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A Vision to Revive Mud architecture, Community Heritage Architecture in India, for Affordable Housing

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Abstract:

Mud architecture is an extension of the land; it affirms the link between human beings and the earth. This technique is considered an ideal model for human adaptation to the natural environment and the sustainable exploitation of its natural resources. This realization has led architects in different regions of the world to call for the study of heritage architecture, especially mud architecture, in their respective countries. These studies aim to develop architectural thought to converge with human instinct and encourage a shift away from modern buildings, representing the forces of globalization that typically transform urbanization into generic. The aim of this research was to define mud architecture and its techniques and to study how to use it in housing projects, especially in affordable housing, since previous studies have confirmed that mud houses have many possibilities to promote energy efficiency and public health through their properties of insulation and ventilation. The hypothesis of this research is that studying mud buildings is important because it shows the alignment between India's architectural heritage, the concept of sustainability, and reducing the cost of construction in accordance with household income. This study focused on mud architecture in India, in an attempt to promote sustainable mud architecture for use in urban construction.

1. Introduction

Background

Mud architecture, one of the oldest forms of construction, has been used across cultures and climates for centuries due to its accessibility, low cost, and eco-friendly properties. Built from earth and other natural materials, mud structures are prevalent in regions with limited access to industrial construction materials. Despite the availability of modern building technologies, mud architecture persists in many areas as a viable construction method that aligns with sustainable practices.[1]

In recent years, there has been a growing awareness of environmental issues and a strong push toward sustainable development in the construction industry. Conventional construction methods contribute significantly to carbon emissions, resource depletion, and environmental degradation, prompting architects, urban planners, and sustainability advocates to explore traditional methods like mud architecture.[2] Mud structures are not only sustainable but are also known for their natural thermal insulation, energy efficiency, and capacity to maintain indoor air quality, making them beneficial for health and comfortable for inhabitants.

In countries like India, where a substantial portion of the population resides in affordable housing, there is an urgent need to develop cost-effective, sustainable housing solutions. Mud architecture offers a promising alternative, as it aligns with the principles of environmental conservation, economic affordability, and preservation of cultural heritage.[2] Despite its benefits, mud architecture has largely been overlooked in urban construction due to perceptions of it being outdated or fragile. However, recent studies suggest that mud architecture, when properly designed and maintained, can meet modern structural requirements while contributing to sustainable urban development.

Importance of Studying Mud Architecture

Studying mud architecture is essential because it offers a viable solution to multiple modern challenges in housing and sustainability:

1. Environmental Sustainability: By using locally sourced, natural materials, mud architecture minimizes the carbon footprint associated with traditional building materials like concrete and steel.[4] It also reduces the energy consumption of buildings due to its natural insulating properties.

2. Economic Feasibility: Mud architecture can lower construction costs, which is crucial in affordable housing projects. This is especially relevant in countries like India, where budget constraints are a significant barrier to housing development for low-income populations.

3. Cultural Heritage and Identity: Mud architecture preserves cultural traditions and regional aesthetics, fostering a sense of identity and connection to local heritage. This is important in an age of rapid globalization, where urban landscapes often lose their unique cultural characteristics.

4. Health and Well-being: The natural properties of mud, such as breathability and thermal comfort, promote a healthier indoor environment, which can positively impact residents' well-being.

Aim

To investigate the potential of mud architecture as a sustainable, cost-effective solution for affordable housing, particularly in India, by examining its techniques, benefits, and adaptability in modern urban construction.

Objectives

1. To define the concept of mud architecture and outline its traditional techniques.

2. To explore the benefits of mud architecture, focusing on energy efficiency, insulation, ventilation, and public health.

3. To analyze the relevance of mud architecture in the context of India's architectural heritage and its alignment with sustainable development goals.

4. To assess the feasibility of using mud architecture in affordable housing, emphasizing cost reduction relative to household income.

5. To promote sustainable architectural practices by demonstrating mud architecture as a viable alternative to conventional urban construction techniques.

Research Questions

1. How can mud architecture be effectively integrated into affordable housing projects, particularly in urban settings?

2. How does mud architecture align with India's architectural heritage and cultural values, and what role can it play in preserving these aspects in modern urban construction?

3. What challenges and limitations exist in implementing mud architecture in contemporary housing, and how can they be addressed to promote its use in sustainable urban development?

2. Literature Review

Historical roots of mud architecture in India

Mud architecture in India can be traced back to one of the world's oldest urban settlements, the Indus Valley Civilization, with cities like Mohenjo-Daro and Harappa. These settlements used sun-dried mud bricks as a primary building material, creating houses, granaries, and drainage systems that were efficient and environmentally adapted. This early use of mud bricks demonstrated an understanding of local materials and sustainable construction practices that made buildings thermally comfortable in hot, arid environments.

