



Level of Wall Building Material in Rohtak District, Haryana

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Abstract

The construction sector plays a pivotal role in the socio-economic development of any region, with wall building materials serving as fundamental components in construction activities. This study of level of availability and quality of wall building materials in Rohtak District, Haryana, aiming to provide insights for sustainable construction practices and urban development planning. The study evaluates the availability and distribution of various wall building materials, including bricks, concrete blocks, and alternative materials such as AAC blocks. Furthermore, it examines the quality parameters of these materials concerning strength, durability, and environmental sustainability. Key findings reveal the dominance of traditional brick-based construction methods in Rohtak District, with variations in material quality and sourcing practices across different localities. The study underscores the importance of promoting sustainable alternatives and enhancing the quality control mechanisms in the local construction industry. Recommendations are proposed to stakeholders, including policymakers, urban planners, and construction practitioners, to foster the adoption of environmentally friendly and cost-effective wall building materials. Additionally, strategies for improving supply chain management and facilitating skill development initiatives within the construction sector are discussed to ensure long-term sustainability and resilience in Rohtak District's built environment. Overall, this research contributes to the understanding of the dynamics surrounding wall building materials in Rohtak District, offering insights into potential pathways for enhancing the efficiency, affordability, and environmental sustainability of construction practices in the region. The utilization of Grass/Thatch/Bamboo etc. as wall building material has been noticed high in the Makroli Khud village in Rohtak District. Meanwhile the consumption of Mud/Unburnt brick material has been scored higher in the Nandal Villages. 6 Out of 136 villages have 100 per cent utilization of Burnt brick in the process of wall of the houses in Rohtak District.

Keywords: Wall building materials, Rohtak District, Haryana, Grass/Thatch/Bamboo, Bricks,



Introduction

Different regions in India have varying levels of availability of wall building materials such as bricks, concrete blocks, stone, and alternative materials like fly ash bricks or AAC blocks. Availability can be influenced by factors such as geographical location, proximity to raw materials, and local manufacturing capabilities. The quality of wall building materials is crucial for ensuring the structural integrity and longevity of constructed walls. Quality parameters include strength, durability, resistance to weathering and environmental factors, and adherence to building codes and standards. Assessing and maintaining quality standards are essential for safe and sustainable construction practices (Sabapathy & Maithel, 2013).

With increasing awareness of environmental concerns, there is a growing emphasis on sustainable construction practices in India. The choice of wall building materials can significantly impact sustainability, considering factors such as energy consumption, carbon footprint, and resource depletion. Sustainable alternatives like fly ash bricks, which utilize industrial by-products, or AAC blocks, which offer energy efficiency and reduced environmental impact, are gaining popularity. India's diverse geography and climatic conditions lead to regional variations in the choice and availability of wall building materials. For instance, regions with abundant clay may have a preference for brick-based construction, while areas prone to seismic activity may prioritize materials with higher structural flexibility (Jasvi & Bera, 2015).

The economic feasibility and affordability of wall building materials play a crucial role, particularly for low-income housing and infrastructure projects. Factors such as material cost, transportation expenses, and availability of skilled labor influence the choice of materials and construction methods (Bardhan & Debnath, 2017). Government regulations, building codes, and standards play a significant role in shaping the use of wall building materials in India. Policies promoting sustainable construction practices, such as green building certifications and incentives for adopting eco-friendly materials, can influence market trends and industry practices. Advancements in construction technology, such as prefabrication, modular construction, and new materials research, are reshaping the landscape of wall building in India. Innovations aim to improve efficiency, reduce costs, and enhance the sustainability of construction projects (Mate, 1969).



Objectives

- To assess the availability and distribution of wall building materials including bricks, concrete blocks, etc. within Rohtak district.
- To evaluate the quality parameters of different wall building materials in terms of strength, durability, and environmental sustainability.
- To identify the dominant practices and preferences in wall construction methods within the district, including traditional brick-based construction and alternative methods.

