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A New MINDSET: Regenerative Design to Counter Climate Changes for Reaching Net-Positive Energy Buildings in Egypt

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Abstract- **Climate change is the most critical global challenge countering today; therefore, the impacts of climate change require an urgent and collective response where building and construction industry is regarded as one of the highest contributors to many issues that the world is encountering today, especially in a country undergoing rapid urbanization and industrialization such as Egypt. The primary objective of this paper is to promote the use of regenerative design to develop buildings intended to restore and improve the surrounding natural environment by aiming to leave a positive impact instead of harm reduction and participation in Egypt's plan for encountering climate change through a theoretical study for regenerative design and the Living Building Challenge (LBC) as a supporting tool to simplify the regenerative approach for discussing Net-Positive Energy Buildings; where the buildings aim not simply to generate energy but to identify the purpose and the way to handle resources to provide more than the building requires. Then the paper summarized two office buildings that achieved the Living Building Challenge certification, which provides using different architectural and mechanical systems working in concert to perform better, and this could be a reference repeated in developing countries such as Egypt. The study found that regenerative buildings offer an exceptional opportunity to effectively solve current environmental problems and achieve Net-Positive impacts on buildings to "add value" and be designed and operated to generate more than is needed.**

***Keywords*- Climate Change, Regenerative Design, Living Building Challenge (LBC), Net-Positive Energy Buildings (NPEBs).**

I. INTRODUCTION

Rapid population growth has contributed to the development of buildings and cities that barely engage with the environment or users [1]. In contrast, the designs of buildings generally focus on aesthetics, function, and fixed levels of comfort and have been given minimal consideration to whether buildings harmonize with the natural environment and human life [2]. Egypt seeks to maintain the environment by taking action to hasten the shift to a development model that is more environmentally friendly and the rational use of resources. It is essential to note that all facets of society, not only government organizations, required participation in Egypt's national climate change policy implementation, including civil society and non-governmental organizations.

Where created the framework of Egypt Vision 2050 aims to achieve social integration and participation with a balanced and diversified ecosystem, benefiting from its strategic location and human capital to achieve sustainable development for a better life for all Egyptians and achieve this by addressing the impact of climate changes and increasing the use of renewable energy [3]. The call has gone out to move further advancements, so requires a new way of thinking and participation in meaningful action is needed that could be helped the Egypt plan. So, the paper discussed that the regenerative design process provides frameworks for positive change [4]. The regenerative design redefines the built environment to encompass relationships between and among structures, infrastructure, and natural systems, as well as communities' culture, economy, and politics, as opposed to the outdated, building-centric definition. It redefines what sustainability means and requires within a dynamic, interdependent, evolving world[5]. It also re-weaves Human groups, and natural ecosystems can co-evolve into a single entity where people live in harmony with the environments it occupies. The regenerative approach reduces human activities' environmental footprint. It creates a net-positive ecological impact, where the ability of some structures to provide more than is required is a core concept in regenerative design[6].

II. AIMS AND CONTRIBUTION

The paper has two interrelated goals:

- First, supporting the aim of Egypt's plan to encounter climate change by guiding the designers toward a new mindset for designing environmental buildings by following the regenerative design process.
- Secondly, discussing how regenerative design applications could reach the objective of reducing the energy of buildings and generating more than is needed.

III. METHODOLOGY

A literature review was conducted to discuss Regenerative design as a new mindset for designers to reduce the impact of climate change. To simplify the process of regenerative design, Living Building Challenge (LBC) was chosen as a supporting tool for regenerative design and speciating on reducing energy in buildings, as power is one of the causes of climate change, through identifying the Net-Positive Energy concept where analyzing the process steps to aid on formulating a vision and a framework for Net-Positive Energy to produce more energy than it expends. The paper summarizes two projects that achieved all previous goals using existing technology as a reference, which could be repeated in developing countries such as Egypt.

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IV. THE IMPACT OF CLIMATE CHANGE

Climate Change and "global warming" are frequently used interchangeably and include physical occurrences and public policy issues, according to the United Nations Framework Convention on Climate Change [7]. In addition, surveys have reached a consensus of 97%, with 90–100% of the experimental data pointing to humans being the primary cause of global warming. [8].

