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# Assessing the Sustainability and Deployment of Autoclaved Aerated Concrete (AAC) Blocks in Construction

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**ABSTRACT:**

This research paper delves into the usage of Autoclaved Aerated Concrete (AAC) blocks as alternatives to the usual blocks that are used in construction. This study highlights the importance and advantages of using these blocks as they are highly sustainable compared to the other alternatives present. This study is relevant in today's day and age due to the emerging importance of sustainability.

This study realistically analyzes the use of these blocks in the industry and its various aspects.

**Keywords:** Sustainability, Environment-friendly, Construction Materials, Energy efficiency

## 1. Introduction:

Construction blocks, commonly known as building blocks, are solid units used to construct walls, foundations, and other structural elements. They are typically made from materials like concrete, clay, or stone and are designed to provide strength, durability, and insulation to a structure. Construction blocks are generally stacked and bonded with mortar to form a stable, long-lasting structure.

Their uniform size and shape make construction faster and more consistent in comparison to using irregular stones or other natural materials. Additionally, blocks can be designed with specific features such as thermal insulation or water resistance to enhance their functionality in different building environments.

Various types of construction blocks are used in the industry, they are:

1. Concrete Blocks: These blocks are made from cement, sand, and aggregates, commonly used in load-bearing walls.
2. Clay Bricks: These traditional bricks are made from clay, fired in a kiln, and used for exterior walls.
3. AAC Blocks (Autoclaved Aerated Concrete): These blocks are lightweight, eco-friendly blocks made from fly ash, cement, and lime, known for good insulation.
4. Hollow Blocks: They have cavities to reduce weight and improve insulation. They are used in non-load-bearing walls.
5. Fly Ash Blocks: These are made from fly ash, lime, and cement; eco-friendly and cost-effective.
6. Glass Blocks: They are transparent or translucent blocks, often used for decorative purposes or windows.

**Autoclaved Aerated Concrete blocks:**

Autoclaved Aerated Concrete (AAC) blocks are lightweight, precast construction materials used in building construction. These blocks are made from a mixture of cement, lime, silica, and water, along with an expanding agent. AAC blocks are formed into blocks or panels that are cured in an autoclave which is a machine that is used to carry out industrial processes involving a high temperature and pressurized environment.

This process gives them unique properties, such as being highly durable, non-combustible, and environmentally friendly. Autoclaved Aerated Concrete blocks are known for their excellent thermal insulation, soundproofing, and resistance to fire, pests, and mold. Due to their lightweight nature, they reduce the dead load on structures, making them easier to work with and transport.

These blocks are more expensive in comparison to the regular blocks that are used in construction activities but have many benefits that outweigh the cons in comparison with other construction blocks.

Additionally, they are energy-efficient, sustainable, and better for the environment as they contribute to lower energy costs for heating and cooling.

## 2. Review of Literature:

1. **MA Kamal (2020)**

While traditional bricks are prevalent in the construction sector, Autoclaved Aerated Concrete (AAC) blocks are increasingly recognized as a modern building material. Composed of fly ash, lime, cement, water, and an aerating agent, AAC blocks are lightweight, durable, and energy-efficient because of their internal air voids. Produced through a steam-curing method known as autoclaving, AAC is environmentally friendly, incorporating industrial waste and non-toxic components. This paper examines the sustainability and potential of AAC, including a cost comparison with conventional red clay bricks.

2. **A Wahane (2017)**

AAC blocks, or Autoclaved Aerated Concrete blocks, are lightweight masonry products created through a reaction involving aluminum powder and a blend of lime, cement, and fly ash or sand. This type of cellular concrete has been in use for more than 80 years but currently lacks viable recycling methods. The manufacturing process produces hydrogen gas, resulting in countless tiny air cells that enhance AAC's structural integrity and enable significant expansion. Cured with high-pressure steam, AAC is cost-effective, easy to work with, and meets the need for lightweight, energy-efficient, and environmentally friendly building materials. This study examines the manufacturing process of AAC blocks.

3. **U Jain, M Jain, S Mandaokar (2018)**

Brick is the most commonly used building material in construction, whereas AAC blocks represent a newer, lightweight option. When comparing blocks of the same dimensions (200mm x 100mm x 100mm), AAC blocks are three times lighter than conventional clay bricks, enabling more area coverage for the same weight. This paper examines the feasibility of substituting clay bricks with AAC blocks, emphasizing that their adoption can lower construction costs by as much as 25% and reduce the need for materials like cement and sand by up to 55%.

4. **A Raj, US Dixit (2020)**

Autoclaved aerated concrete (AAC) is gaining traction as a building material due to its lightweight characteristics, thermal insulation, and sound absorption capabilities. This article outlines an experimental assessment of AAC's mechanical properties, such as moisture content, water absorption, dry density, compressive strength, and tensile strength. It also evaluates the performance of AAC masonry with thick mortar, focusing on compressive strength, tensile bond strength, and shear bond strength. The results indicate a positive relationship between mortar strength and AAC masonry strength, with observed failure patterns pointing to block-mortar interface problems. While AAC masonry shows promise, it currently falls short of clay brick masonry in terms of strength.

5. **FM Saiyed, AH Makwana (2014)**

Autoclaved Aerated Concrete (AAC) is an extremely lightweight masonry product, weighing as little as one-fifth of standard concrete due to its distinct cellular structure filled with millions of tiny air pockets. Made from readily available materials like sand, cement, lime, fly ash, gypsum, aluminum powder, water, and an expansion agent, AAC can expand up to five times its raw material volume, with an air content of 70% to 80%. This efficiency positions AAC as a promising solution to the construction industry's ongoing material shortages and environmental issues. This study outlines the AAC manufacturing process and its benefits compared to traditional concrete.

6. **R Sudhakar, B Balakrishnan (2023)**

Autoclaved Aerated Concrete (AAC) masonry systems are frequently utilized as partition walls in framed buildings, but they often experience cracking over time due to dimensional changes caused by fluctuations in temperature and relative humidity (RH). Previous research has shown that bedding mortar significantly impacts these dimensional changes. This study examines how temperature and RH affect AAC blocks, both with and without bedding mortars, under controlled and ambient conditions. It also compares the dimensional changes in AAC blocks to those in traditional clay and fly ash bricks. Results from one month of experiments indicate that both AAC blocks and bedding mortar undergo significant dimensional changes influenced by the conditions of the masonry system, RH, and temperature. The study concludes with recommendations at both the component and system levels to help reduce crack formation in AAC masonry.

7. **A Farid, A Aidan (2017)**

Autoclaved aerated concrete (AAC) is a sustainable material recognized for its lightweight, heat, and sound insulation properties, which contribute to reduced energy consumption. However, it has relatively low compressive strength compared to conventional concrete masonry units. This paper investigates a new AAC-concrete sandwich composite designed to create a lightweight, load-bearing building block using construction and demolition waste, including cement and fine powder.

8. **D Ferretti, B Gherri (2018)**

This paper aims to create a comprehensive set of eco-mechanical indexes to assess the mechanical performance and environmental attributes of autoclaved aerated concrete (AAC) blocks. It starts by reviewing existing sustainability indexes for concrete and subsequently develops tailored eco-mechanical

indexes for AAC masonry blocks to allow for comparisons with lightweight aggregate concrete blocks. The results show that, based on current information, only a limited number of parameters effectively capture the overall sustainability of AAC blocks. While recent studies have concentrated on the structural properties of these materials, there is a significant gap in environmental data that requires further exploration in future research for more dependable evaluations.

**9. M Kaluza (2020)**

Choosing the right strengthening method for masonry structures is challenging due to the diverse materials involved. This article evaluates various external strengthening techniques using different glass-fiber-based materials on masonry walls constructed from autoclaved aerated concrete (AAC), commonly used in low-rise urban buildings. The study employs GFRP sheets and two types of glass meshes as reinforcement. The walls undergo diagonal compression testing to mimic shear conditions, with the research concentrating on the cracking process, shear capacity, and modes of failure in the tested walls.

