International Journal of Aquatic Science
ISSN: 2008-8019
Vol 12, Issue 03, 2021

Importance Of Regenerative Systems In Architecture For Climate Change

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Abstract: The climate all over the world has become worst in the past few years. There are many causes for this crisis; such as global warming, pollution, infrastructure, development and many more. Sustainability in the Architecture has been evolving, but now it became a responsibility to everyone. India is one of the most populated countries and hence pollution is a serious issue. There had been climatic hazards since few years and rise in construction is one of the causes responsible for this. A huge amount of energy and water is used by buildings, they generate hazardous chemicals and that cause pollution, at the same time it affects climate. Based on the concept of use of minimum resources regenerative systems can help improving the condition. The main purpose of regenerative architecture is to reduce the environmental impacts like climate change from a building, at the same time the building should also improve the environment. In this research, the study of regenerative systems in architecture had done and through the case study analysis, how climate can be improved.
Keywords: architecture, climate, environment, building systems, regeneration.

1. INTRODUCTION

Regenerative systems are the systems that help re-create sources we need for day to day life and building cycle. We know that buildings consume a lot of energy (electricity & water), material, space, and destroy native vegetation as well as cause pollution. These all factors adversely affect the climate as a huge amount of carbon dioxide emissions come from buildings. To reduce climate impact we need to adopt regenerative systems in architectural buildings. The challenge we face due to rise in construction and urbanization are; carbon emissions, water shortage, scarcity of resources, depletion of biodiversity, depletion of fossil fuel, adverse impacts on human health. Regenerative systems may change the environment and create sustainable development. [2] The main purpose of regenerative architecture is to reduce the environmental impacts like climate change from a building, at the same time the building should also improve the environment.
Aim: To study and Regenerative architecture and its contribution to improve climate crisis.
Objectives:

- Importance of regenerative systems
- Impacts of construction and development on climate.
- Case Study and analysis

Research Question: Can Regenerative systems contribute in Climate Change? How important is the need to adopt regenerative systems in buildings?

Regenerative Systems:
The concept of regenerative systems is not only to reduce the usage but also regenerate to operate and reverse the damage caused and providing net positive impact. The situation today is already worse, thus only limitations of use will not be enough, and we must restore the lost resources and environment. This is the ultimate objective of Regenerative architecture. There are many ways to adopt these systems;

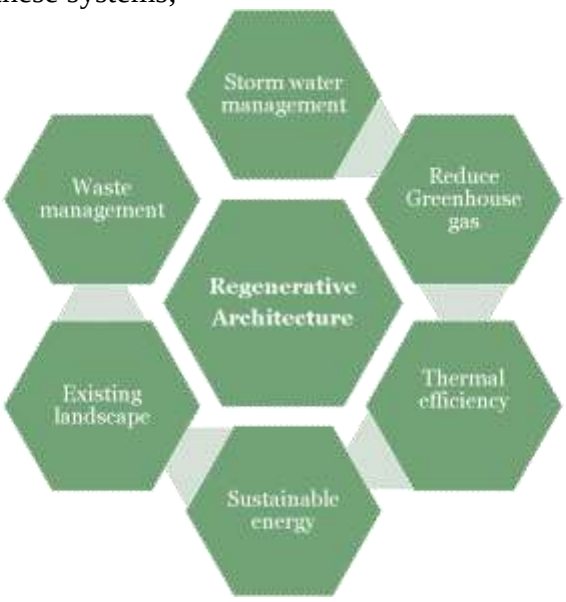

Fig 1: Regenerative systems in Architecture. Source: Author

Importance of Regenerative Systems in Architecture:
Resources such as land, water, energy, materials and air are declining day by day due to excessive demand, use and they get declined faster than nature can regenerate them. We must restore water, energy, biodiversity, vegetation, etc. along with that, we must use recycled material to reduce pollution and greenhouse gas, wastewater management and solid waste management are also important. Preserving the existing landscape will keep the environment at its original state. All of these strategies and many more collectively are regenerative systems. [3]
The rising global warming and climate change make an urge to change the systems of building that only consume but not regenerate. Cities need to conserve and protect the biodiversity at most because urbanization declines resources and biodiversity. The major cause of climate change is urbanization. The goal of urbanization is to retrofit cities to support the wellbeing of the people and urban interventions. Along with this regeneration and biodiversity restoration is equally important to sustain the future of the cities.