However, the harm caused by human activity to the planet and climate change, environmental damage, and pollution may be the principal challenges of our time. The structure and construction sectors are the most significant sectors benefiting from natural resources regarding land use and raw material consumption. Buildings consume about 36 percent of final global energy and 37 percent of energy-related CO2 emissions [9]; In 2019, the highest CO2 emissions ever recorded for this sector [10], the worry is that construction demand will push emissions higher. Based on the International Energy Agency (IEA), the energy sector is the basis of around three- quarters of greenhouse gas emissions [10]. That caused much environmental and human damage, particularly in developing countries such as Egypt, where Egypt's total GHG emissions rose from 134 million tones (Mt) of carbon dioxide equivalent (CO2 e) in 1990 to 352 Mt CO2 e in 2019, representing a 0.73 % share of global emissions[11]. The energy sector mainly contributes to Egypt's GHG emissions, accounting for 74 percent of 2019 emissions in Egypt and producing over 261 Mt CO2. Egypt's energy consumption grew by 52 % between 2005 and 2021[12]. Gas consumption in Egypt has been increasing steadily but soared in recent years.[13].

Scientific studies estimate that by 2060, due to climate change, the average temperature in Cairo is expected to increase by 4 ◦c, and for the rest of Egypt, from 3.1 to 4.7 ◦c [14]. The direction that future human activities take will determine how severe the effects of climate change are. More climatic extremes and extensive negative repercussions on our planet will result from increased GHG emissions[15].

V. A NEW MINDSET

Buildings are essential to collective cultural memory representing society's values and technological prowess during construction and reflecting on environmental issues important to the community. Designers went through many stages of development to aim for less harm to the environment and human health besides the efficient use of resources [16]. However, rather than doing less environmental damage, it is essential to learn how to participate in the background by utilizing the health of ecological systems as a foundation for design[17].

A- The Trajectory of Environmentally

The trajectory of environmentally moves through the following ‘stages’: A degenerating system (conventional practice and green) to one that is sustainable, restorative, and ultimately regenerative as following with more details.

- Conventional practice when there is no consideration for environmental problems in the design and use of the building as it only attempts to meet legal requirements[17].
- Green design is a general term implying a direction of improvement in design. Continual improvement towards a generalized ideal of no harm. [18].
- Sustainable design is a ‘Green Design’ with an emphasis on reaching a point of sustaining the health of the planet’s organisms and systems over time[19].
- Restorative design is an approach that thinks about design in terms of using design and building activities to restore the capital- the ability of local natural systems to a healthy state of self-organization.
- Regenerative design is realizing that humans, their built environment, cultures, and society belong to ecosystems. It seeks to achieve the utmost health potential for the environment and humans on social, physical, cultural, and economic levels. The term regenerative is valuable because it suggests that living systems have self-organizing, self-healing, and self-evolving properties[18]. Figure (1) shows the trajectory of environmentally responsible design.

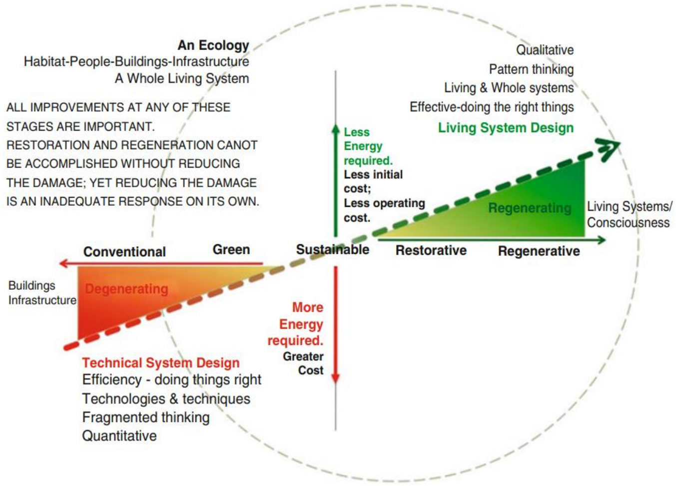

Fig. 1: Trajectory of environmentally responsible design [20].