Mud architecture represents more than a construction technique; it embodies India's historical relationship with the land and local ecosystems.[4] Culturally, it is seen as a symbol of simplicity, resilience, and connection to nature, reflecting India's agrarian roots and the philosophical emphasis on living in harmony with the environment. Across centuries, mud architecture has not only met functional needs but has also become a repository of indigenous knowledge and craftsmanship, connecting generations and adapting to evolving social and environmental demands.

Mud Buildings In India

Mud in popular consciousness

Mud architecture emphasizes an intimate relationship between human beings and construction and can connect building practices, architectural massing, house shapes, roofing patterns and the surrounding environment. Mud construction realized the desires of traditional architects in architectural forms; as a raw material available in the local environment, it is significant in terms of its physical, structural, emotional, symbolic and cultural aspects.[8] Mud retains popular symbolic value as the initial material from which human beings have created enduring structures. As a product of soil and water, mud combines the principles of receiving and formation.
Water is the source of life and the complement of creation. Mud represents a primary material that human beings used to build shelters in villages, after they roamed the desert with their tents.[7]

Mud buildings in India are a testament to the country's rich heritage of sustainable architecture, shaped by its diverse climates, materials, and cultural practices. Across India, mud architecture remains prominent, especially in rural areas, where it has adapted over centuries to the unique environmental and social needs of each region

The philosophy and knowledge of the anonymous builders and their indigenous construction, present the largest untapped source of architectural inspiration, for it touches the increasingly troublesome problem of shelter. A sustainable future society requires using traditional architecture along with modern technology [5].

Classifies mud buildings into two broad categories:

1. Constructed by traditional techniques, including:

- Adobe or sun-dried brick
- Rammed earth construction
- Wattle and daub construction

2. Constructed by contemporary techniques, including:

- Compacted mud blocks
- Stabilized compacted mud blocks
- Compacted mud blocks with stone facade
- Chemically stabilized mud blocks
- Pneumatically rammed earth

