

Moab to Maharashtra: A Study in Sustainability

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Abstract

Contemporary architectural practices focused on sustainable design and materials evidence the increasingly important role art, architecture, and design occupy in conversations and solutions around climate change. As carbon emissions continue to rise and global climate change becomes ever harder to ignore, it is imperative that architectural design incorporate sustainable materials and practices accessible to all. Using data from artists, architects, and designers committed to sustainability one can address the changing responses and developing technologies used to address climate impact. This article focuses on sustainable architecture, its historical roots, and its contemporary application to geographic areas particularly susceptible to climate change. I incorporate my first-hand research and analysis of Utah-specific solutions to climate change, including the state's overall sustainability practices, and the construction of LEED-certified buildings and environment-friendly designs. This includes a case study I conducted on-site at Community Rebuilds in Moab, UT, and examples of sustainable architecture and design practices in Salt Lake City and Maharashtra, India. Sustainable architecture and design is an exceptionally relevant and pressing issue. By bringing these disciplines into conversation with each other, my research addresses the impactful ways art and design may lead the discourse around sustainability.

Keywords:

Sustainability, Architecture, Climate Impact

During my time on-site at Community Rebuilds in Moab, Utah, in December 2022, I had the opportunity to meet Janis, whose house had recently been completed as part of Community Rebuilds's mission to construct energy-efficient, sustainable, and affordable housing. Janis told me:

It is so easy to fall in love with the quiet beauty, the solitude, and all the extremes of the place. But then there is this amazing supportive community of friends... The economy crashed in '08 and I could not hold on, but the rocks and canyons and the community of Moab called me back... My background in plants took me on a journey of herbal studies and healing. It is one of the many ways I like to give back to the community that has always given to me.¹

In addition to learning about Janis's life, her love for plants, and meeting her two kittens, she invited me in to see the individualized elements of her home, including a pale green mosaic backsplash, an artifact of her life of travels. Just as Janis's home reflects her personal history, architecture is a reflection of political and social issues. One of the most pressing issues in architecture today relates to climate change and the increasing need to design sustainable buildings and complexes.

Contemporary architects and designers are increasingly responding to current and projected effects of climate change on our world. The official definition of "climate change" relates to the numerical changes in temperature whereas the term "climate impact" reflects the resulting repercussions: "They are the visible ways that climate change is affecting Earth."² This can include changes in floods, droughts, and rain levels, in addition to frequent and severe heat waves. It is not that the overall temperature of the earth needs to be lowered, but that the devastating impacts already occurring need to be addressed, planned for, and, if possible, reversed.

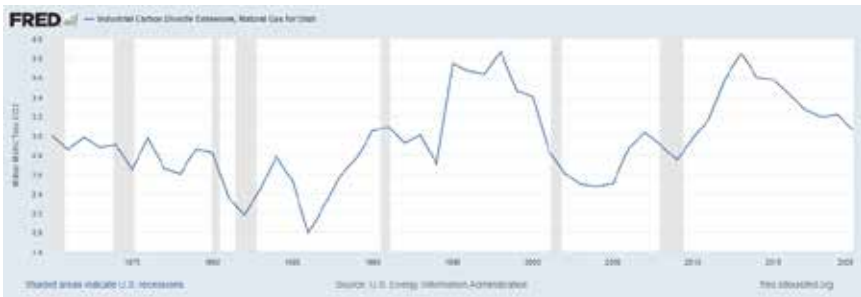
One of the major contributors to global climate change is carbon emission and natural gas usage. According to the Federal Reserve of Economic Data (FRED), national carbon emission rates within

1 Janis Adkins, "Homeowners and Homes," Community Rebuilds, 2022, <https://www.communityrebuilds.org/past-homeowners-and-homes>.

2 US EPA, "Impacts of Climate Change," [www.epa.gov](https://www.epa.gov/climatechange-science/impacts-climate-change), March 8, 2022, <https://www.epa.gov/climatechange-science/impacts-climate-change>.

the US, although trending downward, are still higher than any ‘low’ we have experienced in a decade³ [Fig. 1]. As a nation, we need to lower carbon emissions and strive for a downward trend to begin reversing climate impact. Architecture and design that is responsive to climate change and climate impact exemplifies how sustainable design practices can create effective solutions. For example, architects may incorporate elements of sustainable design into buildings, including ones that remediate poor air quality and utilize naturally sourced “green energy,” such as solar and wind power. Ranging from the incorporation of local elements to brainstorming creative reuse methods, there are a wide range of sustainable tools available for architects and designers to use. For example, solar panels, reused wood paneling, and LED lighting are common features of environmentally focused design.