VI. REGENERATIVE DESIGN

The term "regenerative design" describes a philosophy that views all human activities and environmental systems in a broader context than the traditional idea of sustainability[21]. Figure (2) shows the regenerative design system overview. It profoundly reorients human conduct, urging us to pause, pay attention, and learn from the innate wisdom of nature [22]. Regenerative practices expand beyond traditional design features to address a distinct thinking style and interactivity necessary to create and engage in a regenerative process [18].

The regenerative design incorporates diverse environmental, cultural, social, and economic systems. The regenerative design provides a better system that recognizes humans as a part of the ‘ecosystem’ and values the need for humans to be integrated into it[23]. The regenerative design is considered the highest architectural design concept regarding positive productivity toward the environment. Advocates are invited to incorporate eco-efficient design technologies and processes into an ecologically oriented plan to reverse the degradation of the natural and human systems on the planet and the human systems [24]. Regenerative design has three main goals. Firstly, revitalizing ecosystems and neighborhoods by fostering the

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development of distinctive, complex ecosystems increases urban biodiversity and the ecological foundation of the city.

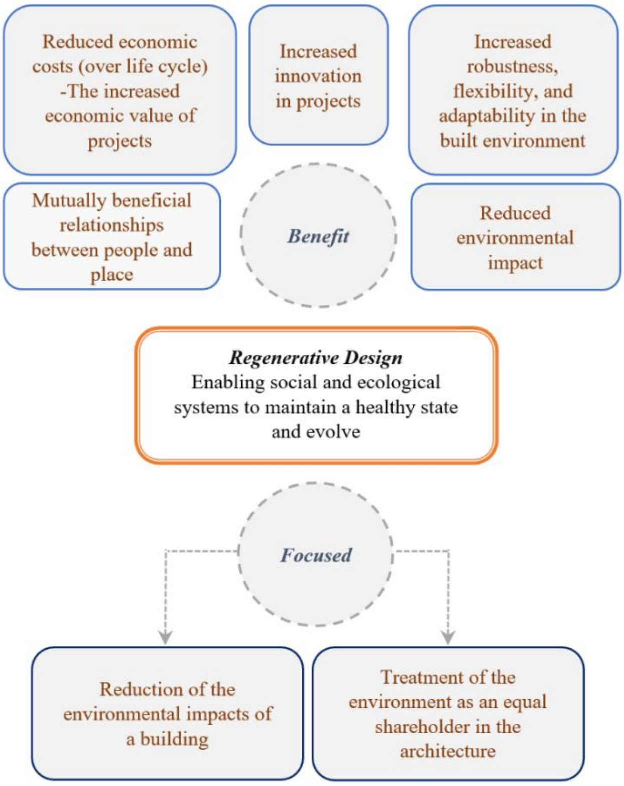

Fig. 2: Overview of the regenerative design[18].

Nevertheless, it is not merely about building the environmental base but also about more complex and diverse social and cultural systems. Secondly, it is about giving back more than one took out, not just in terms of material or resource rushes but also in support of enhancing and empowering the numerous soft components of human systems. Through practices that improve and enhance the connections and flows in which that social-ecological system forms a node, it could contribute to the health and well-being of the social-ecological system.The last primary purpose of regenerative design is to "create a connection" where it not only reconnects humans with nature (as in the ecosystems both inside and outside of them) but even connects individuals to it communities of life to each other[25].

VII. LIVING BUILDING CHALLENGE (LBC)

Experts are developing new design and construction support tools and technological solutions to implement regenerative design principles to support a regenerative worldview. Emerging design support tools help practitioners, designers, and stakeholders by simplifying the theoretical foundations and design process where tools are needed to illustrate essential qualities and attributes. [26]. This paper chooses the Living Building Challenge (LBC) tool, considered a more comprehensive tool for implementing regenerative design principles. The Living Building Challenge mission is to promote a fundamental systemic reform of the construction industry, transforming it into regenerative systems (repairing the damage inflicted by unsustainable practices in the past).