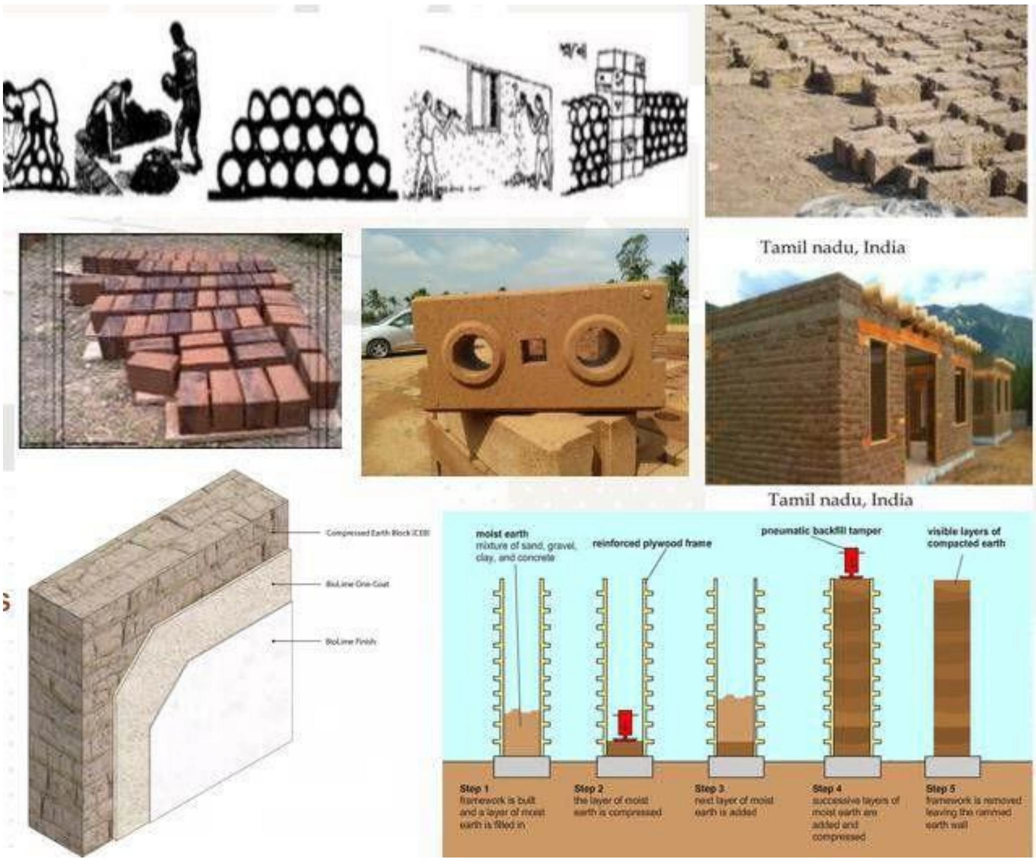

Fig.01 Techniques In Mud Architecture

3. Mud Bricks Are the Primary Building Material

Earth Blocks are high-quality building materials made from compressing the right mix of soil with 6-9% cement, based on the mix design. Earth Blocks are also referred to as Compressed Stabilized Earth Blocks (CSEB) or Compressed Earth Blocks (CEB) or Compressed Soil Mud Blocks (CSMB). Earth Blocks are stabilized with Cement.[9]

Compressed stabilized earth blocks (CSEB) are manufactured from local soil mixed/ stabilised with small amount of cement (upto 5%), sand and water. Being produced from local soil, it offers a sustainable alternate to burnt clay bricks/cement concrete blocks. [9] These blocks are compressed in a Press (manual or motorized) and cured for 28 days to get desired compressive strength. The Auroville has also developed a special machine "Auram Press 3000" for production of these blocks and offers 70 types of blocks with 18 moulds. Depending upon application, the blocks can be solid, hollow, round or customized. These blocks can also be used for construction of columns, floors and roofs. The top soil being fertile is removed and deeper soils are extracted as main raw material for production of these blocks. Depending upon the characteristic of local soil, a design mix comprising of local soil, cement, sand and water is prepared and is cast in moulds through a press to produce blocks of desired strength as per application.[9]