**10. A Raj, AC Borsaikia (2019)**

Recent studies have demonstrated that various industrial wastes can be transformed into valuable products, especially in the construction sector. In India, the accumulation of solid waste poses a major environmental challenge, leading to the creation of building materials from available environmental waste. This paper offers an overview of autoclaved aerated concrete (AAC) as a viable building material, highlighting the sustainable approach of substituting sand with solid and industrial wastes in its manufacturing. It outlines the current status of AAC production, the integration of industrial wastes, the entire manufacturing process, as well as the benefits, applications, cost-effectiveness, challenges, and prospects for AAC.

**11. SA Bhukhari, D Pati (2023)**

NAAC (Nano-Aggregate Aerated Concrete) is a lightweight concrete that incorporates waste materials as partial substitutes for fine aggregates, promoting sustainable development by fulfilling current needs without jeopardizing future resources. While materials such as fly ash, geopolymer, and rice husk have been employed, others like waste marble dust, granite dust, and rubber have not yet been utilized. This review paper emphasizes the advantages of NAAC blocks and the waste materials that improve their mechanical properties, concentrating on density, water absorption, compressive strength, and thermal conductivity. Additionally, it includes a case study comparing the cost and time effectiveness of NAAC blocks with AAC blocks and conventional red clay bricks using Primavera Software.

**12. S Kumarasamy, S Jeevanantham (2024)**

Aerated concrete blocks (AAC) represent an innovative construction technology created by mixing fly ash, cement, lime, water, and an aerating agent. Primarily manufactured as prefabricated panels and cuboid blocks, AAC is distinguished by its numerous closed air spaces, which contribute to its lightweight, low density, and energy efficiency. The manufacturing process involves incorporating a foaming additive into the concrete, shaping it in various molds, and then wire-cutting and steam-heating the material through a method known as autoclavingPorotherm bricks are produced from materials such as coal ash, rice husk, granite slurry, and natural clay. They feature horizontal or vertical perforations and are recognized for their fire resistance, durability, and lightweight properties. These bricks can be applied with dry mortar, eliminating the need for curing. In this project, the fly ash content has been increased to 30%, while the cement content has been decreased to 20%. The newly formed blocks will undergo various strength tests and will be compared to both Porotherm bricks and AAC blocks.

**13. A Thakur, AK Tiwary (2021)**

In India, traditional clay bricks are the primary filler material in construction, significantly influencing the built environment and project costs. Recently, Autoclaved Aerated Concrete (AAC) has emerged as a viable alternative to clay and fly ash bricks. While AAC blocks have been in use since 1924, they currently account for only 16-18% of the construction market in India. AAC blocks provide advantageous mechanical properties, low bulk density, improved thermal and acoustic insulation, lightweight design, and ease of installation, making them an attractive option to replace clay bricks. This study seeks to demonstrate the potential of AAC blocks as infill material, advocating for their use in creating more energy-efficient and sustainable buildings, especially in hilly areas.

**14. V Thamke, N Saravade (2024)**

To remain competitive in the expanding construction sector, structural engineers need to emphasize time efficiency. This paper explores the use of STAAD Pro software for analyzing and designing a multi-story residential building (G+5) located in an earthquake-sensitive Zone II, utilizing both conventional and Autoclaved Aerated Concrete (AAC) bricks. The study performs static analysis under medium soil conditions, evaluating parameters such as lateral displacement, axial load on columns, storey drift, shear forces, and moment diagrams per IS 1893:2002. The objective is to compare the properties of various brick types, including fly ash and AAC bricks, and their influence on building design while also addressing the building's conditional and economic factors.

**15. A Raj , AC Borsaikia (2020)**

Autoclaved Aerated Concrete (AAC) blocks are used in both load-bearing and non-load-bearing masonry walls, where their tensile and shear strengths are greatly affected by the bond strength at the block-mortar interface. This article investigates the bond strength of AAC blocks with ordinary sand-cement mortar and various polymer-modified mortars. It introduces a method to improve bond strength without changing the block's surface by applying a thin cement-slurry coating before adding a thicker layer of sand-cement mortar. The study assesses shear bond strength through a triplet test and tensile

bond strength using a cross-couplet test, while also examining failure patterns during these tests. Additionally, cost estimates for AAC walls with different interface types are included. The results show that utilizing a weak mortar combined with a cement-slurry coating is more effective than ordinary sand-cement or polymer-modified mortars, providing a better balance of bond strength and cost efficiency.

**16. RB Philip, A Mohan (2022)**

The environment is facing challenges in managing waste generated by human activities, particularly due to concrete, which is non-decomposable and environmentally harmful. As the demolition of concrete structures increases, so does the construction of new ones. This paper compares a conventional Reinforced Cement Concrete (RCC) slab system with a slab system utilizing Autoclaved Aerated Concrete (AAC) blocks and a steel grid, using ETABS software for analysis. Despite the higher initial construction costs of the AAC and steel grid slab system, its lower maintenance costs, longer lifespan, and potential for reuse make it more beneficial than traditional RCC slabs. This alternative approach helps reduce concrete consumption, promoting more environmentally sustainable construction practices.

**17. P Nagavenkatasaikumar (2017)**

The adoption of Autoclaved Aerated Concrete (AAC) blocks in India's construction sector offers significant benefits for various groups. Project developers gain from quicker and more economical building processes, while builders focused on sustainability prefer eco-friendly materials. Residents in AAC block structures experience enhanced safety and lower energy expenses for heating and cooling. Nonetheless, it's essential to explore how AAC interacts with soil and its environmental implications, especially concerning fly ash and silica ash, which may exacerbate air pollution. This project examines the benefits and challenges of using AAC blocks in contemporary construction practices and their environmental impact.

**18. S Bansal (2023)**

Autoclaved Aerated Concrete (AAC) was first introduced in India during the 1970s, but by 2008, there were only three factories producing less than 1 million $m^3$ annually. Since 2009, the popularity of AAC blocks has risen due to their high strength, excellent insulation, fire resistance, sound absorption, and cost-effectiveness, alongside government support for sustainable building materials. By 2022, the number of AAC factories increased to over 150, with a total capacity exceeding 25 million $m^3$ per year—a 25-fold growth in nearly 15 years. Despite this rapid expansion, AAC still makes up only 5%-6% of the walling industry in India, highlighting substantial growth potential. AAC-reinforced products have also been reintroduced but currently account for less than 1% of total AAC sales.

**19. C Krishnan, A Sidhaart (2023)**

There is a continuous demand for alternatives to natural materials due to concerns over overconsumption and the need for enhanced performance. This is especially true in masonry construction, which has led to the adoption of materials like Autoclaved Aerated Concrete (AAC) blocks in place of traditional bricks. This study examines the material and structural advantages of AAC blocks, which are gaining popularity in the construction industry for their eco-friendly nature and alignment with sustainability objectives. The research focuses on the vertical strength of AAC block panels, comparing them with traditional clay and fly ash bricks. The investigation is conducted in two phases: first, by modeling a 10x10 foot wall to determine material quantities, and second, by evaluating characteristics such as durability, space occupancy, ultimate strength, and electrical conductivity. The findings indicate that AAC blocks demonstrate greater efficiency than conventional brick units. While AAC blocks may have a higher initial cost, this is balanced by shorter construction times, uniform quality, and potential savings in the long run.

**20. NP Zade, P Sarkar (2024)**

Embodied energy is an essential consideration in the selection of building materials and is closely related to the sustainability of construction. Although Autoclaved Aerated Concrete (AAC) masonry is increasingly favored in reinforced concrete (RC) framed buildings, its embodied energy has not been thoroughly studied. This paper examines the initial embodied energy of a typical RC framed building infilled with AAC block masonry and compares it to a similar structure using traditional fired clay bricks. The results show that replacing fired clay bricks with AAC block masonry leads to a reduction in material flow and embodied energy by 13% and 18%, respectively. Furthermore, the study assesses the life cycle energy of AAC block masonry infill using a life cycle assessment approach, providing valuable insights for the field. The findings indicate that utilizing AAC block masonry in RC-framed buildings can improve the sustainability of the built environment.