Database & Methodology

For this study, district-level 2011 census data on the housing conditions of households and the level of wall building material have been used. Five indicators have been used in this study to determine the housing status of households in rural Rohtak with regard to wall building materials. They are listed below:

1. Material of roof; Grass/ Thatch/ Bamboo/ Wood/Mud etc. (X_1),
2. Material of roof; Mud/Unburnt Brick (X_2),
3. Material of roof; Stone/Slate (X_3),
4. Material of roof; Burnt Brick (X_4),
5. Material of roof; Cement (X_5),

On the basis of natural break method, the thematic maps have been prepared by using ArcGIS software. Based on the findings from the study, formulate actionable recommendations for policymakers, industry stakeholders, and practitioners to enhance the availability, quality, and sustainability of wall building materials in India. Emphasize strategies for promoting innovation, improving standards enforcement, and fostering collaboration among stakeholders.

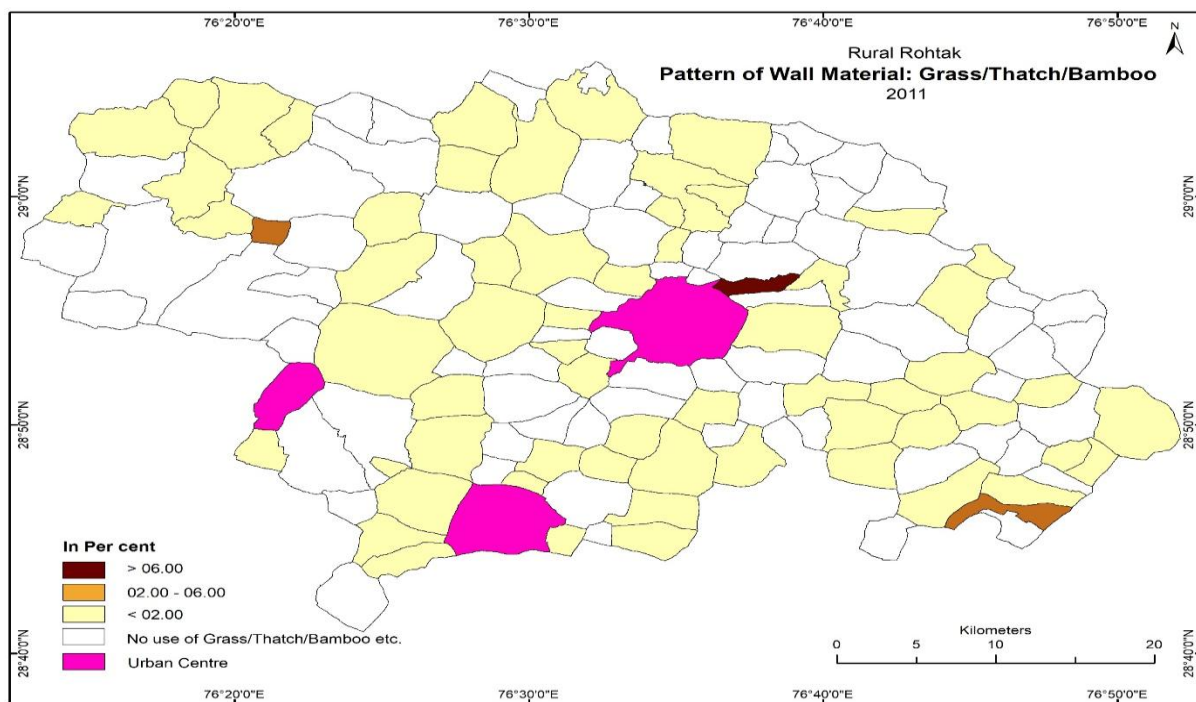
Result & Discussion

Spatial Pattern of Wall Building Material: Grass/Thatch/Bamboo

The map 1 provides a detailed breakdown of villages in Rohtak District, Haryana, categorized by the percentage of households utilizing grass, thatch, or bamboo as wall building materials. The data provides a comprehensive overview of construction practices across various regions, highlighting the use of traditional and natural resources for building purposes. The percentage of households using grass/thatch/bamboo as wall building material

varies across different villages, ranging from 0% to 14%. This suggests that while some villages have a higher prevalence of traditional materials, others have transitioned to alternative options.

While some villages exhibit significant reliance on these traditional materials, with percentages as high as 14%, others register minimal or zero usage. Local factors like geography, cultural traditions, and socioeconomic conditions influence construction choices, necessitating targeted interventions for sustainable development in rural areas. The data emphasizes the need for environmental considerations in construction decisions, highlighting the need to balance traditional practices with modern techniques for resilient, sustainable housing infrastructure. The data is a valuable resource for policymakers, researchers, and development practitioners working on inclusive and sustainable housing solutions in Rohtak District (Map 1).