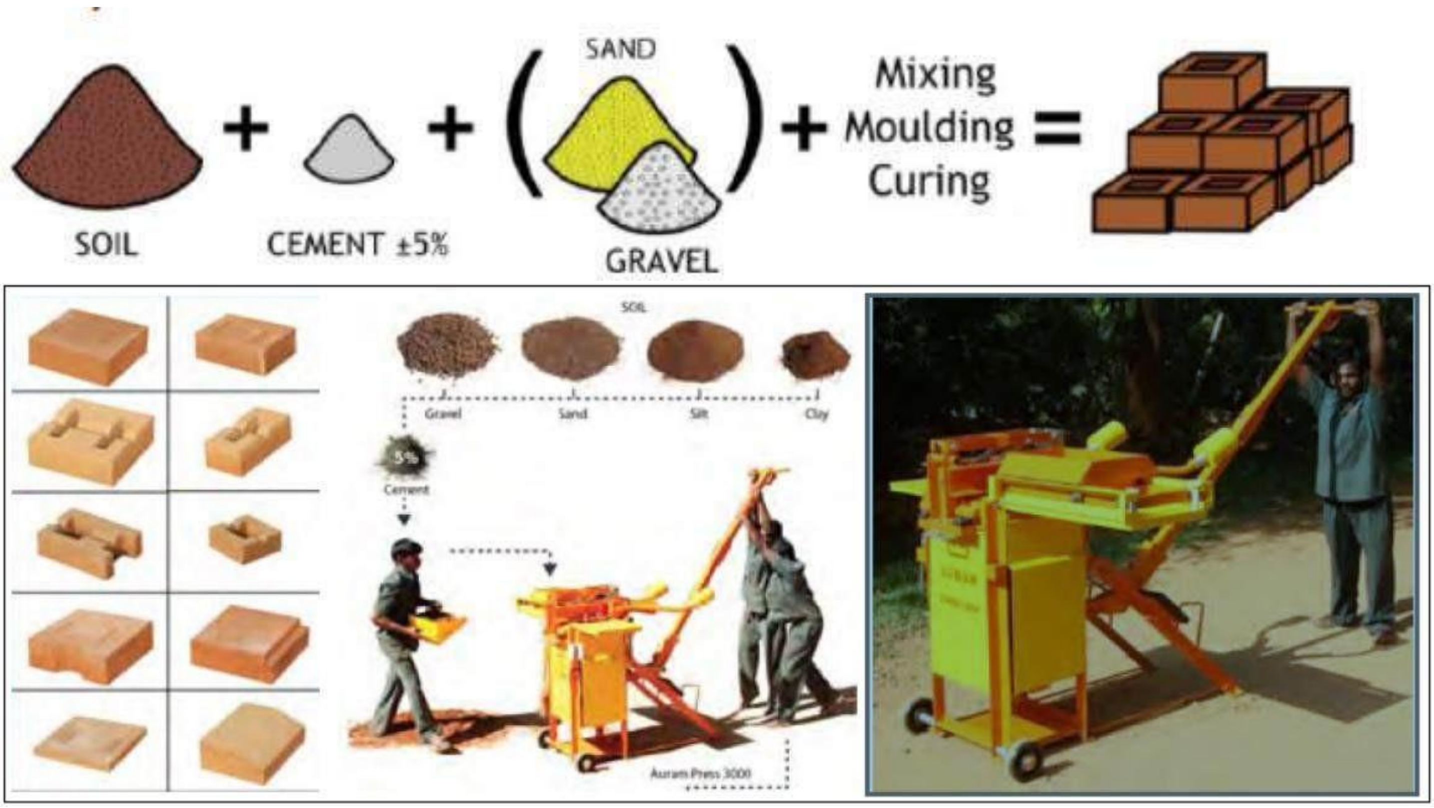

Fig.02 Manufacturing of CSEB Bricks

- The dry compressive strength of these blocks after 28 days of curing varies from 5 to 9 MPa whereas wet compressive strength varies from 3 to 4 MPa (after 24 h. immersion).
- The dry bending and shear strength after 28 days curing varies from 0.5 to 1 MPa and 0.4 to 0.6 MPa respectively.[10]
- The water absorption is 8 to 12% after 24 h. immersion whereas the bulk density of these blocks varies from 1800 to 2000 kg/m3.
- The quality of blocks is greatly influenced by the soil quality, compression force, curing and percentage of stabilizer and quality of manufacturing.
- These blocks offer sustainable solution for wall construction replacing burnt clay bricks and cement concrete blocks.[10]
- The blocks can be manufactured at the site itself leading to cutting down transportation cost saving fossil fuel and generating local employment.

- Greenhouse gas emissions are significantly reduced as these blocks are not fired in kilns as done in the case of burnt clay bricks. Being made from local soil, these blocks are resource efficient, cost-effective, climate resilient, energy efficient and eco friendly.
- These blocks are particularly suited for rehabilitation purpose after disaster and have been used worldwide including after Bhuj earthquake of 2001,2003 Bam earthquake of Iran, 2004 Tsunami relief and rehabilitation at Tamil Nadu.

Fig.03 Hollow Interlocking Blocks

Fig.04 Smart Earth Blocks

Fig.05 Solid Earth Blocks

Fig.06 Solid Interlocking CSEB Bricks

CSEB - Benefits

- Creates superior indoor environments
- Earth Block structures are warm, solid, and quiet.
- Environmentally sound
- Earth Block structures can use up to 20 to 30% less energy to heat and cool than concrete block structures.
- Dirt is a renewable resource that is plentiful.
- Earth Blocks take very little energy to make compared to the extreme heat necessary to make cement-based blocks & the firing process required to make clay bricks.
- Earth Block walls are sound proof, fire proof, bug proof, and mold proof.
- Since the blocks are made from natural materials they do not out-gas any toxic chemicals like most conventional building components.
- Long lasting, Earthen homes have been around for thousands of years. Earth Blocks will stand the test of time.

Comparative Analysis Of CSEB, RED BRICKS

PROPERTIES	CSEB BRICKS	RED BRICKS
Definition	Compressed Stabilized Earth Brick (CSEB), also known as Pressed Earth Brick, are a type of construction material created by compressing moist earth under high pressure to form blocks.	A Red brick is a single unit of a ceramic i.e., clay material used in masonry construction.
Composition	Compressed Stabilized Earth Blocks (CSEB), commonly called, Pressed Earth Blocks, are construction material made using damp soil under high amount of pressure to form blocks. They are composed of dry inorganic subsoil, non-expansive clay, aggregates and Portland cement.	Red bricks are made by mixture of clay (alumina), sand, lime, iron oxide and magnesia. Sand from locally available natural soil is used for production of bricks.

