the world. It is every one's responsibility to decrease the carbon footprints that will hamper the whole environment. It will be having a cascading effect in the country. That is why carbon footprints need to be decreased in the future. In the coming years there might be a severe increase of pollution across the world. Environmental degradation is causing the widespread effects of pollution's effect on the individuals with the devastating impact on the public health. Increase of carbon footprint is another important aspect in it by reducing the carbon foot prints leads to the environmentally friendly atmosphere.

In India companies are dumping huge levels of wastes in the rivers and other canals due to this huge level of pollution. Chance towards increasing the pollution. But due to political influence this will hamper the whole environment which is leading to a serious amount of pollution. The primary motive is to earn money, not to make a good and friendly environment.¹⁷

¹⁷ Global Footprint Network, *Climate Change & the Carbon Footprint*, Global Footprint Network

5.2 LIFE EXPECTANCY RATES COMPARATIVE ANALYSIS

Because of environmental degradation life expectancy is decreasing on par because it is only 67 in India. Why because the kind of pollution and environmental degradation that is in India life expectancy rate is decreasing. The USA has only 77 years of life. The USA is having the world's biggest companies and their headquarters why India is in the decreasing state.

There is a comparison of how much environmental degradation is happening in India. People cannot live their lives with the good amount of fresh air which is the glaring problem in India. India with the good amount of resources that is plundered by the British government in order to make the country worse for utilising the resources. Japan having the Most of the life expectancy with the 87 percentage with high in the world compared to the world happiest country Finland has the highest expectancy rate of 81 years of the age which is the glaring example of how sustainable cities can develop the future countries. Good ecofriendly countries have a greater life expectancy rate.

Countries with the highest level of quality will be having the great level of life with the sustainable utilisation of natural resources. countries though there is not an adequate level of natural resources they need to be improved by improving the green and sustainable buildings. Green buildings are the most important and part of our human life. They are the ones who protect us from the devastating climate attacks. Countries will not follow those things. They will face some huge changes in the environmental aspects and it will lead to the destruction of the environment. Small species also make a difference if honey bees were dying then it would be a danger to the human beings because of pollinators. Small butterfly effects will lead to the biggest cyclone in another country that is why every eco system is the important one.

6. CONCLUSION

It is high time to save the environment for the future hurdles that will emerge in human life. Human beings are always ready to destroy the environment but there needs to be some sort of diligence towards

(Dec. 2022),
<https://www.footprintnetwork.org/our-work/climate-change/>.

the people who have to take responsibility towards the environment. It is on the peoples' take to protect the environment for unprecedented problems that will arise in the future. That is why all the conventions and treaties came into the picture to protect the environment.

To protect the environment human beings need to take more and effective actions to protect the future. Environmental miseries are occurring at large in the countries which will cause devastating harm towards the environment. To avoid the uncertainties to improve the standards of life it is the need to maintain a clean and healthy environment. Environmental concerns are at par which will help the government and industries to help and strive towards the development of the future projects in the environment. There must be the common problem with the environment which is there from the beginning is negligence. Neglecting the environment with the quality and improving the standards of life is an important factor in environmental development. There are several problems with the degradation of the environment; it can cause health issues around human beings. That is because human beings who are at the highest level of the risk who will produce the CNG gas emissions will devastatingly harm the environment which is responsible for the loss that they caused. Several factors which will lead to the drastic impact in the society.

That is why the problem of Eco-friendly buildings will exist in the future. It will have a big impact to change the buildings as the ECO friendly and conserving villages in the future. Eco friendly villages will strive towards the better and more sustainable in the future. Eco friendly villages can change the paths with completely new solutions to the future generations who are living.