Figure 1. *Industrial Carbon Dioxide Emissions, Natural Gas for Utah as recorded by the Federal Reserve of Economic Data (FRED)*



Sustainable architecture, with its focus on environmental impact, “is a revised conceptualization of architecture in response to a myriad of contemporary concerns about the effects of human activity.”⁴ Architect Terry Williamson has compared the historical use of architecture to its current use, as follows: instead of protecting its inhabitants from the environment around them, architecture today aims to protect the environment from the inhabitants. This

3 U.S. Energy Information Administration, “Industrial Carbon Dioxide Emissions, Natural Gas for Utah,” FRED, Federal Reserve Bank of St. Louis, January 1, 1970, <https://fred.stlouisfed.org/series/EMISSCO2TOTVICNGUTA>.

4 Terry Williamson, Antony Radford, and Helen Bennetts, *Understanding Sustainable Architecture* (London: Spon, 2002), 1.

sentiment is echoed by the cultural theorist Chris Jenks, who wrote: “The problems will go on multiplying because, for the first time in history, humanity rather than the Earth has become the dominant background. The players have become the stage.”⁵ Ultimately, we must acknowledge that not only are humans responsible for the changes occurring in our environment, but we are also equally responsible for creating sustainable solutions for the future.

Although evident in the numerous calls for sustainability, there are still many who feel that it is not our responsibility to correct changes in the environment. However much humans may have contributed to climate change, some view the changes in the environment as a form of evolution. The main weakness in this argument is that it is simply not possible to ignore the impacts of climate change any longer. In a local example, a report published on January 4, 2023, by a coalition of environmental, public health, and economic experts in Utah states that the “Great Salt Lake is facing unprecedented danger” and that “an emergency response plan needs to be put in action during the first half of this year to avoid catastrophic changes in the Great Salt Lake system.”⁶ Not only is climate change disastrous in nature, but its impact spans generations into the future.

Ignoring climate change only broadens problems instead of solving them. Sustainable architecture therefore must “endorse improving (not merely maintaining) the quality of life within the limits of the carrying capacity of supporting ecosystems.”⁷ This means embracing sustainable design as core to architectural practices. As Williamson writes, “The notion of ‘sustainable architecture’ includes questions of a building’s suitability for its sociocultural as well as environmental context. The associated question of what does sustainability mean for architecture? forefronts architecture and looks for ways in which it must adapt.”⁸ Questions surrounding application are answered directly through sustainable certification efforts.

To certify and encourage sustainable design, architects and designers often aim to align with LEED certification, which stands

5 Chris Jenks, *Cultural Reproduction* (London: Routledge, 1993), 126–27.

6 Benjamin Abbott et al., “Emergency Measures Needed to Rescue Great Salt Lake from Ongoing Collapse,” accessed January 17, 2023, <https://pws.byu.edu/GSL%20report%202023>.

7 Williamson, 5.

8 Ibid, 4.

for Leadership in Energy and Environmental Design. LEED provides “a framework for healthy, efficient, and cost-saving green buildings.”⁹ LEED certified buildings aim to save money, improve efficiency, and create healthier spaces all while lowering carbon emissions and lessening the environmental impact. LEED and other sustainably focused buildings are found all over the world but are usually found in areas more susceptible to the impacts of climate change.

Figure 2. *Depiction of Living Building Challenge focus areas as defined by the International Living Future Institute*



Beyond the actual building itself, other certifications, including the Living Building Challenge (LBC), work to incorporate sustainability into the surrounding environment of buildings. By including elements that promote health and happiness, LBC goes beyond mere building construction by factoring in community needs and incorporating sustainable materials into their buildings. Breaking design goals into seven areas, or “petals,” designers seeking LBC certification must meet as many petals as possible. The petals include place, water, energy, health and happiness, equity, beauty and inspiration, and materials [Fig. 2]. These designations include considerations for equitably sourced building materials, artistic design demands, and the creation of positive and energy-efficient buildings.¹⁰

9 USGBC, “LEED Rating System,” usgbc.org, 2020, <https://www.usgbc.org/leed>.

10 International Living Future Institute. “Living Building Challenge | Living-Future.org.” *International Living Future Institute*, 2 May 2019, living-future.org/lbc/.