Durability	CSEBs are an environmentally friendly alternative to clay bricks that most of the residential construction in India today uses.	Red bricks are strong, hard, and durable; therefore, they are used as a structural material in different structures such as buildings, bridges, foundations, arches and cornices, and pavements. Red bricks are also used for aesthetic purposes such as facing bricks, architectural purposes, exposed practice work and in landscaping.
Sizes	**Standard modular sizes are:** 190x90x90 mm 190x90x40 mm	**Standard modular sizes are:** 190x90x90mm 190x90x40mm 230x110x70 230x110x30
Compressive Strength	Depending upon class of the CSEB bricks, its compressive strength ranges from 75 to 150 N/mm2.	Depending upon class of the red bricks, its compressive strength ranges from 3.5 to 35 N/mm2. Though IS code providing maximum strength of 35 N/mm2, the maximum strength that is available in the market is 7.5 N/mm2.
Water Absorption	Water absorption of fly CSEB bricks should not be more than 12.5 – 15% of its	Water absorption of brick should not be more than 20% of its weight.
Thermal Conductivity	Thermal conductivity for CSEB blocks ranges from 0.52-0.93 W/m.	0.6 – 1.0 W/m K. The amount of heat transfer from a specific material is called its thermal conductivity. The thermal conductivity of brick is high, and hence heat transfer from brick is more than that of AAC blocks.
Pest Resistance	CSEB bricks have excellent insect resistance.	Red bricks are not termite resistant as they are made from clay which is an organic material.
Breakage	Negligible breakage. Almost 100% utilization is possible.	Average 10 to 12 % or even more breakage happens on construction site depending upon the quality of bricks. So 100% utilization is not possible. Even at some place, due to the poor quality of bricks, wastage goes up to 33%, while loading, unloading, etc.

Carbon Emission	CSEB bricks have less carbon emission as compared to fly ash and red bricks.	Red brick is not a green product. Red bricks are made from the clay which is naturally available material but it reduces the top fertile soil cover. Hence, the land available for agriculture gets reduced. More amount of CO2 is emitted during the manufacturing of red bricks.
Cost	CSEB blocks are costlier as compared to red bricks and fly ash bricks.	They are cheaper as compared to other masonry units. However, overall cost is more, as it requires more mortar both for joints and plaster.