2. LITERATURE REVIEW

A paper written by Ar. Vaishali Parmar, Dr. Bhupinder Pal Singh Dhot titled 'Understanding Regenerative Architecture through Case studies' demonstrates three case studies that explain the concept of regenerative architecture. The design and development that aims to regenerate natural resources, repair the cycles of nature and achieve net positive goal is evaluated in the case studies. Case studies studied are; IIT Bombay, Biodiversity Training Institute at Sikkim, Greenfield University Ho Chi Minh City has been studied. The analysis shows that all of the case studies have various strategies to restore the nature's richness by wind study, local

construction techniques, microclimate, afforestation, vegetation, preserving landscape, Façade that grows plants, site development with embankments to prevent flooding, and many more. The Built, Natural, Human, social, Symbolic and Financial capitals are described. [1]
A paper by Haritha Bharath titled 'A Study on Regenerative Architecture' demonstrates a study of regenerative architecture by research and data analysis of a Regenerative Observation Centre in Shilong, Meghalaya in India. They explain the range of sustainability approach in which regenerative systems require less energy giving a well human living and whole systems of balance and restoration. The observation centre is to study and experience various landforms of earth. The study of climate and its characteristics is done to explain passive techniques. The degrading biodiversity and its importance are highlighted with all other parameters that are the cause. The benefits and principles of regenerative architecture create a deep understanding towards the research study. [2]

Impacts of Conventional Buildings in the Urban:
Buildings in the urban that do not follow any green building standards or regenerative systems are discussed to clarify the comparison and highlight the importance. RCC buildings/normal buildings require huge amount of concrete for construction. Concrete consist of a mixture of cement aggregate and water, it undergoes a chemical reaction when water is added. This causes hydration and thus during mixing concrete huge amount of carbon emissions happen. Not only concrete mixing but also the manufacturing of cement while adding clinker, carbon emissions occur. If only RCC construction is used and no recycled material, it gives no contribution to environment. However recycled materials are available to use, recycled concrete debris can be used as aggregate, and cement can be replaced with waste materials such as fly ash, blast furnace slag or micro silica.
Electricity provided by government is non-renewable energy that produces pollution while generating at power plants. To reduce this renewable energy sources should be used. No use of natural light and ventilation, artificial lights and HVAC system is used generally. This consumes lot of energy and also creates an unhealthy environment. All the site is paved with impermeable surfaces destroying native landscape and vegetation; no provisions for rainwater harvesting or Storm water. Water is supplied by Municipal Corporation or underground water but no provision of recharging underground water given.
Huge amount of waste is disposed without treating. Planning buildings very deep prevent exterior views and natural ventilation and thus forces to use artificial methods. Biodiversity that is destroyed due to construction should be replanted at available space on site.

Case Studies

1. Sulzon One Earth, Pune – Office Building
Architect: Christopher Charles Benninger
Site area: 10.3 Acres, year – 2009

International Journal of Aquatic Science
ISSN: 2008-8019
Vol 12, Issue 03, 2021

Fig 2: Sulzon One Earth, Pune. Source: slideshare.net

Sulzon One Earth is an Office building located in Pune, Maharashtra State in India. It has green building certifications i.e. LEED. Out of the total consumption of energy of the building, 97% energy is generated on site by solar and wind energy. This makes it a net zero /carbon neutral footprint. Renewable sources are used at onsite and offsite for power generation. A balance between human and natural environment is maintained by designing the landscape with existing features and vegetation. More green spaces and trees are designed to keep the environment cool. Storm water runoff is controlled by providing drains at certain intervals and less impermeable surfaces.

The building design is in such a way that maximum daylight is exposed while reducing use of artificial lighting. 75% Workstations have external views for comfortable working and efficient performance. Artificial lights are LED bulbs that consume less energy and give brighter lights. Maximum parameters of energy efficiency control the consumption and pollution caused by non-renewable energy generation. Non-Toxic and recycled materials used in construction make it eco-friendly construction.

This green building has adopted various green building standards to create a sustainable environment which is worthy. Nowadays very few architects and people participate in constructing a green building. The aim of green buildings is to reduce use of resources and save them.

2. Indian Institute of Technology Mumbai, India 550 acres Public educational institute

Fig 3: IIT Bombay Campus (Mumbai, India) Source: iitb.ac.in

The Indian Institute of Technology Bombay (Mumbai) is an educational campus of Engineering and Technology located in Mumbai; various campuses of IIT are located in the major cities of India. The campus is located near Powai Lake; the site was a barren marsh. Various strategies were made by the institute to restore the land. The whole Campus is a home to many species of Flora and Fauna. 843 species of plants and trees, 172 species of butterflies and other indigenous trees also exist. Thus here the ecology and biodiversity is a great importance.