Moab: A Study in Residential Sustainability

Utah is unique for its susceptibility to extreme temperatures, poor air quality, and dry desert conditions.¹¹ Because of this, Utah, in many ways, is leading the development and utilization of sustainable design. In addition to LEED-certified buildings found in every major city and university campuses across the state, community-oriented groups have taken the initiative to respond to the specific effects felt keenly in the desert state. For example, NGO Community Rebuilds in Moab is dedicated to building low-income sustainable housing on a USDA land trust in southern Utah. By focusing on low-income housing, Community Rebuilds pushes the boundaries of sustainable design by challenging the idea that sustainable architecture and design is cost prohibitive.¹² By exploring technology that is less expensive and more accessible, Community Rebuilds demonstrates creative solutions to environmental impacts.

Community Rebuilds was the first NGO to negotiate with the USDA for a loan building program. Because of its location on a land trust, Community Rebuilds must work within both economic constraints and those of sustainability. USDA loan building practices require homeowners to contribute 40 hours to home construction a week. However, for most homeowners building on the land trust, 40 hours a week is simply not economically possible due to work and family obligations. This is where Community Rebuilds steps in, subsidizing construction costs and lowering homeowner responsibility to 25 hours a week. This adjustment gives single-adult households a greater chance at finishing their homes within the contractual period.

Additionally, to build best practice homes by prioritizing high quality materials and construction methods, Community Rebuilds incorporates sustainable design elements into each of their homes. Although the cost is often greater upfront, by shifting to sustainable homes, Community Rebuilds cuts monthly utility and mortgage costs over the long run for their homeowners. Because of their work in the niche space between sustainable design and low economic funding, Community Rebuilds incorporates best practice technology that is cutting edge in its field.

11 American Lung Association, “Press Releases | American Lung Association,” www.lung.org, accessed January 17, 2023, <https://www.lung.org/media/press-releases/ut-so-ta-22>.

12 “Sustainable, Affordable Housing | Community Rebuilds,” Community Rebuilds, accessed December 8, 2022, <https://www.communityrebuilds.org/what-we-do>.

It must be noted that “some elements of sustainable design can simply not be done cheaply,” and therefore must be subsidized and/or creatively re-designed.¹³ This includes solar paneling, doors, windows, and other high quality, and locally sourced building materials. By prioritizing high-quality sustainable elements, Community Rebuilds homes go beyond energy efficiency by reflecting the environment around them in color, design, and material. One way Community Rebuilds sources higher cost building materials from the community is by rescuing doors and windows from houses before they are torn down. Community Rebuilds also maintains a community drop-off site, where members of the community can donate functioning building components ranging from décor to plumbing. Reusing local materials is often taboo in large-scale residential architecture, making this specific approach incredibly unique. By using locally available materials, Community Rebuilds represents a model of sustainability that has wide-ranging impact on the local community and beyond.

By helping subsidize upfront costs, Community Rebuilds builds homes that last while also being nearly 100% recyclable. Costs are further reduced by creating internship and certification-based opportunities through their volunteer program. Volunteers come from across the country to help learn more about home building and sustainable methods. During my on-site visit to Community Rebuilds in December 2022, I interviewed several interns participating in the Worker BEE program. They described their time at Community Rebuilds as follows:

The whole experience demystifies the construction of a house. It helped me gain a greater understanding of just how simple high-quality design is.

Calia, Art and Architecture Student

I just wanted to know more about how a house worked. Just like a car owner should know how a car works, I think every homeowner should know how their house is being built.

Sarah, traveled from Minnesota to participate

13 Leah Olsen. Program Outreach, Projects, and Technology Community Rebuilds. 13 Dec. 2023.

This experience has taught me the importance of sustainability and how energy efficiency is a great place to start. It also gave me a greater understanding of how few contractors and builders knew how to cater towards sustainability. If we can create greater incentive to educate contractors while allocating legislation to sustainable practice, I think that is where we will see the most change.

*Dedra, Employee of Solar Paneling Company*¹⁴

Through volunteering to help build homes, interns and volunteers gain valuable on-site experience and certification, while helping homeowners complete their homes sooner and cheaper than otherwise possible.