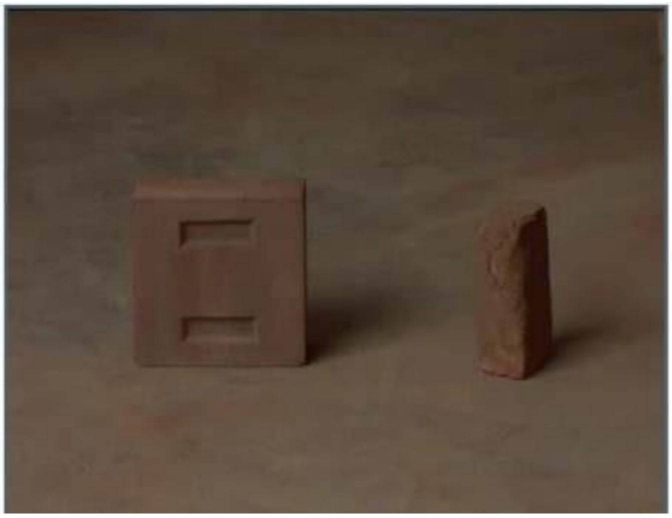

Fig.07 Strength Of CSEB Brick and Fried

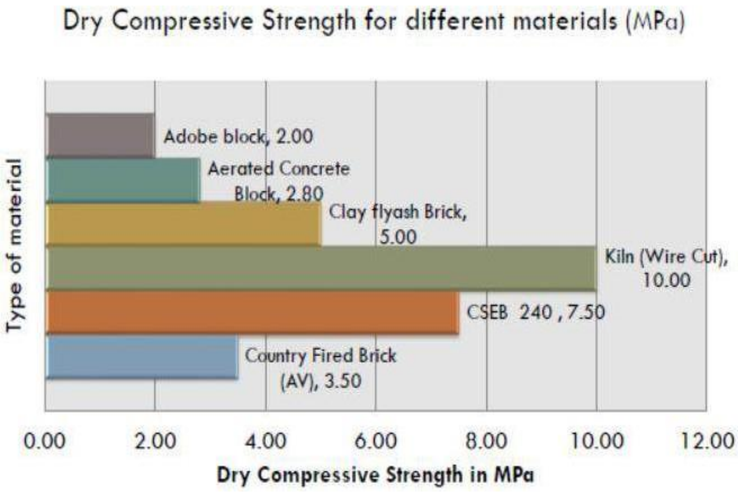

Fig.08 Dry and Wet Crushing Strength 7.5 MPa , 3 - 4MPa

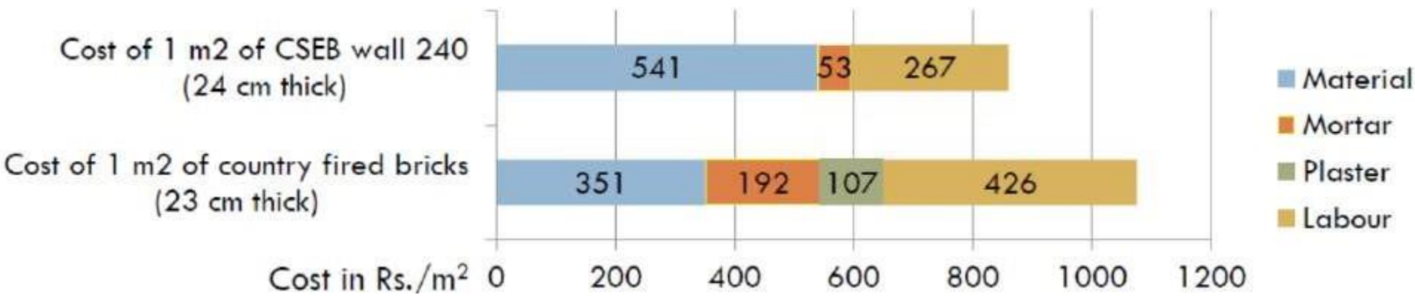

Fig.09 CSEB Is Much Cheaper Then Fried Brick

Cost Analysis Of CSEB BLOCK And Red Brick

1. Estimation and Quantity of material required per cubic meter wall using First ClassBricks and mortar of ratio 1:4

Volume of wall = Base quantity = 1m3

Dimension of brick with mortar = 0.2m x 0.1m x 0.1m = 0.002 m3 Number of bricks required = 1/0.002 = 500 nos . Actual volume of 1 brick = 0.19m x 0.9m x 0.9m = 1.539 x 10-3 m3 Total volume of required bricks = 500 x 1.539 x 10-3m 3 = 0.7695 m 3 Volume of mortar required = 1 – 0.7695 = 0.2305 m3
Actual volume of mortar required will be 40% more due to presence of voids in sand = 0.2305 + 40 % of 0.2305 = 0.3227 m3

Using mortar of ratio 1:4 Quantity of cement required = 0.3227/5 = 0.06456 m3 1 m3 = 30 bags of cement, therefore 0.0646 x 30 = 1.938 bags say 2 bags (or 100 kg) Quantity of sand required = 0.0646x 4 = 0.2584 m3

Sr. no.	Item	Quantity	Unit	Rate	Total(Rs)
1	Brick	500	Nos.	6	**3000**
2	Cement	2	bag	300	**600**
3	Sand	0.2584	m^3	1000	**258.4**
				TOTAL=	**Rs 3854.4**

Table .01 Cost of Material for Brick Wall

2. Estimation and Quantity of material required per cubic meter wall using CSEB blocks and mortar of ratio 1:4

Volume of wall = Base quantity = 1m3

Dimension of brick with mortar = 0.3m x 0.2m x 0.1m = 0.006 m3 Number of blocks required = 1/0.006 = 166.67 ~ 167 nos.
Actual volume of 1 block = 0.29m x 0.19m x 0.9m = 4.959 x 10-3m3 Total volume of required blocks = 167 x 4.959 x 10-3m3 = 0.830m3 Volume of mortar required = 1 – 0.828 = 0.172 m3
Actual volume of mortar required will be 40% more due to presence of voids in sand = 0.172 + 40 % of 0.172 = 0.2408 m3

Using mortar of ratio 1:4 Quantity of cement required = 0.2408/5 = 0.04816 m3 1 m3 = 30 bags of cement, therefore 0.04816 x 30 = 1.448 bags say 1.5 bags (or 75 kg) Quantity of sand required = 0.04816 X 4 = 0.1927 m3

Sr. no.	Item	Quantity	Unit	Rate	Total(Rs)
1	Block	167	Nos.	12	**2004**
2	Cement	1.5	bag	300	**450**
3	Sand	0.1927	m^3	1000	**192.7**
				TOTAL=	**Rs 2646.7**