## 3. Data analysis and interpretation:

**Table 1:**

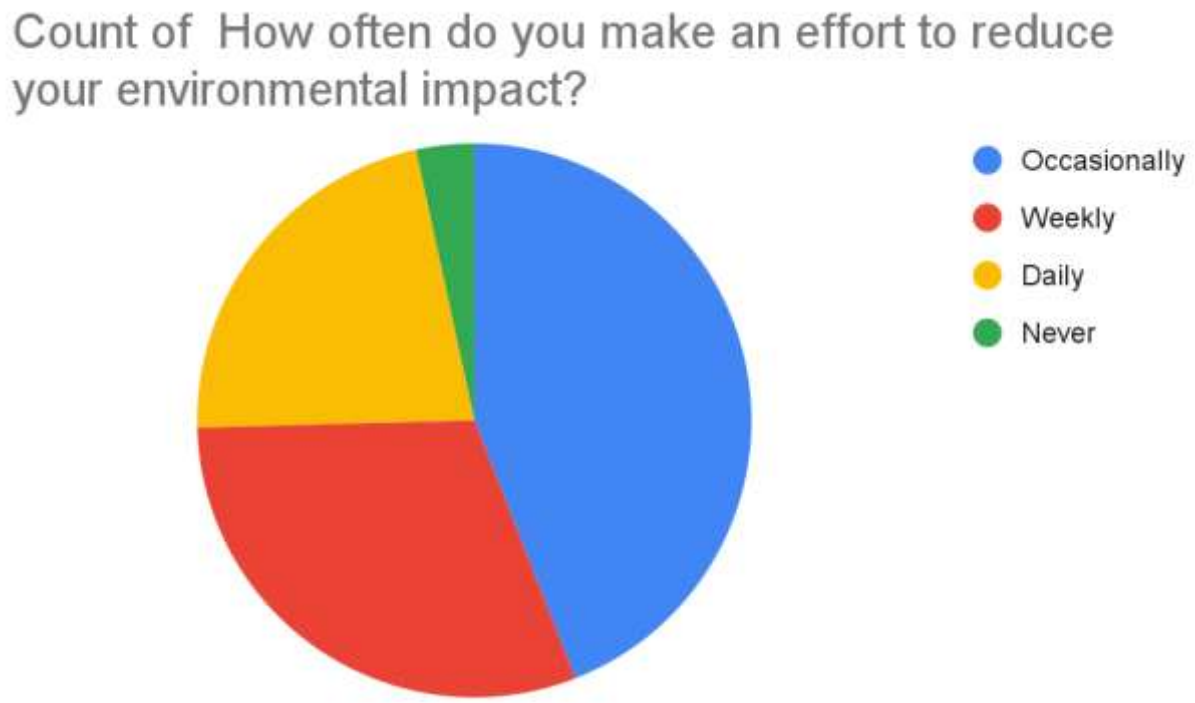
How often do you make an effort to reduce your environmental impact?

| Sl. No. | Factors | Number of Respondents | Percentage |
|---|---|---|---|
| 1 | Weekly | 18 | 30.51% |
| 2 | Occasionally | 26 | 44.07% |

| | | | |
|---|---|---|---|
| 3 | Never | 2 | 3.39% |
| 4 | Daily | 13 | 22.03% |
| | Total | 59 | 100 |

(Source: Primary Data)

The data presented in Table 1 illustrates how frequently individuals attempt to reduce their environmental impact. Respondents had four choices: Weekly, Occasionally, Never, and Daily, with a total of 59 participants. This information stems from a survey where people shared their efforts to adopt more eco-friendly habits. The table emphasizes these four categories: Weekly, Occasionally, Daily, and Never.




What's particularly interesting is that the results show the majority of respondents—around 44.07%—make an effort occasionally. Following closely, 30.51% indicated they strive to be environmentally conscious on a weekly basis. Daily efforts were reported by 22.03% of participants, while a small 3.39% confessed they never take steps to lessen their ecological footprint.

The fact that occasional efforts are the most prevalent, along with the weekly actions, suggests that for some, maintaining a steady commitment to environmental awareness can be challenging. It's also notable that only a tiny fraction of respondents never attempt to make a difference, which points to a generally optimistic outlook on sustainability.

This table provides valuable insights into how consumers perceive sustainability, helping us grasp how integrated it is into their lives and what measures can be taken to promote even more sustainable practices in their everyday routines.

**Table 2:**

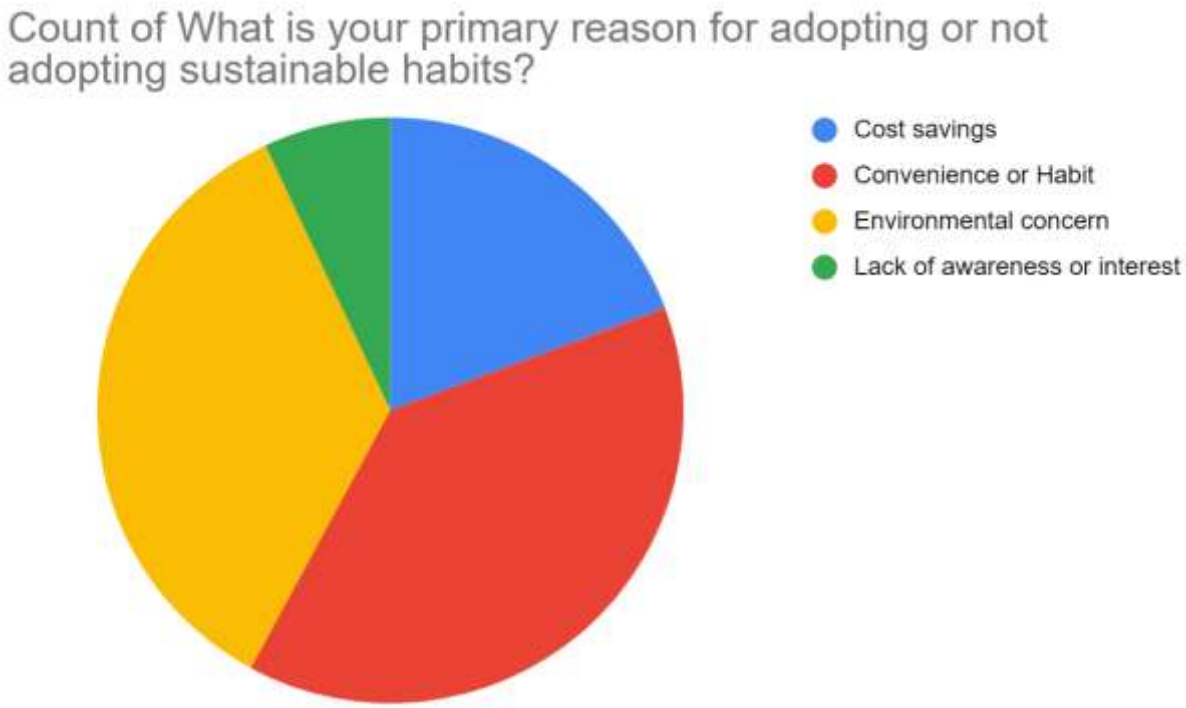
What is your primary reason for adopting or not adopting sustainable habits?

| Sl. No. | Factor | SUM of | Percentage |
|---|---|---|---|
| 1 | None of the above | 2 | 3.39% |
| 2 | Convenience or Habit | 22 | 37.29% |
| 3 | Cost savings | 11 | 18.64% |
| 4 | Environmental concern | 20 | 33.90% |

| | | | |
|---|---|---|---|
| 5 | Lack of awareness or interest | 4 | 6.78% |
| | Grand Total | 59 | 100 |

(Source: Primary Data)

The table outlines the main reasons why people either embrace or shy away from sustainable habits. It breaks down into categories like convenience or habit, cost savings, environmental concern, lack of awareness or interest, and none of the above. This data sheds light on the key motivators and obstacles that shape our choices regarding sustainability.