By incorporating cost-effective practice at every level of design and construction, Community Rebuilds creates both environmentally sound and aesthetically pleasing buildings. Lower cost elements include the use of straw bale and blown cellulose insulation, double studded walls, adobe flooring, and HRV vents. By using straw bale and blown cellulose, Community Rebuilds incorporates reused materials that demonstrate the effectiveness of sustainable methods. Although inexpensive to supply, straw bale and blown cellulose insulation require specialized building installation and personalized designs [Fig. 3]. And though tedious in construction, research has shown that straw bale insulation is as effective as other insulation while being lower in cost.¹⁵ Additionally, straw bale insulation can be individually designed and plastered to create original and personalized designs for homeowners allowing the addition of aesthetics to sustainable design.

Double studing, water-tight house wrap, and Heat Recovery Ventilator (HRV) installation ensures homes are air-tight, while allowing air and water to move through the house, limiting the risk of mold or water damage [Fig. 4]. By double studing walls and alternating posts, the framing of the house provides pathways for humid air to move up and through the walls while being absorbed into the HRV system, which helps ensure air moves

14 Worker BEE Program: Experiences and Takeaways, December 12, 2022.

15 Ilaria D'Ambrosi, "7 Reasons Why We Should Build Straw Houses and Live in Them," LifeGate, January 29, 2015, <https://www.lifegate.com/7-reasons-why-build-straw-houses-to-live-in#:~:text=Straw%2Dbale%20constructions%20are%20environmentally>.

Figure 3. Completed Straw bale-insulation wall from Community Rebuilds home.



through the home without becoming stale.¹⁶ These methods both ensure the survival of the building materials and exponentially increase energy efficiency throughout the home by making it easier to heat while using fewer resources. Although these methods are simply redesigning the application of common building materials, the unique combination of double-studding and installing HRV systems, Community Rebuilds maximizes the sustainability of each component, compounding their impact to make incredibly sustainable and environmentally independent homes. Community Rebuilds certainly recognizes that: “Energy efficiency is one, very successful approach to cost-effectiveness.”¹⁷ Such efforts lower electricity bills to as low as \$15 a month for their tenants, while preserving sustainable practices.¹⁸

The methods of sustainable architecture and design utilized by Community Rebuilds are effective in a range of physical environments, not just the Utah desert. By placing south-facing walls to help capture and preserve solar energy and heat,

16 “HRV’s: What They Do and How to Care for Them,” Morrison Homes, 2023, <https://www.morrisonhomes.ca/home-school/hrvs-what-they-do-and-how-to-care-for-them#:~:text=How%20does%20an%20HRV%20work>.

17 Matthew Pesce. *Construction Methods of Community Rebuilds Projects*. 13 Dec. 2023.

18 Olsen.

Figure 3. CSP1 to CSP4 Pre and Post Results.

Figure 4. (Left) Picture displaying double studding method of construction, Community Rebuilds (Right) Two Community Rebuilds homes after being house wrapped.



Community Rebuilds homes demonstrate that such sustainable technology is as effective in a desert as it would be in the tundra. As Community Rebuilds Construction Supervisor Matthew Pesce told me: “Awareness of the environment is one of the greatest barriers to sustainable design. And yet, best practice is the same for everywhere.”¹⁹ By approaching architecture with an eye to the larger surrounding environment, Community Rebuilds homes have a distinct energy of environmental awareness uncommon in most buildings, especially with residential building increasingly turning into cookie-cutter design. This versatility of building methods and materials helps create buildings that are better equipped to face drastic temperature changes and other results of climate repercussions.

Even with innovative technology, sustainability is still hard to incorporate into a construction industry that has historically thrived without it. Leah Olsen, Community Outreach Coordinator for Community Rebuilds shared: “It is not manufacturing costs that make these methods inaccessible. It is education.”²⁰ In talking with Leah and Matthew, both conveyed how one of the greatest barriers to sustainable design is finding contractors and building designers that know how to work within the requirements of sustainable building certifications. By supporting their program with certifications and

19 Pesce.

20 Olsen.

curriculum for builders and contractors, Community Rebuilds works to spread the use of sustainable methods, making them both widely accessible and more available, which lowers the overall cost of employing sustainable design when building homes. Matthew made it clear that, “Once we train them on sustainable methods, they can go on to support sustainably minded projects. But without that training, work becomes overly specialized and expensive, and unnecessarily so.”²¹ By responding to a housing and climate crisis through rural, niche, and sustainably minded design, Community Rebuilds demonstrates creative solutions to the problems found within their region while offering examples of how their practices can be employed elsewhere.