The seven performance 'Petals' that comprise the Living Building Challenge are Place, Water, Energy, Health + Happiness, Materials, Equity, and Beauty. Each Petal is separated into Imperatives, for twenty Imperatives in the Challenge. [27].

The Imperatives could be used for almost every building project, whether a new building or an existing structure project, regardless of scale or location. [28]. Innovatively, the Living Building Challenge bridges the gap between ancient and modern worldviews. As demonstrated by the diverse range of projects already underway in many nations, Living Building Challenge projects could be constructed in any climate zone anywhere in the world. This paper will be discussed the "energy petal," which intends to reach (Net-Positive Energy) and create new renewable energy sources that permit projects to operate year-round in a resilient, carbon-pollution-free manner. "Energy petal" prioritizes energy efficiency to reduce wasteful spending of energy, resources, and capital. Furthermore, it attempts to set a unique paradigm for humanity's relationship with power that places where it lives, works, and plays evolved catalysts for a healthy and resilient future.

VIII. NET-POSITIVE ENERGY

The term of Net-Positive Energy is new[29]. It is utilized to collectively address climate change and improve energy efficiency and renewable energy share in buildings. NPEBs are generally concerned with buildings producing more energy than they consume annually, where the electrical energy surplus provided into the grid surpasses the annual power imported [30].The challenge in evaluating Net-Positive Energy based on a Net-Zero Energy structure is that the Net-Positive Energy goal goes beyond energy conservation[31] as shown in Figure (3).

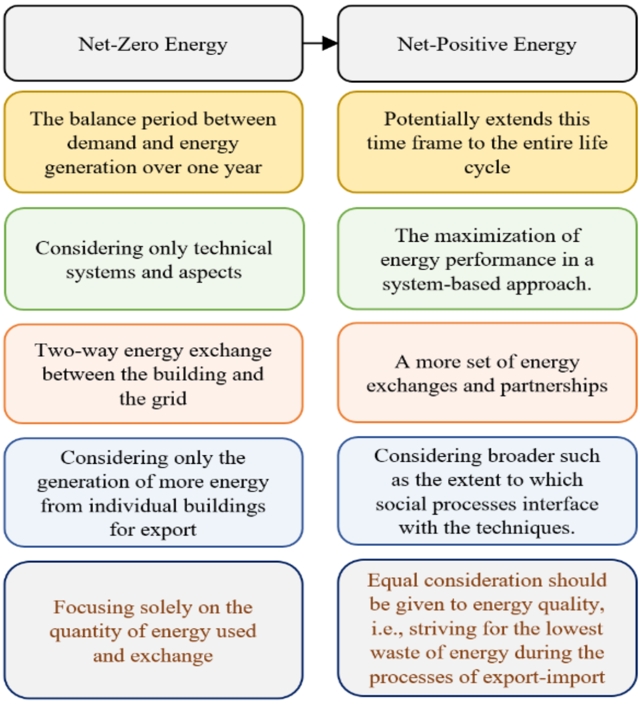

Fig.3: The challenges of NPEBs [34].

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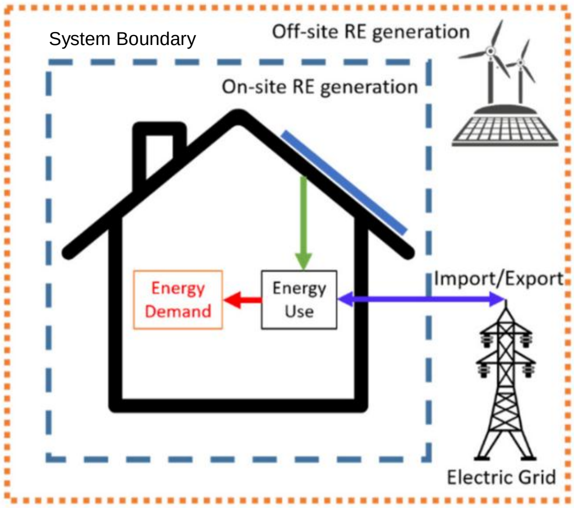

Fig. 4: A brief outline of the Net-Positive Energy Building[38].