The information in Table 2 comes from a survey conducted with a group of respondents who were asked to pinpoint their primary reasons for adopting or not adopting sustainable habits. The table highlights five key factors: Convenience or Habit, Environmental Concern, Cost Savings, Lack of Awareness or Interest, and None of the Above. The findings reveal that the largest group of respondents, 37.29%, base their sustainable habits on convenience or habit. Following closely, 33.90% cited environmental concern as their main reason. Cost savings were a motivating factor for 18.64% of respondents, while 6.78% mentioned a lack of awareness or interest as their reason. A small fraction, 3.39%, didn't resonate with any of the listed factors.

This table offers valuable insights into what drives and hinders sustainable behavior. The emphasis on cost-related factors and the lack of awareness among some respondents point to opportunities for educational initiatives and incentives that could foster greater engagement in sustainable practices.

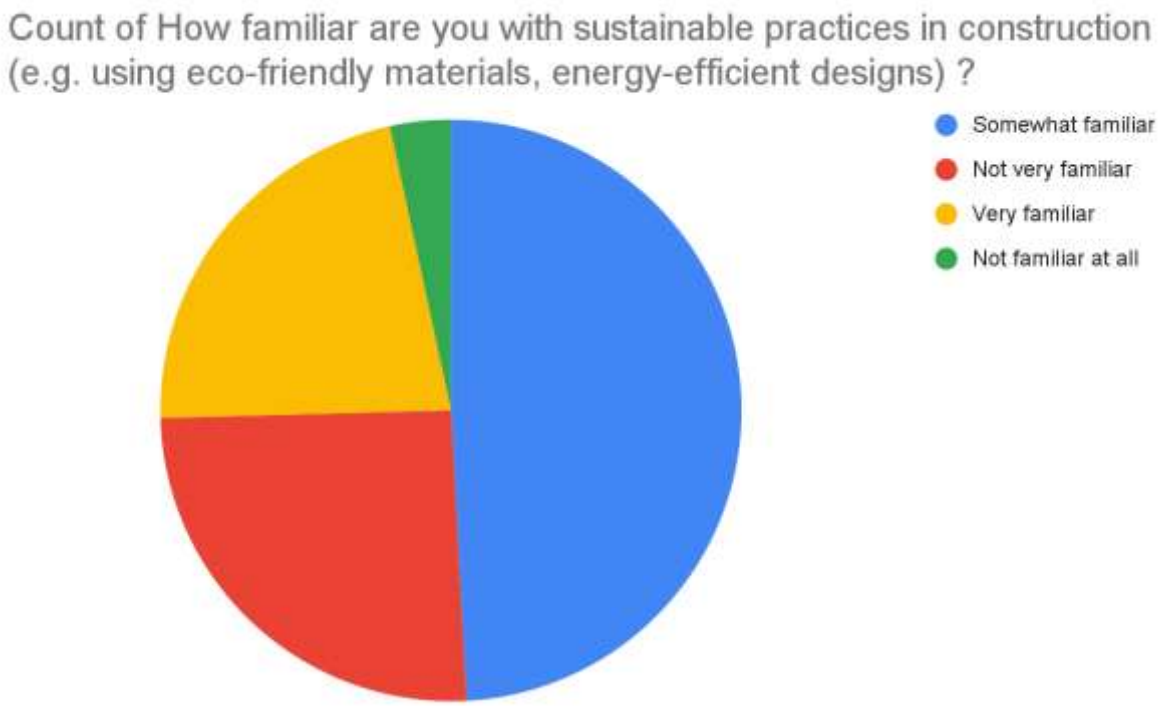
**Table 3:**

How familiar are you with sustainable practices in construction (e.g. using eco-friendly materials, energy-efficient designs)?

| Sl. No. | Factor | Value | Percentage |
|---|---|---|---|
| 1 | Not familiar at all | 2 | 3.39% |
| 2 | Not very familiar | 15 | 25.42% |
| 3 | Somewhat familiar | 29 | 49.15% |
| 4 | Very familiar | 13 | 22.03% |
| | Grand Total | 59 | 100 |

(Source: Primary Data)

The table breaks down how familiar respondents are with sustainable practices in construction into four distinct levels: Not Familiar at All, Not Very Familiar, Somewhat Familiar, and Very Familiar. These categories show different levels of awareness about eco-friendly materials and energy-efficient designs.




The data in Table 3 comes from a survey conducted with a sample of respondents who were asked about their familiarity with sustainable construction practices. The responses were sorted into four categories: Not Familiar at All, Not Very Familiar, Somewhat Familiar, and Very Familiar. The results reveal that a significant portion of respondents, 49.15%, feel somewhat familiar with sustainable construction practices. Those who consider themselves very familiar made up 22.03%, while 25.42% reported being not very familiar. A small group, just 3.39%, indicated that they were not familiar at all.

This shows us that there is a large scope for sustainable practices to be included in construction and also popularising them within the general crowd to raise awareness about the same. Governments, industry experts, and educational institutions should take note of this and work towards increasing the awareness of sustainable construction practices for overall development and increasing the penetration of sustainability in the construction sector.

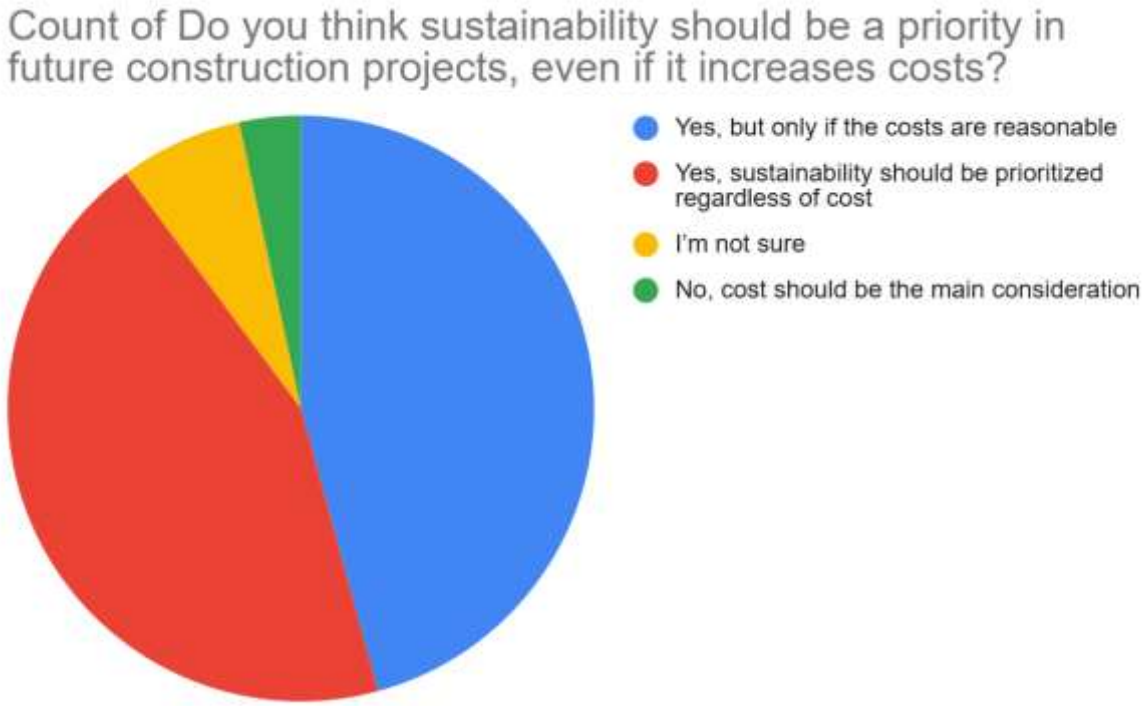
**Table 4:**

Do you think sustainability should be a priority in future construction projects, even if it increases costs?

| Sl. No. | Factors | Value | Percentage |
|---|---|---|---|
| 1 | I'm not sure | 4 | 6.78% |
| 2 | No, cost should be the main consideration | 2 | 3.39% |
| 3 | Yes, but only if the costs are reasonable | 27 | 45.76% |
| 4 | Yes, sustainability should be prioritized regardless of cost | 26 | 44.07% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table breaks down how people feel about whether sustainability should take center stage in future construction projects, even if it means spending a bit more. There are four main responses: Not Sure, No (Cost Should Be the Main Consideration), Yes (But Only if Costs Are Reasonable), and Yes (Sustainability Should Be Prioritized Regardless of Cost). These categories show different levels of willingness to put sustainability first in construction.