Table .02 Cost of Material for CSEB Block Wall

4. THE MOST IMPORTANT TYPES OF MUD ARCHITECTURE IN INDIA

Case studies	Design features	Material/techniques used
Residence at Dindugal [9]. -Ar.Noel Jerald	Geometric rectangular fashion over three dimensions. The double height space differentiated through different levels and lit through sky lights and appropriately placed windows. A north courtyard garden, provides daylight and ventilation	Wall- Stabilised mud blocks Roofs- Filler slabs (Clay pot) Flooring-Clay tiles.
Residence for Mr.Joseph,Kottayam -Ar.Jose K.Mathew	Maintained the slope of the site as well as conservation of all its trees. Courtyards with water bodies have been placed on the west and south sides to cool rooms.	Internal walls –Stabilised with interlocked bricks. Roof- Filler slabs of recycled MP tiles
Govardhan Eco Village,Palghar -Ar.Chitra Viswanath	Soil got from excavating the ponds. Laid into clear recharge and discharge zones and buildings. Avoid locating buildings and roads in valleys. Cluster units with shared courtyards	Wall- CSEB Block CSEB tiles with precast elements. CSEB "U Blocks" for sill and lintel.
Green Design Residence,Vadodara -Ar.Kalpesh Dalwadi &Ar.Shreya Dalwadi [9].	Cube shape with a central courtyard letting in daylight and allowing wind movement in all the living spaces encircling it.	Wall-Compressed earth blocks. Roofs- Filler slab, mud pans as roof fillers. Natural stone masonry for courtyard walls.
Bodhi house,Kollam [9].	Two blocks are visually connected with courtyard [9].	Wall-Cob wall

Weaving walls, cottage,Thannal Hand Sculpted Homes [10]. -Ar.Biju Bhaskar	Comfortably enclosed but connected with the openness of the surrounding. Spaces in free flowing movement with broken tiles flooring and inbuilt furniture. Placed blue tinted glass bottles into the west side wall. The evening sun hits the glass bottle which was the cottage with a hue of blue.	Wall-wattle and daub construction The cobbed portion of the wall not only acts as the base of the structure but also flows into interiors to take form of seating, shelves and niches. Roof- Double layer roof, with Mangalore tile above that allows the heat to escape from the top. Green roof by having a layer of mud on top is one of the experiments. Flooring-broken tiles
Vikas Community, Apartment, Auroville [11]. -Ar.Satprem Maini	Four storeys building utilization with self-sufficient onsite soil. This extraction from soil allowed a perfect integration of the excavations with the buildings and landscape.	Foundations- Stabilised rammed earth Walls-CSEB Roof-CSEB (flat ,vaults and domes) These vaults and domes were built with, by using the "Free-spanning" technique Floorings- CSEB tiles
-Ar.Eugene N.Pandala	Openings in the top of the wall for escape of hot air out and to make the living space cool. Its gentle slopes and elegant curves evoke an eagerness to explore inside. Intricate jaalis and pedestals step out of the walls to make their presence felt. cobbed inbuilt furniture and niches.	Roof-Ferro cement sloped with clay tiles Flooring - terracotta tiles.
Shell House,Calicut -Ar. R.K.Ramesh Kumar	Parabolic vaulted roof resembles no distinct walls, its continuous roof in shell shape. Air spaces in the mud hollow blocks make thermal comfort.	Wall- mud hollow blocks Roof-hollow Blocks-Parabolic shell. .
St.George Orthodox Church,Mattanchery,Cochin,Kerala -Ar.Vinu Daniel	Concept of domes, vaults and arches rose from early symbols of Marthoma cross. Altar blessed by a "cross of light" by natural earth bricks.	Wall- compressed, stabilised mud blocks. Rammed earth foundation Using ancient Nubian technology of arch and vault Roof- CSEB laid for centenary vault.

5. HOUSING POLICIES AND THEIR RELATIONSHIP TO THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT

Housing policies in India are increasingly being shaped by the principles of sustainable development, aiming to address the need for affordable, environmentally-friendly, and socially inclusive housing.

The Indian government seeks in its housing policy to provide housing for people with limited income with linking these policies to local materials with a low cost, such as clay, fly ash Brick, Bamboo and thus reducing the cost for limited income, so that this housing becomes cheap for them, the construction of mud would have been a mutual activity, involving the members of one or more family, implying the existence of social units consisting of cooperating persons which reduce the cost of construction.[12]

Sustainable development, in its overall sense, is linked to improving the quality of life for all segments of present-day society without affecting the ability of subsequent generations to meet their own future needs. To achieve sustainable human development requires a focus on the social, environmental and economic dimensions of human development. 'However, factors that affect housing demand in India in general.

In housing policy, where housing is a basic human need and one of the main factors in improving the quality of life, the main challenge in Indian housing policy is to meet housing needs and to adapt to the growth rates of the population by providing healthy housing at prices commensurate with citizens' requirements. Greater equality of opportunity and combating urban poverty, while balancing the distribution of the population and of housing, are key development requirements. To meet this challenge, housing policies and housing production must be aligned with the requirements of economic, social and environmental growth in light of the high costs of housing production, especially since the price of the housing unit is eight times the annual income of the family.[13]

'One of the main challenges facing Indian in respect to housing policy is determining best practices for dealing with the escalating demand for housing that has arisen as a result not only of high population growth (2.2% per annum) of its own citizens, but also following influxes of forced migrations from the surrounding countries. The housing sector has witnessed an enormous increase, with the number of housing units increasing, the number of households grew from approximately 230 million in 2001 to around 330 million in 2021, reflecting a steady rise in housing needs. Low-income households constitute about 25%- 30% of total households in India'.