Salt Lake City: A Study in Commercial Sustainability

While Community Rebuilds works to explore sustainable solutions in residential building, Architectural Nexus, based in Sacramento, CA and Salt Lake City, UT, explores the same

Figure 5. Example of “living wall” design as found within the Architectural Nexus Salt Lake City Headquarters



21 Pesce.

technology while working within commercial building. Also modeled after LBC building designations, Architectural Nexus works on office, retail, and manufacturing buildings with an eye toward a sustainable future. Specifically focusing on the seven petals of sustainability as outlined by LBC, Architectural Nexus works to respond to each petal individually. In addition to the buildings they design, ArchNexus employs sustainability at home, having designed one of the leading sustainable buildings for their own use: their Headquarters in Salt Lake City, Utah.

In addition to implementing many of the methods used by Community Rebuilds, such as HRV systems, solar paneling, reused design materials, and rainwater collection and reuse methods, Architectural Nexus incorporates some of the more expensive sustainable elements. An example of this is their integration of “living walls,” a sustainable element adds an aesthetic and natural element to their buildings [Fig. 5]. By running gray water into sections of wall filled with plant life, water waste is cut down. Additionally, the plants aid in gray water recycling. The result is a lush, plant-clad wall inside a corporate building. However, these living wall systems are far from

Figure 6. *In house gray water recycling of the Architectural Nexus Salt Lake City Headquarters*



commonplace and for good reason. Only specific plants tolerate gray watering combined with limited sunlight and the unique pH levels found within closed buildings. Furthermore, regular maintenance is required to keep the plants happy and healthy. That said, living plant walls in buildings are an innovative and aesthetic solution to gray water waste.

In addition to the building's natural and reused elements, Architectural Nexus also has an on-site gray water recycling system that recycles gray water for plumbing and sewage maintenance within the building [Fig. 6]. In addition to being incredibly advanced, the greywater recycling system decreases their overall water usage, making the building far more independently sustainable than it would have been otherwise. Although gray water recycling is not uncommon,

Figure 7. *Atrium of the Architectural Nexus Salt Lake City Headquarters displaying ergonomic flap design*



in-house treatment and reuse in a corporate space is nearly unheard of.

An added expensive element of corporate sustainable design is the construction and implementation of atriums. By maximizing natural lighting and providing direct access to nature for nearly every occupant, these atriums are both functional and beautiful additions to the corporate space. With the addition of natural light comes glare, which designers respond to by designing ergonomic flaps to manage light reflections without trapping or limiting sunlight [Fig. 7]. Additionally, the atriums are built with open paneling so that when the weather is nice and pollution is low, the walls of the atrium can be opened like windows, decreasing air-conditioning usage and creating an aesthetically well-rounded workplace. In addition to the complex heating and cooling systems, the ability to have “unproductive” space within a corporate office is a luxury most offices chose not to prioritize.

In addition to natural heating and cooling through atrium design, smart air-conditioning systems monitor internal temperature, turning off when outside temperatures are comfortable enough to maintain a temperate environment without unnecessary power usage. Air-conditioning and power usage is also cut down by “No commute Fridays.” Every Friday, Architectural Nexus makes coming into work optional, with remote working further decreasing power usage and commuter pollution.

Architectural Nexus works to provide a community of sustainability by encouraging responsible recycling. This includes having a kitchen with compost, glass, metal, plastic, and landfill waste options available. The waste is then processed by a third party to ensure proper recycling methods are taken for each type of waste. Although these additional methods of sustainability work for their corporate space, Shruti Boyle, the Building Performance Analyst at Architectural Nexus, admits that the methods are not designed for residential or small-scale implementation. Because of this, they are often not the most cost-effective solution to the issues of sustainability we face today. However, when paired with high-quality and reusable building materials and a passion for sustainability, these methods used by Architectural Nexus stand as positive developing technologies for a better future of building design.²² Additionally,

22 Shruti Boyle. Building Performance of Architectural Nexus. Interview, February 17, 2023.

by promoting a lifestyle of recycling and food waste awareness, the sustainable impact extends to the individual lives and homes of their employees, maximizing waste management and expanding the reach of sustainable impact.