The data in Table 4 comes from a survey of various respondents who were asked if sustainability should be a priority in future construction projects, even if it leads to higher expenses. This table captures four distinct viewpoints: Not Sure, No (Cost Should Be the Main Consideration), Yes (But Only if Costs Are Reasonable), and Yes (Regardless of Cost). The results reveal that a significant portion of respondents, 45.76%, support sustainability in construction but only if the costs are kept in check. Almost as many, 44.07%, believe that sustainability should be prioritized no matter the cost. A smaller group, 6.78%, were unsure, while just 3.39% felt that cost should be the main focus.

This table offers valuable insights into how the public views sustainable construction. The nearly even split between those who support sustainability with cost considerations and those who prioritize it without hesitation suggests a growing trend toward greener building practices, although cost remains a key factor. The small percentage of respondents who think cost should be the only concern highlights an increasing awareness of the long-term advantages of sustainable construction. These insights can assist policymakers and developers in finding a balance between affordability and environmental responsibility in upcoming projects.

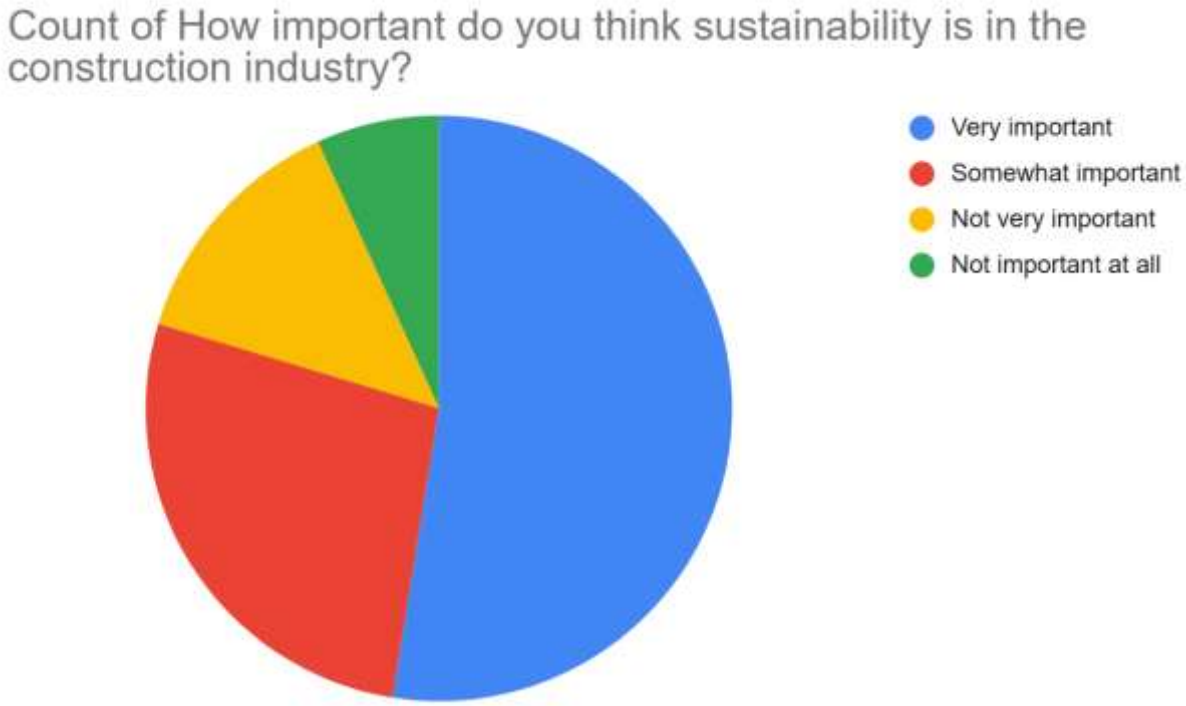
**Table 5:**

How important do you think sustainability is in the construction industry?

| Sl. No. | Factors | Value | Percentage |
|---|---|---|---|
| 1 | Not important at all | 4 | 6.78% |
| 2 | Not very important | 8 | 13.56% |
| 3 | Somewhat important | 16 | 27.12% |
| 4 | Very important | 31 | 52.54% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table breaks down how respondents feel about the importance of sustainability in the construction industry into four distinct categories: Not Important at All, Not Very Important, Somewhat Important, and Very Important. These categories show different levels of how significant people think sustainable practices are in construction.




The data in Table 5 comes from a survey conducted with a sample of respondents who were asked about their views on sustainability in the construction field. This table captures four different opinions: Not Important at All, Not Very Important, Somewhat Important, and Very Important. The results reveal that a significant majority, 52.54%, believe sustainability is very important in the construction sector. Additionally, 27.12% see it as somewhat important, while 13.56% think it's not very important. A smaller group, 6.78%, feels that sustainability isn't important at all.

This table offers valuable insights into how the public perceives sustainability in construction. The high percentage of respondents who regard it as very important indicates a strong awareness of the impact that sustainable practices can have in the industry. However, the fact that some individuals see it as less significant suggests that there's still a need for more education and advocacy. These findings can guide policymakers and construction companies in promoting the benefits of sustainability, helping to ensure that environmentally friendly practices take center stage in future projects.

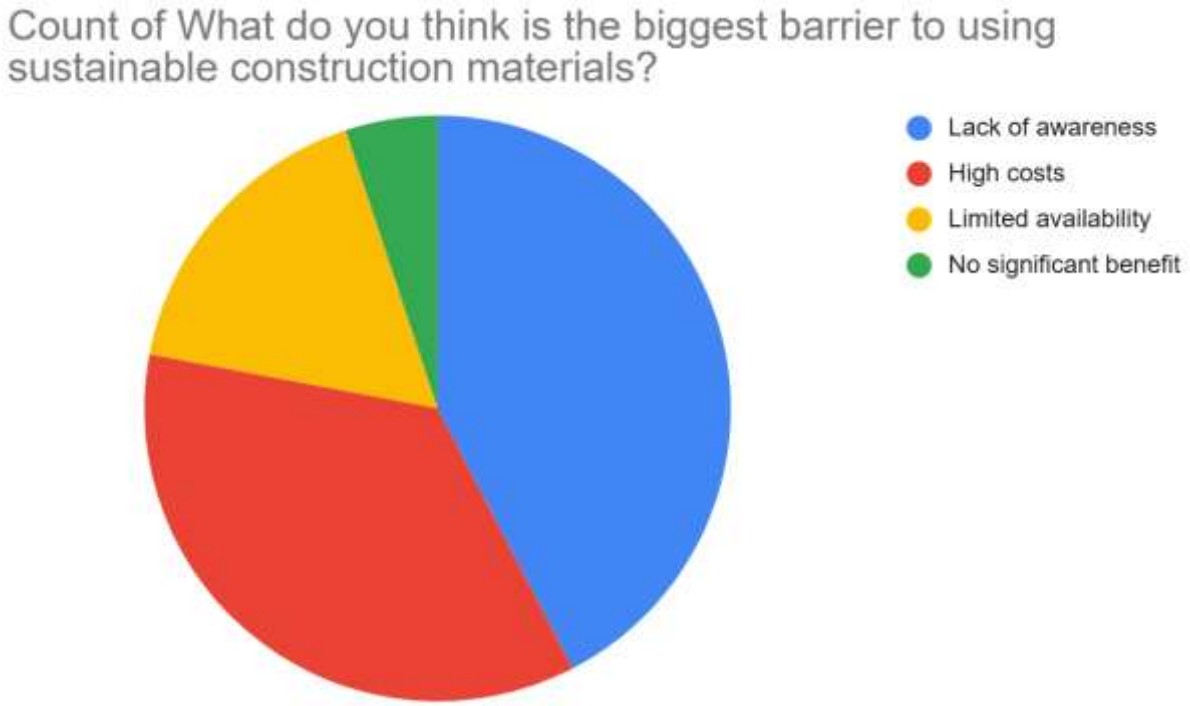
**Table 6:**

What do you think is the biggest barrier to using sustainable construction materials?

| Sl. No. | Factors | Values | Percentage |
|---|---|---|---|
| 1 | High costs | 21 | 35.59% |
| 2 | Lack of awareness | 25 | 42.37% |
| 3 | Limited availability | 10 | 16.95% |
| 4 | No significant benefit | 3 | 5.08% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table classifies respondents' opinions on the largest obstacles to applying sustainable building materials into four factors: High Costs, Lack of Awareness, Limited Availability, and No Significant Benefit. These factors identify the main obstacles hindering the extensive use of sustainable materials in construction.