Source: Census of India, 2011.

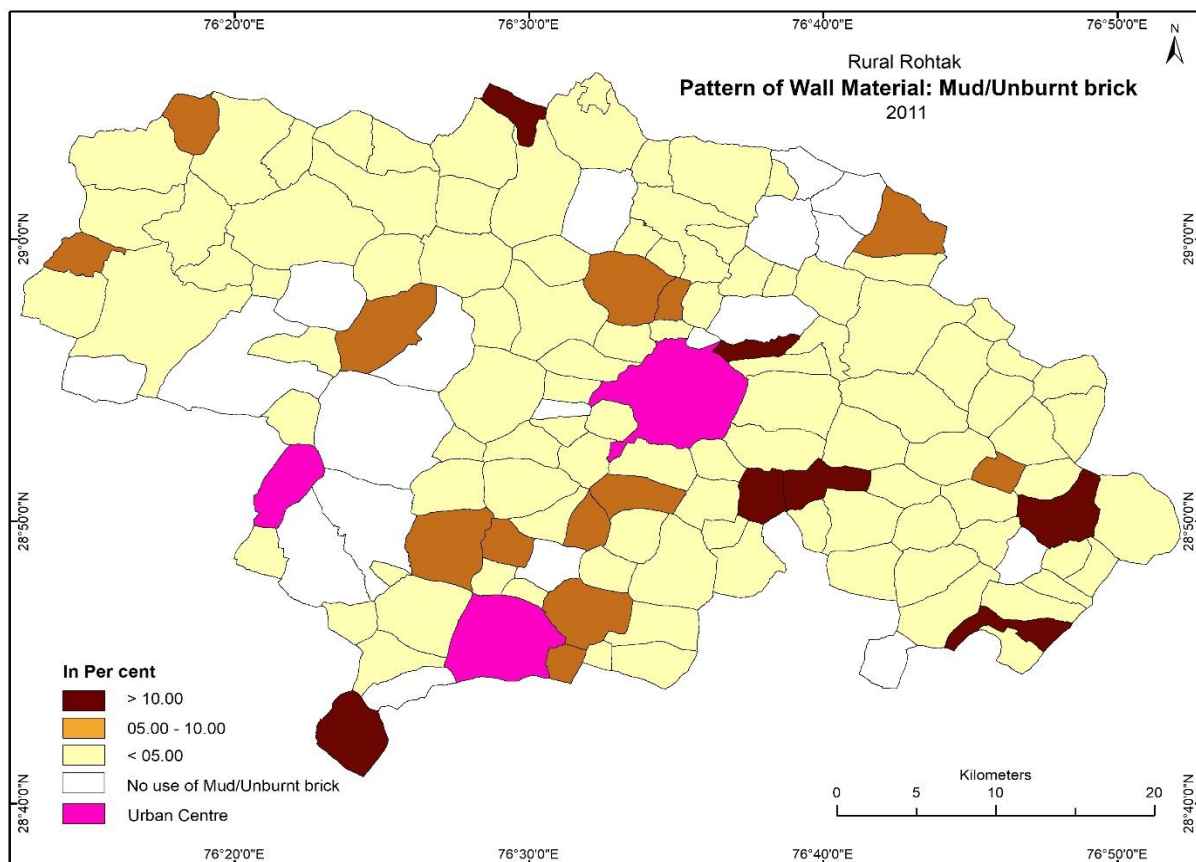
Map 1

Spatial Pattern of Wall Building Material: Mud/Unburnt Brick

The map 2 presents a comprehensive overview of villages in Rohtak District, Haryana, categorized by the percentage of households using mud or unburnt brick as wall building

material. It provides a detailed snapshot of construction practices across various villages, shedding light on the prevalence of traditional building materials in the region. Village names are listed alongside the corresponding percentages, allowing for a direct comparison of adoption rates.