India: A Study in Global Sustainability

It is through creative proposals that innovative solutions of sustainability are developed. Sustainability and environmental awareness have been the focus of many artists since before carbon emissions were tracked and analyzed. For these, and other reasons, artists may hold the secret weapon to the wide implementation of sustainable design. Artist and curator Linda Weintraub notes the importance of creative thinkers in this endeavor: “A special entreaty might be made to artists because problem-solving, and persuasion are two qualities that have always been used to measure art’s excellence and to explain its significance...innovative eco-art explorations are burgeoning around the globe.”²³

This proved to be true when my research took me to a small ecovillage in Western India, which I visited as part of a study abroad trip in March 2023. Govardhan Ecovillage in Maharashtra, India, is bursting with sustainable practice and cutting-edge sustainable technology, some of which has been in practice in the village for hundreds of years. While giving a tour of the village’s many sustainable elements, Ganga Narayan Das, a monk at the village’s ashram who is also the chief materials and resources manager, explained how sustainability often starts and ends with us. “Everything, every act we do, contributes to nature. In a good or bad way, this contribution depends on what we do, and how intensely we do it.”²⁴ Mirroring the cyclical doctrines of Hinduism, sustainability for Govardhan means “closing the loop” or increasing our accountability of waste and waste management. Ganga shared: “waste is not waste until we waste it,” and it therefore has the potential to be reused or maximized somewhere else.²⁵ Unique to Govardhan was the individuality of responsibility to the environment. Beyond the technology itself, contributions at the individual level created a hub of social responsibility, interdependency, and sustainable success.

23 Linda Weintraub, *To Life!*. (University Of California Press, 2012), 320.

24 Ganga Narayan Das. Sustainable Materials and Processes of Govardhan Ecovillage. March 7, 2023.

25 Narayan Das.

Much like at Architectural Nexus, Govardhan Ecovillage found managing wastewater to be an easy first step towards long-term sustainable practices. In addition to the chemical filtering of water, Govardhan's water purifying system includes the complex involvement of plant and animal life in making the gray water not only reusable, but drinkable. By creating carefully managed banks of water recycling, the gray water runs through many levels of purification, including being processed through agriculture built directly within the water purification system [Fig. 8]. Absorbing unfiltered water for plant growth, the unused water is naturally

Figure 8. *Two level gray water recycling system at Govardhan Ecovillage, India*



filtered through the plant's phases of growth, essentially being filtered through the plant before continuing. High water-usage plants, such as Hibiscus and Papaya, aided in water purification with the additional benefit of agricultural produce to be used at the village. Without recycled water, plants such as these would be unrealistic to grow during the dry season, limiting the diversity of agricultural output. In addition to the production and recycling benefits, the water purification system was designed to lend aesthetic value to the land. These added benefits are seen as a necessary process of sustainability, as "life should be the product of life. Not waste."²⁶ Not only is agricultural and plant-based filtering rare, but the

26 Narayn Das.

multidimensionality of meeting waste, aesthetic, food, and filtering needs with a single design demonstrates a level of sustainability that is unmatched.

In addition to the on-site water recycling plant, the village also treats food and plastic waste on-site. The system recycles composted food through a complex agricultural process so that food waste becomes valuable mulch and compost for the agricultural land [Fig. 9]. By encouraging decomposition at an increased rate, Govardhan can process all food waste within three weeks. This highly efficient mulching process relies on natural materials, taking advantage of natural composites of decomposing materials that result in healthy compost mulch free from chemicals or pesticides while maintaining a high soil yield. Although similar methods of composting are used around the world, the efficiency and in-house effectiveness promotes a level of sustainable independence that indicates an unconventional approach.

Perhaps the most astonishing technology within this remote ecovillage in India is their plastics processing plant. With local experts responsible for the design, the processing machinery recycles plastic into usable carbon and petroleum substances. The carbon byproducts are built into the walls of the buildings in the ecovillage, thereby increasing the strength and insulation of the buildings.