The concept of regenerative design raises the promise that buildings could "add value" and be designed and operated to generate more than required [32]. Therefore, a vital issue in a Net-Positive Energy design system is producing more energy and figuring out how the extra resources will be used [33].

Net-Positive Energy Buildings contribute renewable energy to the surrounding environment, reducing neighboring buildings carbon footprint. [35]. However, it means more interaction with the energy grids than in the case of Net-Zero-energy buildings. The Net-Positive Buildings' objective is to explore the possibility of adding value for users and occupants[34]. Where increased output, tenant satisfaction, and energy savings outside the confines of the specific facility could all add value [36]. The emphasis now changes to maximizing energy performance in a system-based approach rather than just comparing the generation of more exported energy versus its importation to different buildings or the grid[37].

IX. THE FRAMEWORK OF NET-POSITIVE ENERGY BUILDINGS

A technical framework is required to provide a basis for Net-Positive Energy Buildings where the parameters change depending on the location, climate conditions, and local policies. [12]. Therefore, when defining an NPEB, it is essential to consider local conditions, which change based on the weather and building regulations Figure (4).

A. System Boundaries

The system boundary of NPEB to identify the area available for renewable energy installations and what type of energy flows across the border and the system boundaries are divided to:

A1. Physical boundary

The geographic perimeter, the location of the building, and the actual location of the energy system are all considered to be its physical boundaries[39]. It defines whether renewable resources are 'onsite' or 'off-site, which is required to identify 'on-site' generation if the renewable sources and storage are located within or outside the boundary. [38].

A2. Balancing boundary

The limit over which the energy carrier under consideration is balanced is referred to as the balancing boundary, and it is necessary to know this limit to identify the energy types employed and evaluated in NPEBs. For instance, the energy could be heating, cooling, electricity, and fuel, and the operational power for the balance include electricity, cooling, heating, domestic hot water, ventilation, fixed lighting, and plug loads[29].

A3. Boundary condition

The first step is determining the building's use, function, space utilization, temperature, and level of comfort required. The space use specifies how space is being distributed among the users. In addition to the space use, the use schedule is also essential. Building purpose and plan could guide the people density and how much the building's peak hour or peak demand occurs where the schedule variation could impact the energy[35].

B. Energy Supply and balances

B1. Passive Energy

Net-Positive Energy Buildings utilize passive design strategies to reduce energy consumption by exploiting the local climate[29]. Passive design strategies use natural heating or cooling to achieve balanced interior conditions. The energy flow in passive design is natural such as radiation, conduction, or convection, without utilizing any electrical device[40]. In a climate with high temperatures most of the year, keeping a building indoors comfortable requires slowing the rate of heat gains into the structure and promoting the removal of excess heat. This can be done by blocking heat from entering the system or removing it once it has.

B2. Renewable energy systems

The variety of the on-site and off-site renewable energy systems varies for NPEBs, which depends on climatic and geological conditions, building types, and techno-economic and techno-political conditions[35]. Renewable energy supply sources, such as solar panels, can be located on the building site or transported to the site through a general categorization and a ranking for preferred renewable energy sources. Considering the interaction of neighborhoods in terms of transferring the excess energy opens up new forms of partnerships and challenges to current notions of ownership[39].

B3. Energy balancing

Energy balancing is carried out to balance the supply and demand throughout a year, month, or hour. According to the weighting factor, the various energy carriers are typically transformed into primary energy. Furthermore, the weighting variables translate the different energy carriers into similar metrics. Many balancing methods can be used, such as balancing the year's supply and demand or importing and exporting power to and from the grid. However, to make the building a Net-Positive Energy Building, the export of energy should be higher than the import of power.[35].

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C. Network interaction and energy matching

The grid is the route or medium via which energy, electricity, heating, cooling, gas, or fuel is delivered, and the grid may be either one-way or two-way [38]. One way is when the building only receives electricity from the national grid or source. The two-way (or bi-directional) grid guides the channel that provides energy to the building and could also obtain power from the building to the grid.