Villages like Nandal and Pehrawar stand out with remarkably high percentages exceeding 80%, indicating a strong reliance on mud or unburnt brick for construction purposes. These villages likely represent rural or semi-rural areas where traditional building techniques are deeply ingrained and access to modern construction materials may be limited. Conversely, towns like Samchana and Pilana have adoption rates that are more moderate, ranging from roughly 13% to 19%. These percentages, though still noteworthy, point to some variation in building methods, with some households choosing to utilize different materials. Villages like Kheri Sadh and Marodi Jatan show lower reliance on mud or unburnt brick, suggesting urbanization or access to modern building materials and techniques (Map 2).



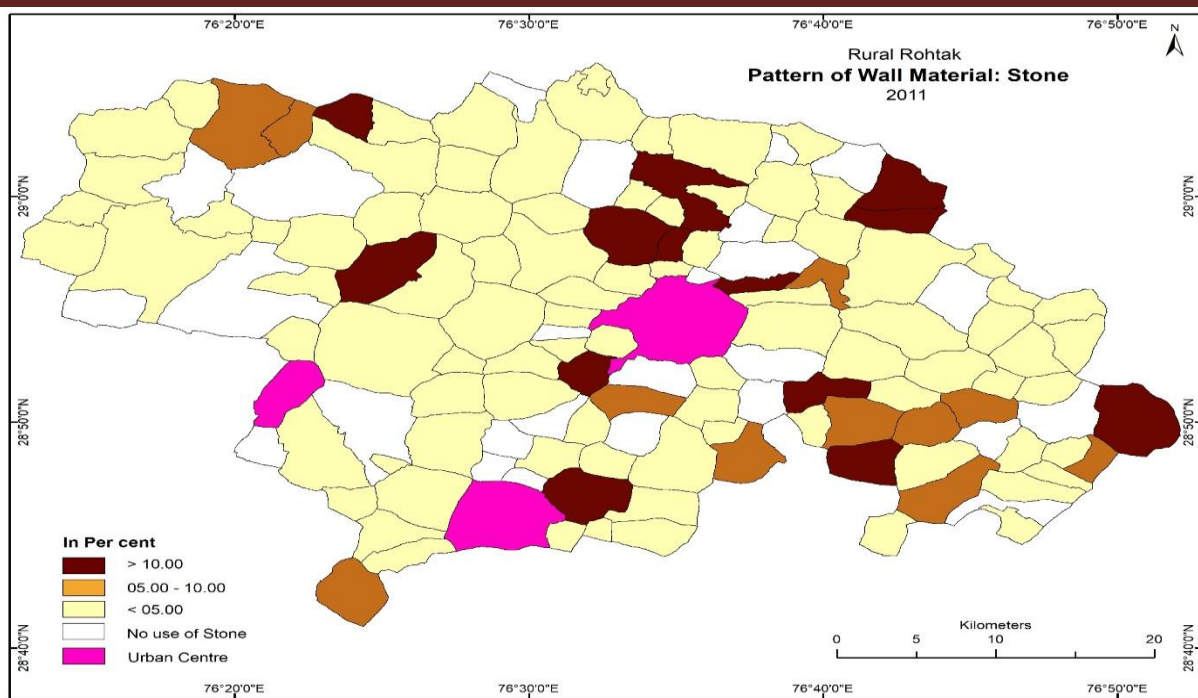
Source: Census of India, 2011.

Map 2



Spatial Pattern of Wall Building Material: Stone/Slate

The provided data presents the distribution of households using stone as a primary building material for walls across various villages. Notably, Makroli Khurd stands out with the highest percentage, where approximately 62% of households utilize stone for constructing their walls. Following closely behind are Khidwali and Kheri Sadh, with 34.9% and 34.7% respectively. As the list progresses, the percentages gradually decrease, indicating a declining trend in the usage of stone as a building material across different villages. Notably, villages like Chuliana, Rithal Phogat, Sundana, and Titoli exhibit relatively lower percentages, suggesting a lesser preference for stone walls in these areas. This data sheds light on the varying architectural practices and material preferences within the region, likely influenced by factors such as local traditions, availability of resources, and socioeconomic conditions (Map 3). Among the villages listed, Kehrawar has the highest percentage, with 9.8% of households employing stone for their walls. Following closely are Sunari Khurd and Pilana, with 9.1% and 7.2% respectively. As we move down the list, the percentages gradually decrease, indicating a lower preference for stone walls in these areas (Map 3). Villages such as Karontha, Ladot, and Atail exhibit the lowest percentages, suggesting a lesser inclination towards using stone as a building material among their households. The provided data presents the distribution of households across various villages, categorized by the percentage of households utilizing stone as a building material for walls. The data reveals considerable variation in the prevalence of this architectural choice among different villages. At the upper end of the spectrum, villages like Kherainti, Bedwa, and Gudhan exhibit relatively higher percentages, with approximately 4.8% to 4.9% of households employing stone for their walls.