The information in Table 6 is derived from the survey among a sample of respondents. The survey participants were asked to name the greatest obstacle in employing sustainable building materials. The table illustrates four main challenges: High Costs, Lack of Awareness, Limited Availability, and No Significant Benefit. According to the findings, the most frequently named challenge is a lack of awareness, which was named by 42.37% of the respondents. High costs come second, with 35.59% naming it as the greatest problem. Limited availability was the preference of 16.95%, while 5.08% feel that sustainable materials do not provide much benefit.

The table gives useful insights into the major impediments to the uptake of sustainable materials in construction. The revelation that awareness is the largest impediment indicates that educational programs and improved information dissemination would promote the increased use of environmentally friendly materials. On the other hand, the major issue of high costs indicates that financial incentives or cost-saving options need to be implemented to make sustainability more viable.

The proportionately smaller percentage of respondents naming availability as a problem indicates that supply is less of an issue than awareness and cost. Such results can assist policymakers and business leaders in creating plans to encourage sustainable materials by enhancing education, lowering prices, and opening up access.

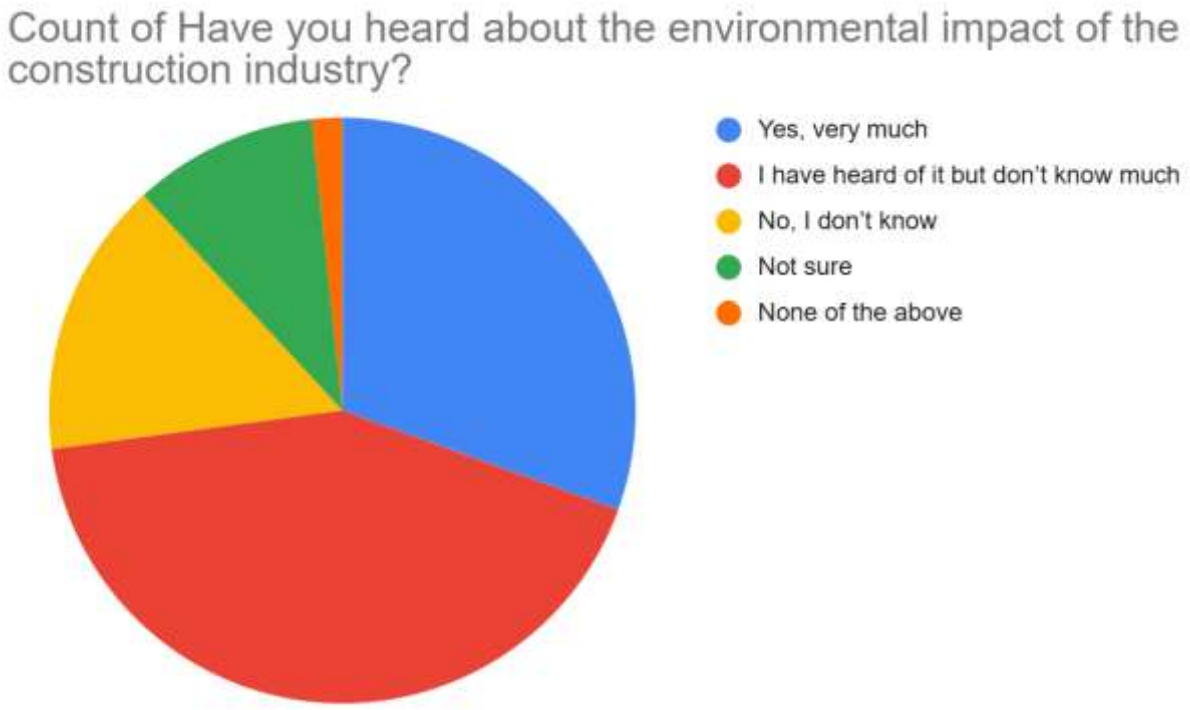
**Table 7:**

Have you heard about the environmental impact of the construction industry?

| Sl. No. | Factors | Values | Percentage |
|---|---|---|---|
| 1 | None of the above | 1 | 1.69% |
| 2 | I have heard of it but don’t know much | 25 | 42.37% |
| 3 | No, I don’t know | 9 | 15.25% |
| 4 | Not sure | 6 | 10.17% |
| 5 | Yes, very much | 18 | 30.51% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table classifies respondents' knowledge about the environmental consequences of the construction sector into five categories: None of the Above, I Have Heard of It but Don't Know Much, No, I Don't Know, Not Sure, and Yes, Very Much. These represent different levels of knowledge regarding the environmental consequences of construction work.




The information in Table 7 is derived from the survey of a sample of respondents. The respondents were queried if they had heard of the environmental effects of the construction sector. This table depicts five levels of awareness: None of the Above, I Have Heard of It but Don't Know Much, No (I Don't Know), Not Sure, and Yes (Very Much). The findings reveal that 42.37% of the respondents have heard about the issue but do not possess detailed knowledge about it. At the same time, 30.51% reported they know a lot about the subject. 15.25% said they knew nothing about it, and 10.17% were not sure. Only a very small fraction, 1.69%, chose None of the Above.

The table indicates public awareness about the environmental impact of the construction sector. Although a large majority of respondents have some degree of familiarity, less than one-third (30.51%) are well-informed, indicating an awareness gap in greater understanding. The large proportion of respondents who have only a superficial knowledge (42.37%) indicates that more educational campaigns are needed to fill the awareness gap. Also, the combined 25.42% of respondents who don't know or aren't sure suggests that more readily available information regarding construction's environmental impact would be useful. These results highlight the need for awareness campaigns and green-conscious initiatives in the construction industry to raise public awareness and promote environmentally friendly construction practices.

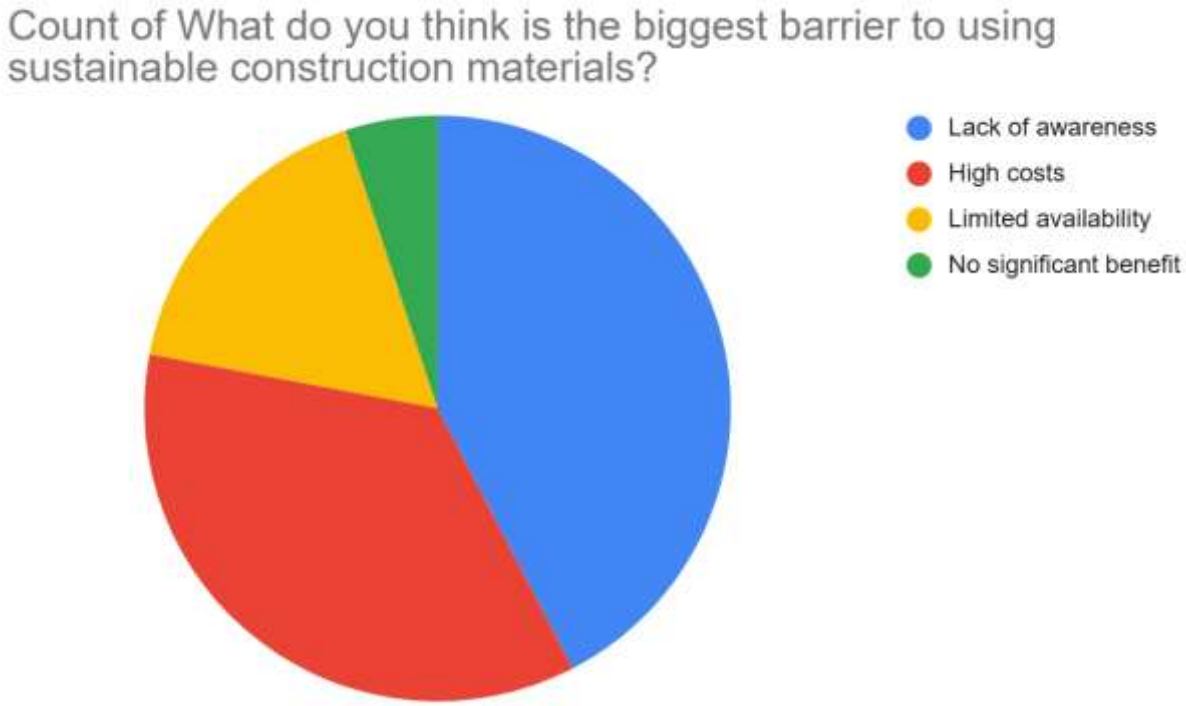
**Table 8:**

Do you think traditional brick kilns contribute to pollution?