According to this 2016 study, the factors leading to India's housing problems were:

- High population growth, rural to urban migration and adverse external migration. The low income of the citizen and the continuous rise in land prices.
- Lack of a general housing policy that takes into account priorities, population distribution and housing needs. Despite government schemes like Pradhan Mantri Awas Yojana (PMAY), the scale of affordable housing construction still lags behind the growing demand.
- Population increases - The growth rate of the total population during the period 2004–2015 is about 4.3% .
- Lack of national economic resources, shown through budget deficits.
- There is a significant gap between the rich and the poor in terms of income, which affects access to housing.
- Continuously increasing housing prices due to increases in the prices of imported building materials.

○ Increased demand for housing as a result of social development and tendency for young people to form nuclear.

○ While housing demand continues to rise, the pace of construction—especially for affordable housing—has been slow due to the above-mentioned challenges.

7. CONCLUSIONS

The unique character of mud is its plasticity, reusability and transformability. Experimental mud construction systems and techniques display the continuity of traditional character and expression connecting the past, present and the future. Even in many areas in India due to rapid urbanization and changing life style, the possibility of mud becoming an integral part of construction material seems to be challenging. These types of construction usually arouse emotional feelings and link us with the past generation. This also gives the satisfaction of affordable healthy living for the rest of the life. By and large, we may conclude that a need has now arisen to promote earth architecture with innovative initiatives by nongovernmental organizations, architects and other pioneers in the field who are supposed to facilitate by creating awareness about mud as a construction material and highlighting its health benefits which will ultimately redefine the character of the built forms and environments.

This study concludes:

(1) The use of available local materials contributes to achieving the concept of sustainable development by preserving the environmental, economic and social dimensions of buildings and achieving community participation.

(2) Mud is one of the most environmentally sound materials as it does not release any form of pollution during its manufacture, use or repair or in the case of demolition or renovation of the building. It comes from the ground and returns to it.

(3) Mud is available in most areas of India, which makes the local people self-reliant in producing and using this material.

(4) Mud stores heat, cold and humidity and thus improves the indoor climate; by adding certain bonding materials it can achieve the required durability and insulation features required in many constructions uses.

(5) Mud economizes the energy used in its manufacturing, because mud needs only 1% of the energy required for concrete production.

(6) Thick external walls made of solid mud achieve the maximum time delay in thermal conductivity; the walls of mud with a thickness of 40 cm delay heat transfer by 15 hours, while cement block walls 20 cm thick only retain the heat for five hours and six minutes.

(7) Comparing a mud building with a concrete building, economic savings of 35% were achieved compared to the concrete building, as repeated in several previous studies.

(8) This cheap material available can allow direct and rapid production and construction, which helps to provide housing for people with limited income at the lowest possible cost.

(9) The geography of India permits the construction of mud houses by providing soil suitable for mud construction in most regions.

(10) The adoption of mud architecture restores the intimate relationship between human beings and architecture as represented in the sizes and forms, and the design and heritage elements stemming from its human scale.

8. RECOMMENDATION

(1) To return to the technique of mud construction and to reuse this highly sustainable material.

(2) To follow up the implementation of construction projects for the poor by using low-cost mud buildings to meet the need for affordable housing.

(3) To give simple loans for citizens to build their houses using mud construction.

(4) To communicate with international institutions, funding agencies, investors and the private sector, to ensure support for this eco-economic housing model.

(5) To raise awareness of mud-building technologies in buildings, especially in suitable areas and to attract tourists from all over the world to see both heritage and modern mud housing.

(6) To restore and make use of existing locally-produced mud houses.

(7) To provide field training opportunities in order to provide skilled labour that can construct mud buildings for traditional and modern requirements by traditional methods.

(8) Where mud construction faces challenges in certain applications, such as strength limitations, to consider hybrids between concrete and mud brick architecture.

(9) For architects to develop more modern models of mud architecture in India, taking into account techniques that have proved their durability and strength through.

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Akriti Dubey is an accomplished architect (COA) and Assistant Professor. She obtained her Bachelor's degrees in Architecture from Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore. Pursuing Master’s in Architecture. Akriti has always been passionate about creating environmentally friendly spaces. With her exceptional communication skills, Akriti has been able to effectively convey her ideas and collaborate with colleagues and clients. Her Interest in sustainable architecture has allowed her to work on various innovative projects that prioritize environmental preservation.