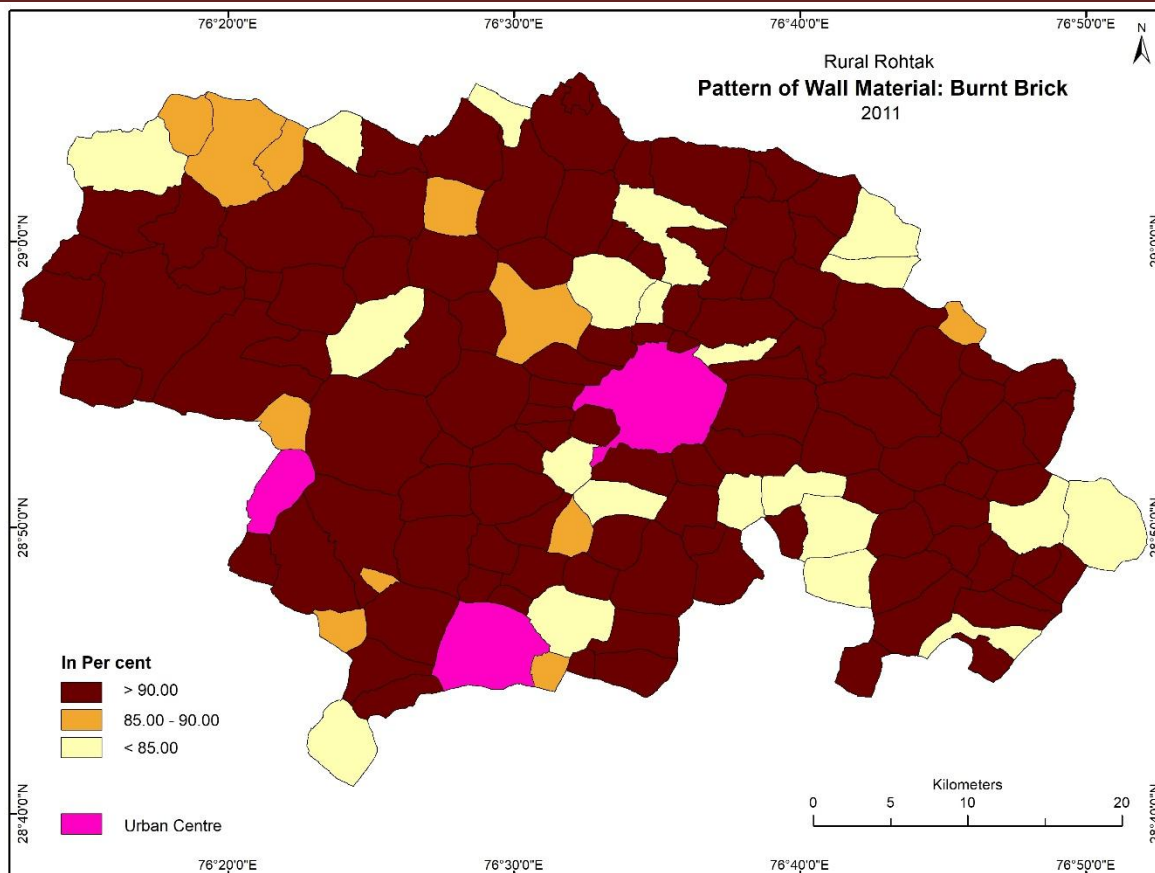
Source: Census of India, 2011.

Map 3

As the list progresses, the percentages gradually decrease, indicating a lesser preference for stone walls in the respective areas. Notably, several villages have notably lower percentages, with some even falling below 1%, suggesting a lesser inclination towards using stone as a primary building material for walls in those communities.