This remarkable plastic recycling process not only decreases plastic waste but does so without releasing any of the damaging and

Figure 9. *Food and mulch composting center at Govardhan Ecovillage, India*



harmful chemicals that are often part of the improper disposal of waste [Fig. 10]. By avoiding PET and PVC plastics, they can process the most amount of plastic without releasing dangerous chemicals into the environment. Instead, their plastic processing plant can process up to two tons of plastic a day, producing newly usable materials and less waste.²⁷ Not only is their use of recycled plastic innovative, the technology of converting plastics into usable materials without damaging the environment is a feat few attempt and even fewer succeed. Besides large-scale corporate recycling, the level of effectiveness achieved by the technology at Govardhan is unparalleled.

Beyond their inspiring recycling methods, the ecovillage also incorporates sustainability into their building designs. By using a method of “load building wall construction,” Govardhan builds its buildings smaller than three stories without column or cross beam support. Instead, they create walls made with CSEB or Compressed Stabilized Earth Blocks [Fig. 11]. By cutting back on material usage, these blocks replace insulation, framing, plastering, and paint with a single wall of brick-like blocks. These blocks are proven to be as

Figure 10. *In house gray water recycling of the Architectural Nexus Salt Lake City Headquarters*



seismically versatile as crossbeam designs in buildings up to three stories high. Past three stories, cross beams are necessary in supporting the weight of buildings. However, for buildings less than three stories, these CSEBs are cheaper to produce, more energy efficient, and are in fact stronger than the average brick. See Fig. 12 for a Comparison between Conventional Fired Bricks and CSEB.

In addition to the blocks being stronger, more cost and energy effective, and higher in aesthetic variation and quality, these blocks are made from a centuries-old recipe. This formulation may hold the key to long-term sustainability in our future. In addition to being an incredible resource for the village itself, production is such that blocks are made and sold out of the village, increasing the local economy and globalization of material.

Figure 11. (Top) *Compressed Stabilized Earth Blocks (CSEB) in Govardhan Ecovillage, India*
(Bottom) *Community center at the Govardhan Ecovillage built using CSEB.*



Figure 12. (Top) Compressed Stabilized Earth Blocks (CSEB) in Govardhan Ecovillage, India (Bottom) Community center at the Govardhan Ecovillage built using CSEB.

	Conventional Fired Bricks	Compressed Stabilized Earth Blocks (CSEB)
Fundamental Process	Made by burning clay in kilns. Consumes high levels of wood and causes pollution.	Made by compressing a combination of mud, stone dust, and lime
Stabilization	Stabilization is achieved by burning the brick.	Stabilization is achieved by adding 5-10% cement.
Mortar	1 cement: 6 sand	1 cement: 1 mud: 4 stone dust
Wall Finishing	Needs plastering & painting	Plastering and painting are not required. Pointing is done to fill in the cavities between bricklayers
Energy Consumption	72.3 MJ/Kg	0.275 MJ/Kg
Strength	40 Kg/cm ²	65 Kg/cm ²
Cost (finished wall)	\$78.80/m ³	\$42.41/m ³
Size Variation	10-25 mm	0-2 mm
Variation in Shapes	Only 1 shape	8 possible shapes

Best Practice: An Approach to Sustainability

And so we return the driving question behind sustainable architecture: What can be done right now to turn the tide of climate change? In addition to turning to artists and designers for creative and innovative solutions, the fight for a greener, more sustainable future will take all of us. By making low-cost, sustainable elements of architecture more readily available, we can raise the standard for

sustainable architecture. With supportive legislation lasting beyond political terms, we can create consistent and reliable sustainable initiatives. By creating greater awareness and providing accessible solutions, we can, in fact, design a greener tomorrow.

By analyzing the shared approaches of Community Rebuilds, Architectural Nexus, and Govardhan Ecovillage, one can deduce the key elements to versatile and long-lasting sustainable designs. Perhaps even more surprising than the versatility of each innovative design is the similarities shared between them. By prioritizing energy efficiency, the quality of products, and a well-rounded approach to the purpose of the building, we can not only find lasting solutions, but we can design buildings whose impact extends beyond their walls. Most importantly, these methods of sustainability can be applied to all buildings – from apartments to museums. Not only can we learn from each approach individually, the opportunities for effective and lasting change become exponentially more powerful when we share sustainable technology across demographics, design audiences, and continents. Imagine the level of impact we could achieve by building corporate buildings with CSEB or incorporating grey water recycling into residential spaces. By learning from each other and applying innovative technology wherever possible, we can make cities filled with sustainable architecture and design while providing viable solutions to addressing climate impact from the inside out.

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