| Sl. No. | Factors | Values | Percentage |
|---|---|---|---|
| 1 | No, they don’t | 2 | 3.39% |
| 2 | Not sure | 15 | 25.42% |
| 3 | Yes, but not much | 15 | 25.42% |
| 4 | Yes, significantly | 27 | 45.76% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table groups respondents' views about whether conventional brick kilns are polluters into four levels: No, They Don't; Not Sure; Yes, But Not Much; and Yes, Significantly. The levels capture different perceptions of the contribution of brick kiln activities to the environment.




The information in Table 8 is derived from the survey of a sample of respondents. The respondents were questioned if they think that traditional brick kilns are a cause of pollution. This table reflects four different opinions: No, They Don't; Not Sure; Yes, But Not Much; and Yes, Significantly. The findings show that most of the respondents, 45.76%, think that traditional brick kilns significantly cause pollution. An equal proportion of respondents, 25.42%, were either uncertain or believed that brick kilns do, but not significantly. A tiny proportion, 3.39%, replied that conventional brick kilns do not pollute.

The table gives us an idea of how people perceive the environmental effects of brick kilns. Almost half of the people (45.76%) identify a considerable pollution effect implies increasing awareness of the environmental problems related to brick manufacturing.

The large percentage of uncertainty (25.42%), though, signifies a knowledge gap that might be filled by raising awareness. The 25.42% that admit to a small effect indicate that although individuals are aware of pollution from brick kilns, they might not be aware of the full magnitude of the harm. These results point towards increased education on sustainable construction practices and the encouragement of environmentally friendly substitutes for conventional brick kilns.

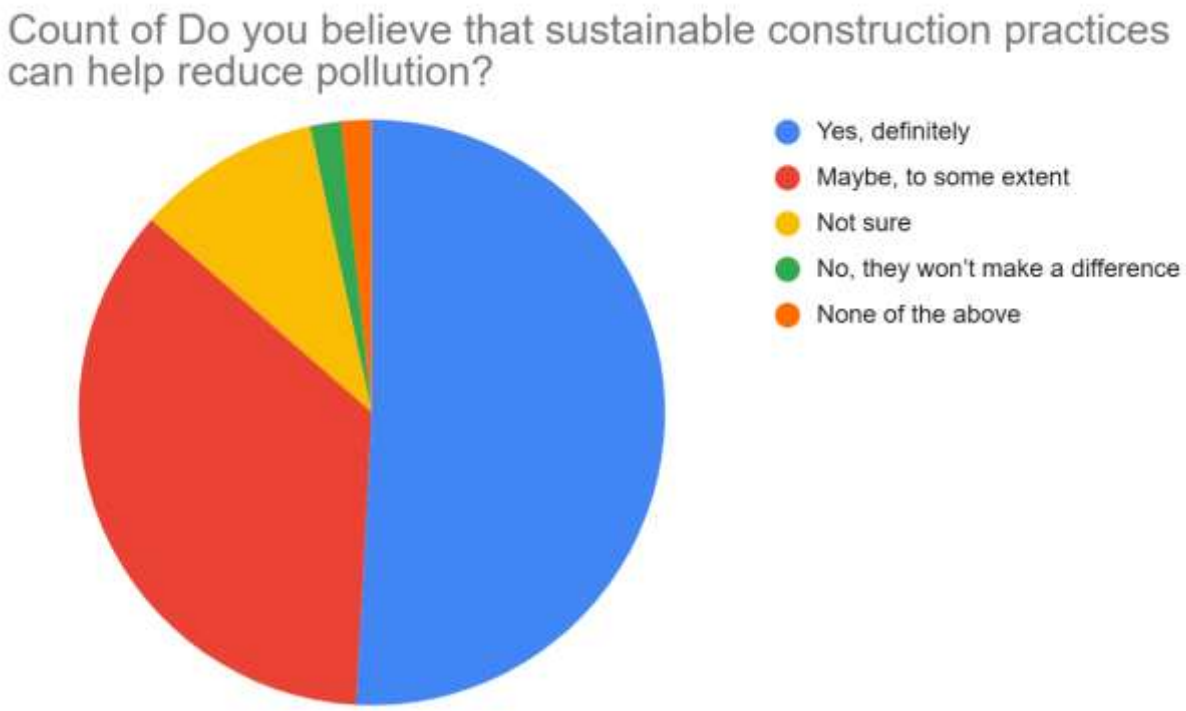
**Table 9:**

Do you believe that sustainable construction practices can help reduce pollution?

| Sl. No. | Factors | Values | Percentage |
|---|---|---|---|
| 1 | Maybe, to some extent | 22 | 37.29% |
| 2 | No, they won’t make a difference | 1 | 1.69% |
| 3 | None of the above | 1 | 1.69% |
| 4 | Not sure | 6 | 10.17% |
| 5 | Yes, definitely | 29 | 49.15% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table shows survey findings on whether the respondents think that sustainable construction practices can minimize pollution. The categories are: Maybe, to some extent; No, they won't make a difference; None of the above; Not sure; Yes, definitely.




The figures in the table are derived from a survey among a sample of 59 people to gauge their opinions on whether sustainable construction practices can curb pollution. The figures show a firm belief in the effectiveness of sustainable practice, as 49.15% of the respondents firmly believed that sustainable construction practice can help curb pollution, representing the largest percentage of responses.

Meanwhile, 37.29% of respondents believe that sustainable construction can mitigate to some degree, reflecting a moderate degree of confidence in how effective they could be. This indicates that although most recognize the potential of these practices, they are uncertain about the degree of their impact.

A few respondents, 10.17%, were not sure if sustainable practices are effective, which shows that there is a lack of information or understanding on the topic. It is interesting to note that just 1.69% of respondents think that sustainable construction practices will not make any difference, and another 1.69% chose "None of the above," suggesting that these respondents might not have perceived a direct link between construction sustainability and reduced pollution.

This distribution is an overall optimism towards sustainable construction practices, with most respondents foreseeing a clear or partial advantage in pollution reduction, which could inform policymakers and stakeholders in the construction industry to give precedence to practical sustainable practices.