Another essential aspect that has to be addressed is whether the supply from renewable energy sources could be exported to the neighborhood or if the renewable energy supply can be used on-site to reduce the demand for the building. The annual energy balance between the need and supply in NPEBs should be met by renewable energy. The external grid or onsite storage should complete the short-term hourly mismatch. When aiming for high self-sufficiency or matching, priority has to be given to the onsite storage to meet the short-term mismatch; afterward, this could be completed by the energy from the grid. [35].

D. Energy storage

Energy storage is essential for widely adopting renewable energy systems where energy storage devices assist Net-Positive Energy in lowering the cost of the maximum demand fee for electricity from the utility grid, enabling the system to respond to demand, maximizing time-of-use, and serving as a backup power source[38]. NPEBs used different energy storage systems, such as active and passive energy storage techniques; a dynamic system necessitates mechanical and electrical equipment, while a passive system does not. A few burgeoning technologies that can store energy [29].

E. The flexibility of a building as a support for the energy grid

The energy flexibility in Net-Positive Energy Buildings could be included by utilizing a building envelope, better control of the technologies, and storage. For example, by counting an active heating or cooling layer in the building envelope, the heating and cooling demand could be shifted from peak hours, or peak load demand could be decreased[29]. Similarly, the peak hour demands could be transferred utilizing more suitable control algorithms to turn the devices and heating or cooling demand off-peak hours when high renewable energy is available or when energy cost is minimal. It would qualify for maximizing onsite assembled renewable energy utilization within the building and decreasing the life cycle cost.[38].

Additionally, the system can take into account storage to increase flexibility and self-sufficiency by saving extra energy generated locally or inexpensive grid electricity. It could improve energy flexibility by providing stored energy during peak hours, decreasing the peak load demand and energy cost, and shifting the peak demand to off-peak hours. The system's flexibility could be increased by adding load shifting and weather prediction in addition to storage[35].

X. THE CASE STUDY

The paper selected two office buildings, "The Bullitt Center" building and "PAE Living" building and the criteria for choosing are:

• The two projects achieved the Living Building Challenge (LBC) certification, which could be a reference repeated in developing countries such as Egypt.

• The design of "The Bullitt Center" and "PAE Living Building" buildings is a marriage of architectural designs and mechanical techniques that suit buildings in different climates.

• The two buildings have used technologies that exist within the economic means, which could be available in Egypt buildings.

Although the two buildings have LBC certificated, both "PAE Living" and the " Bullitt Center" buildings, have used different techniques and strategies as shown in Table (1).

A. The Bullitt Center Building

Situated on the border of Seattle, Washington, the “Bullitt Center” building opened its doors in April 2013. One of the world's most sufficiently certified regenerative projects , designed by Miller Hull to prove that an office building could be Net- Positive Energy Building[41].Figure(5) shows the “Bullitt Center” building.

Fig. 5: The Bullitt Center building[42]

The “Bullitt Center” building objective is not to create revenue but to propel change in the marketplace faster and further by showing what is achievable today. The building achieved the certification of a Living Building Challenge, as certified (version 2.0) by the International Living Future Institute (ILFI)[43]. The design strategy employed in the Bullitt Center is an integrated design strategy which means that it is a marriage of architectural and mechanical elements working in concert to achieve higher performance than they could on their own, as shown in Figure (6). The building has 575 solar panels on the roof, which generates electricity in a 14,000-square-foot array[41].Also, it uses the electrical grid like a battery for storing power in the summer and drawing strength from it in the winter[43]. As a result, The Bullitt Center's energy budget demonstrates how a summer surplus can make up for a winter deficit[44]. Windows and shading systems do most of work for daylighting and ventilation, besides assisting in the thermal comfort of the building. The building is heated (and cooled) by an intensive system of veins or hydronic radiant tubing that coils a few inches underneath the concrete overlay of each floor.

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1-Geothermal wells with closed loops.	6- a pane triple-glazed curtain wall.
2- Devoted ventilation system with demand-controlled ventilation and a heat recovery wheel.	7-242 kW PV solar panel array
3- Low-velocity ceiling fans.	8- 56,000-gallon cistern holds rainwater for use by the building or site.
4- Radiant heating and cooling under the floor.	9 - Composting restrooms.
5- Automatically operated windows provide ventilation during the night and fresh air.	10 - A trench for infiltration of treated greywater.