Spatial Pattern of Wall Building Material: Burnt Brick

The map 4 presents data regarding the prevalence of burnt bricks as a primary building material for walls across multiple villages. At the upper end of the spectrum, villages like Behlba, Kalanaur, and Kalanaur Kalan demonstrate a complete reliance on burnt bricks, with 100% of households using this material. Similarly, other villages such as Rohtak, Sisar Khas, and Taja Majra also exhibit full adoption of burnt bricks for wall construction. As the list progresses, we observe slight fluctuations in percentages, indicating varying degrees of preference for burnt bricks across different villages. For instance, while some villages like Kahni 7, BhainiBhairon, and Madina Gindhran maintain high percentages in the high 90s, others like Bhasru Kalan, Ladot, and BhainiMaharajpur show slightly lower percentages but still significant adoption rates of burnt bricks. Furthermore, several villages with percentages in the 90s indicate a strong preference for burnt bricks, albeit not at full adoption levels.



Source: Census of India, 2011.

Map 4

Conversely, villages with percentages below 90%, such as Sanghi, Atail, and Ismila-11 Biswa, suggest a lower inclination towards using burnt bricks as a primary building material for walls. Overall, this data highlights the diverse architectural practices and material preferences among villages, likely influenced by factors such as local traditions, resource availability, and socioeconomic conditions within each community.

The presented table outlines the proportion of households utilizing burnt bricks as the primary construction material for walls across various villages. In multiple villages, burnt bricks serve as the predominant material for constructing walls, with percentages ranging from 85.8% to 89.9%. Samar Gopalpur, Farmana Khas, and Masudpur emerge as the leading villages in this aspect, with usage rates of 89.9%, 89.8%, and 89.8%, respectively. These figures suggest a prevalent preference for burnt bricks within these communities, possibly influenced by factors such as durability and accessibility of materials. Katesra and Basana



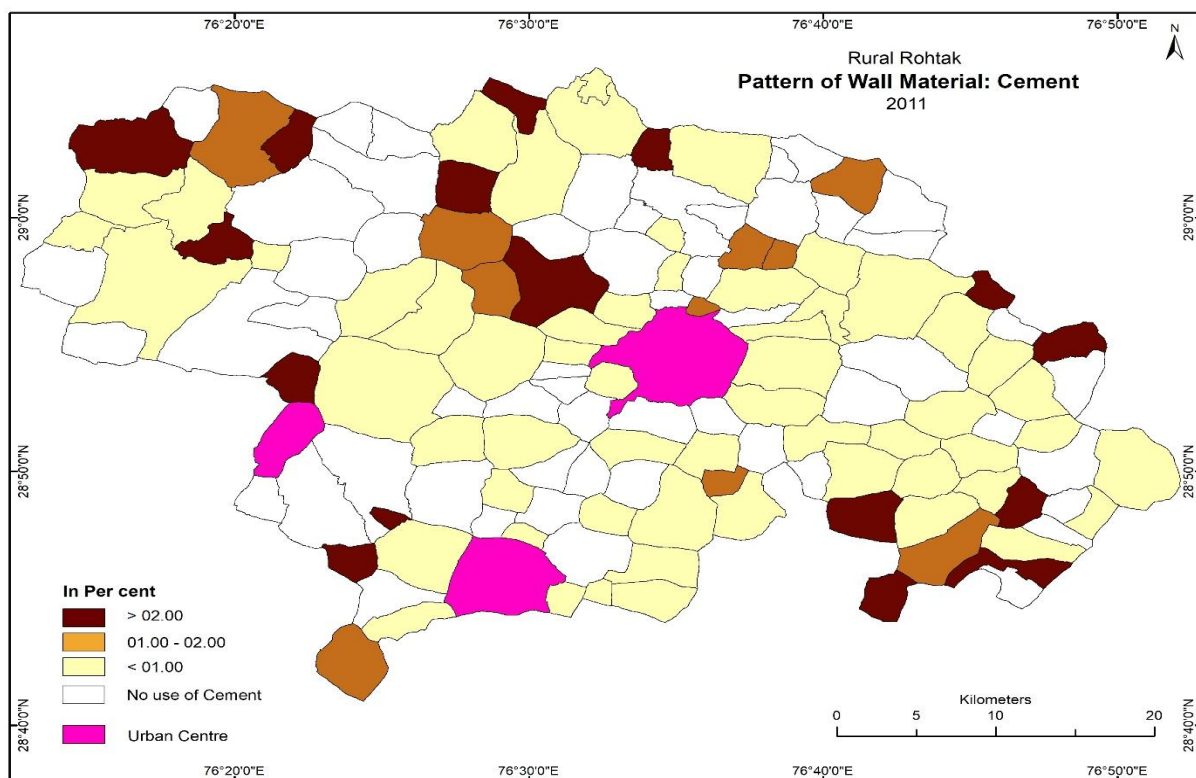
also exhibit substantial adoption rates at 89.6% and 89.3%, respectively, indicating a widespread acceptance of burnt bricks as a reliable building material. Similarly, Polangi and Marodi Jatan demonstrate high usage rates of 89.3% and 88.8%, further emphasizing the popularity of burnt bricks for wall construction. While Kherainti and Bedwa maintain respectable percentages of 88.4% and 88.2%, respectively, Gudhan and FarmanaBadshapur show slightly lower but still significant usage rates at 88% and 85.8%. Despite variations in percentages, the consistent utilization of burnt bricks across these villages highlights its significance as a preferred construction material, likely influenced by factors such as local traditions and availability of resources.