'Green campus Initiative' was adopted to cater the issues of energy, water, biodiversity, food and waste, climate, atmosphere and land management. [1] Due to this initiative they created a regenerative campus; as the barren land was converted into fertile and vegetation grown providing home to insects. 30,000 litre of sewage is treated in a constructed wetland (13mx3mx0.8m) before releasing to the Powai Lake. Thus maintaining Powai Lake which is not the property of the campus as a whole but contribution to develop the ecosystem is a regenerative system as well. The initiative was adopted in 40 large educational institutes across 11 cities in India by the end of 2015.

Analysis:

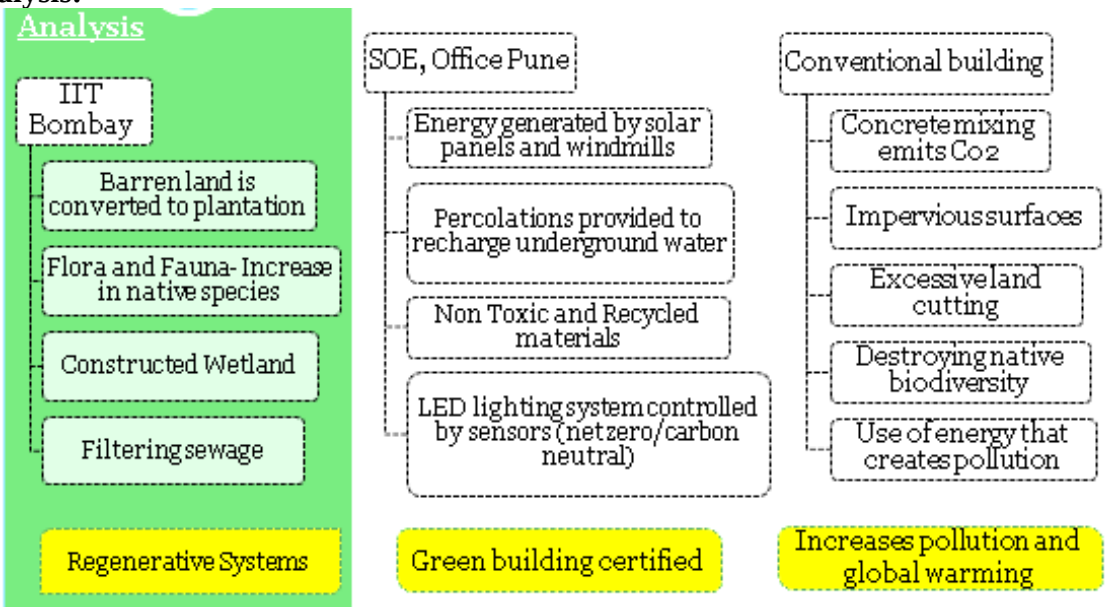

Fig 4: Flow Chart Comparing Case studies. Source: Author

By the above analysis, we can observe that regenerative systems not only should meet green building standards but also restore the environment which can make a change. Green building standards focus to only save the existing resources utilization. Regeneration is beyond saving, the goal is to regenerate resources. To understand regenerative systems this comparative analysis was important. The first case study is a green certified building, just following the standards of minimum utilization. We agree that this is helpful but looking into the current scenario of climate change, we need more than just reducing use. The second case study is an ideal example, the building campus may not be a certified but it still uses sustainable strategies. Regenerative system of restoring the biodiversity is a very great initiative which can improve micro climate. Thus we can conclude that buildings must be regenerative, being green certified or not may not be the focus, contribution to the environment is important. Every existing building can adopt such strategies. Any building being new or old must contribute to restore the environment. The environment is degrading and the urge is not to

just ‘save’ the resources but regenerate more so that we will never be out of resources in the future.

Benefits of Regenerative Systems:

- Regeneration provides more availability of building need and improves surrounding.
- Increase in native biodiversity – Improved environment
- Overcomes Water shortage
- Decrease harmful emissions and reduces pollution.
- Healing the surrounding environment at every individual level.
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3. CONCLUSION

If every existing building and new building adopts the any one regenerative system, the environment and climate will be restored to its original state and get self-healed. Thus we can conclude that regenerative systems are way beyond sustainability and towards a future of restoring the lost and damaged into a healthy environment at its origin. Architects, designers, engineers, builders, users, and all people must participate in regenerative strategies. We are at a stage to ‘Recover the Nature’, thus achieving minimum standards is not what to be in focus. Recovery of the destroyed natural environment is essential to keep balance between human and nature [4]. Not only before planning some implementations can be done after had building constructed. Transforming them into a regenerative structure is possible and will surely help heal the nature. Every building could regenerate at least one system by which climate and earth will heal soon.

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