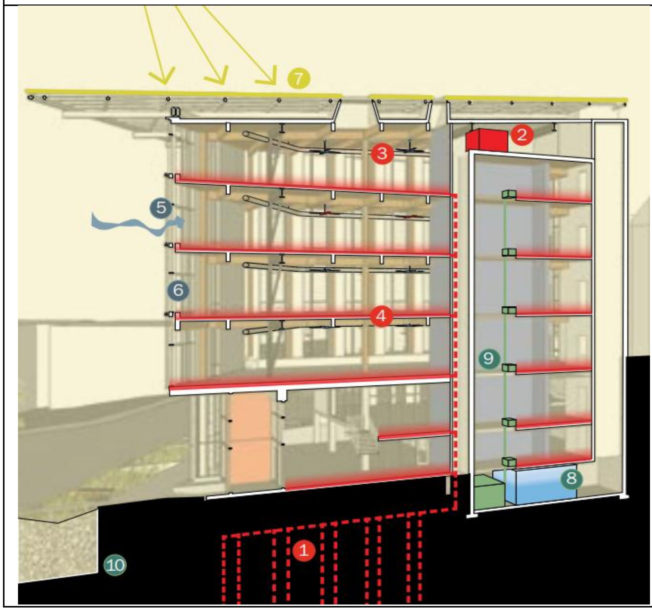

Fig. 6: The Bullitt Center integrated design strategies[42].

Fig.7: PAE Living Building[45]

B. The PAE Living Building

The PAE Living Building is regenerative, contributes positively to society, and represents a vision to help solve the planet's energy and water challenges. The PAE Living Building is shown in Figure (7).

The Building located in a former parking lot in Portland, Oregon, is an office building that achieved the status of a Living Building Challenge, as certified (version 3.1) by the International Living Future Institute (ILFI)[45]. As illustrated in Figure (8), the design strategies used in the "PAE Living" building are clusters of architectural and mechanical systems working in concert to perform better. The project aimed, firstly, to help get the city's 2050 renewable energy targets. Secondly, revitalize and complement the neighborhood and historic district. Thirdly, a replicable, developer-led solution to inspire future living building development[45]. PAE Living Building uses 73% less energy than a typical office building. It produces 103% of its total energy needs, some generated by a 133kw on-site rooftop solar array and 195kw off-site solar array on a partnering affordable housing unit and microgrid with a 250kw battery[46]. In addition, operable windows, A high-performance envelope, and heating and cooling via radiant floors reduce cooling and heating needs to less than half of what specific building needs of this size would need[47]. The windows are double-paned fiberglass windows with a very low u-value which the triple-paned windows were expected to use. However, looking at the embodied and active carbon they would save, were realized that it would only make the difference if the rest of the systems were so efficient[46].

1. Rainwater collection	12. Operable windows
2. Solar arrays	13. local materials
3. Flexible seismic structure	14. water filters
4. Radiant floors	15. Graywater treatment
5. Potable water pipes	16. Composter
6. Gray water piping	17. vacuum pump
7. Treated greywater	18. Liquid fertilization
8. Vacuum flush toilets	19. overflow
9. blackwater piping	20. rainwater cistern
10. urine piping	21. Nutrient recovery system
11. Waterless urinal	

Fig. 8: PAE Living building with a different architectural and mechanical system [45]

C. The comparison of "The Bullitt Center" building and "PAE Living" building

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Table 1: The comparison of The "Bullitt Center" building and "PAE Living" building.