Spatial Pattern of Wall Building Material: Cement

The map 5 provide insights into the construction practices across several villages, focusing on the percentage of households utilizing different materials for building walls. The first table highlights the widespread use of burnt bricks as the primary wall-building material. Villages such as Samar Gopalpur, Farmana Khas, and Masudpur exhibit high percentages, ranging from 85.8% to 89.9%. This suggests a strong preference for burnt bricks within these communities. Conversely, FarmanaBadshapur records a slightly lower percentage of 85.8%, indicating a comparatively lower preference for burnt bricks. In contrast, the second table delves into the usage of cement as a wall-building material. Seman emerges with the highest percentage at 13.9%, followed by Kultana and Polangi at 9.2% each. This data reveals a diverse range of preferences across villages, with some showing a significant reliance on cement, while others exhibit lower percentages, indicating a lesser preference for this material.

Overall, these tables underscore the diversity in construction practices among villages, influenced by factors such as local availability, tradition, and economic considerations. While burnt bricks remain a popular choice in many areas, the usage of cement also emerges as a notable trend, albeit with varying degrees of prevalence across different villages. In Nidana, 2% of households use cement as their main wall-building material, indicating a minor but existing preference for this modern construction material. Similarly, in Sarai Ahmed, Shimli, and Girawar, the usage percentages are 1.5%, 1.4%, and 1.3% respectively, suggesting a trend of limited cement usage across these villages. Furthermore, in Brahmanvas, Basantpur,

and Pilana, the percentages stand at 1.2%, highlighting a slight inclination towards cement-based construction practices. Additionally, Kahni 12, 1/2 Biswa, Ismila-11 Biswa, and Farmana Khas demonstrate a similar pattern, with usage percentages of 1.1%. Overall, while the prevalence of cement as a wall-building material is relatively low across these villages, the data showcases varying degrees of adoption, indicating a mix of traditional and modern construction practices within each community (Map 5).



Source: Census of India, 2011.

Map 5

Conclusion

Villages with higher cement usage might have better access to cement suppliers or construction markets, making it easier for residents to procure this material. The cost-effectiveness of cement compared to traditional materials could influence its adoption. Villages with higher average incomes or access to financial resources may opt for cement despite its relatively higher cost. Villages undergoing rapid urbanization or infrastructure development may favor cement for its durability and modern aesthetic appeal, especially in newly constructed or renovated buildings. Traditional construction practices and cultural preferences play a significant role. Villages with strong ties to traditional building methods



may exhibit lower cement usage, while those embracing modernization may show higher adoption rates. Awareness campaigns or educational initiatives promoting the benefits of cement construction, such as durability, resistance to weathering, and ease of maintenance, could influence villagers' choices. Government subsidies, incentives, or infrastructure projects promoting cement usage may contribute to its adoption in certain villages. Overall, the data suggests a nuanced interplay of economic, cultural, and infrastructural factors shaping construction material preferences across the villages, with cement emerging as a supplementary choice alongside traditional materials.

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