	 The Bullitt Center Building	 PAE Living Building
Architecture Design	- Year Certified: 2013 - Rating System: ILFI Living Building Challenge 2.0 Full Certification - Square Feet: 52.000 - six stories - External shades - Triple-glazed window - Basement - No dedicated bike rooms - Loading dock - External irresistible stair - Automated operable window - 2 Lobby - NLT (Nail Laminated Timber) 4.100SF mechanical room +electrical space	- Year Certified: Estimated 2022 - Rating System: ILFI Living Building Challenge 3.1 Full Certification - Square Feet: 58.000 - five stories - No external shades - Double-glazed window - No basement - Dedicated bike room - No loading docks - Internal architecture exit stairs - Partial operable/ manual windows - 1 Lobby - CLT (Cross Laminated Timber) 2.500SF mechanical room +electrical space
HVAC System	- Ground source geo-exchange - Ventilation and Heat Recovery - Hydronic radiant floor - Supplemental AC: water source heat pumps serving radiant ceiling panel	- Air source heat pump - Hydronic radiant floor - Floor-by-floor heat recovery dedicated outside air ventilation unite - Supplemental Ac: air-cooled VRF fan coil units
Lighting System	- 82% of the building is daylight - Lamps: 0.4 Watt/SF - Energy-efficient LED fluorescent task lights, ambient	- 65% of the building is daylight - Lamps: 0.58 Watt/SF fully lit - 0.15 Watt/SF with daylight controls - LED Lighting with nighttime sweeps
Electrical	- On-site PV system - cantilevered PV - 16.0 EUI - No Battery - No Microgrid	- 133KW Onsite - 195 Offsite - 18.6 EUI estimated includes retail program - Battery 125 KW / 250 KWH - Full microgrid

XI. CONCLUSION

This paper submitted the concept of a regenerative design as a new mindset for responding to the climate changes encountered by developing countries such as Egypt. The built environment could significantly enhance the surrounding urban environment's sustainability by activating the regenerative approach as a paradigm for sustainable and environmentally responsible design. Where paper discussed essential points as follows:

- A regenerative design represents buildings intended to enhance, restore, and improve the surrounding natural environment by aiming to leave a positive impact instead of a harm reduction.
- Regenerative buildings could effectively solve current environmental problems as they go beyond sustainable building levels.
- The Living Building Challenge (LBC) tool is considered more comprehensive for implementing regenerative design principles. Its mission is to promote a fundamental systemic reform of the construction industry, transforming it into regenerative systems.
- The Net-Positive Energy Buildings represent a crucial step toward decarbonizing the building sector, producing more energy than it consumes.
- The parameters of the Net-Positive Energy system would change depending on the location, climate conditions, and local policies.

That paper also summarized two office buildings, "Bullitt Center" and the "PAE living building," which achieved the Living Building Challenge certification, which could be a reference repeated in developing countries such as Egypt. Although the two buildings are in the USA, the architectural designs and mechanical techniques used in the "Bullitt Center" and the "PAE living building" suit facilities in different climates. Moreover, the two projects include as following:

- Renewable energy systems, such as PV arrays on-site, and the redundant energy was exported to the network, such as in the "Bullitt Center" building, or using PV arrays on-site and off-site, and the energy redundant

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was stored in batteries, such as the "PAE Living Building" building.

- HVAC systems such as low-velocity ceiling fans, radiant in-floor cooling, and lighting systems that mainly use daylight and energy-efficient LED lights
- The building envelopes with shading systems and windows with double or triple-glazed, where these techniques reduce energy use and improve the quality of life inside the building.

XII. RECOMMENDATIONS

This paper aims to provide a comprehensive vision of regenerative design and how to reach Net-Positive Energy Buildings to counter climate changes. The following are some recommendations that would contribute to the upgrading of Egyptian environmental architecture:

- Performing training courses for engineers on Regenerative Design, its principles and characteristics, and how to achieve Living Building Challenge certification.
- Raising awareness and advertising the concept of regenerative design and its applications, including Net-Positive Energy Buildings, through publishing in specialized scientific and architectural fields, research, and architectural studies.
- Attempting to benefit from scientific expertise in the regenerative design field to benefit from previous experiences and start from where others left off.
- Forming an integrated research team covering all disciplines related to renewable architecture to conduct a series of research and specialized studies to examine the possibility and ways of applying these strategies to the current reality.
- Inclusion of the concept of regenerative design and the study of its characteristics within the curricula of universities and scientific engineering institutions, whether governmental or private.

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