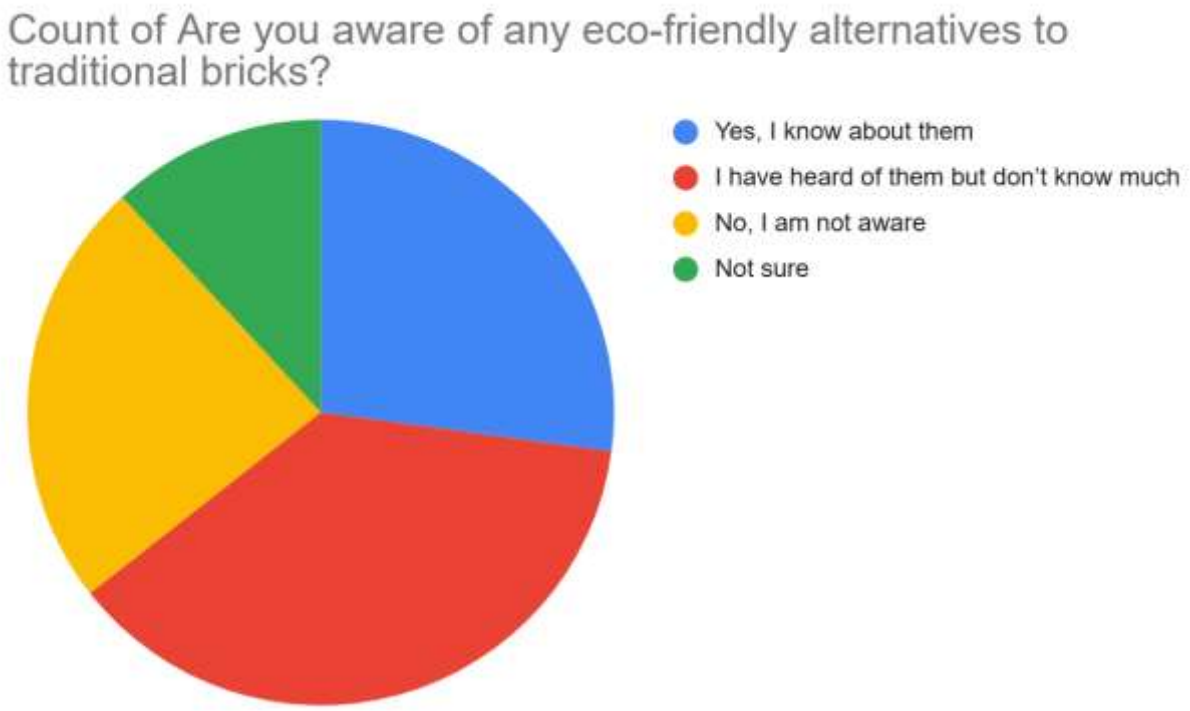
**Table 10:**

Are you aware of any eco-friendly alternatives to traditional bricks?

| Sl. No. | Factors | Values | Percentage |
|---|---|---|---|
| 1 | I have heard of them but don’t know much | 22 | 37.29% |
| 2 | No, I am not aware | 15 | 25.42% |
| 3 | Not sure | 7 | 11.86% |
| 4 | Yes, I know about them | 15 | 25.42% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table illustrates the level of respondents' knowledge of eco-friendly alternatives to conventional bricks. The categories are: "I have heard of them but don't know much," "No, I am not aware," "Not sure," and "Yes, I know about them."




The information in Table 10 indicates the exposure of 59 respondents to eco-friendly alternatives to conventional bricks. The majority of respondents (37.29%) have heard about these alternatives but aren't quite familiar with them. This indicates that although there is some degree of exposure, many might require more information to be entirely familiar with or practice these alternatives.

A further 25.42% of the respondents were not aware of the eco-friendly alternatives to bricks, which means that a quarter of the sample is not yet aware of green building materials. Interestingly, the same proportion (25.42%) of respondents reported that they are aware of these alternatives, reflecting a split base of awareness in the population.

Moreover, 11.86% of the respondents were "Not sure" regarding their knowledge, indicating that a lower percentage is unsure or uncertain regarding this subject.

Comparing the two groups, there is a fairly even split between those who are aware of eco-friendly alternatives (either by having heard about them or being familiar with them) and those who do not know or are unsure. This implies that although awareness does prevail, there is scope for increasing education about the green benefits and presence of these alternatives among the common populace. This information may be beneficial to companies or policymakers looking to increase the use of sustainable building materials and stimulate the wider use of green alternatives to conventional bricks.

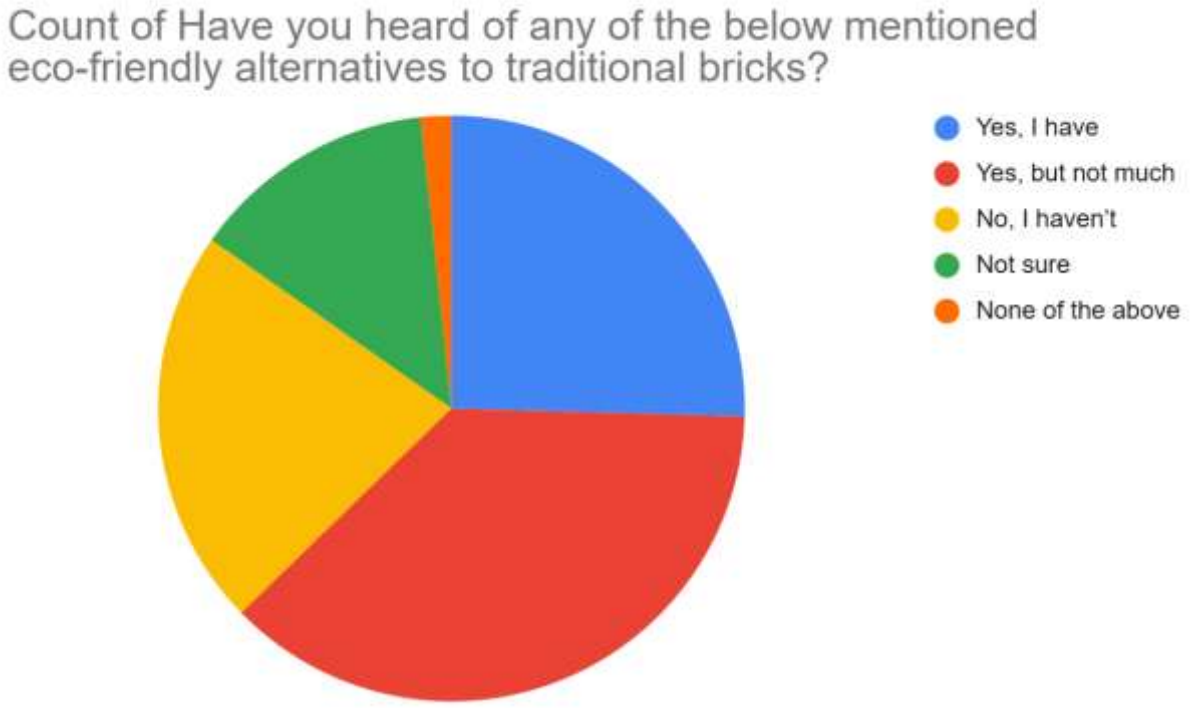
**Table 11:**

Have you heard of any of the below-mentioned eco-friendly alternatives to traditional bricks?

| Sl. No. | Factors | Values | Percentage |
|---|---|---|---|
| 1 | No, I haven’t | 13 | 22.03% |
| 2 | None of the above | 1 | 1.69% |
| 3 | Not sure | 8 | 13.56% |
| 4 | Yes, but not much | 22 | 37.29% |
| 5 | Yes, I have | 15 | 25.42% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table indicates respondents' knowledge of certain eco-friendly substitutes for conventional bricks. The options are: "No, I haven't," "None of the above," "Not sure," "Yes, but not much," and "Yes, I have."




The information in Table 11 shows the degree of familiarity among 59 respondents with certain eco-friendly substitutes for conventional bricks. A large percentage of respondents (37.29%) have heard of these substitutes but not clearly, which means that although they know about the idea, they might not be well-informed about the exact options available.

Another 25.42% of the respondents asserted that they know of green substitutes for conventional bricks, indicating an acceptable level of awareness. However, 22.03% of the respondents replied that they are not aware of any of the alternatives, which indicates that a large section of people are still unaware of such green building options.

The "Not sure" option, at 13.56%, indicates that there are respondents who are unclear if they have ever heard of these options, demonstrating uncertainty in their knowledge of the topic. The "None of the above" option, at 1.69%, indicates that an extremely small number of respondents do not identify with any of the given options.

Comparing across categories, we notice a significant gap between the aware and not aware of eco-friendly alternatives (either generally or to some extent). With more than 60% of the respondents showing some level of awareness, there exists room for more engagement and learning about these alternatives. The information indicates a potential for stakeholders in the construction sector to create awareness and enhance education on environmentally friendly building materials to further close the knowledge gap and enhance sustainability.

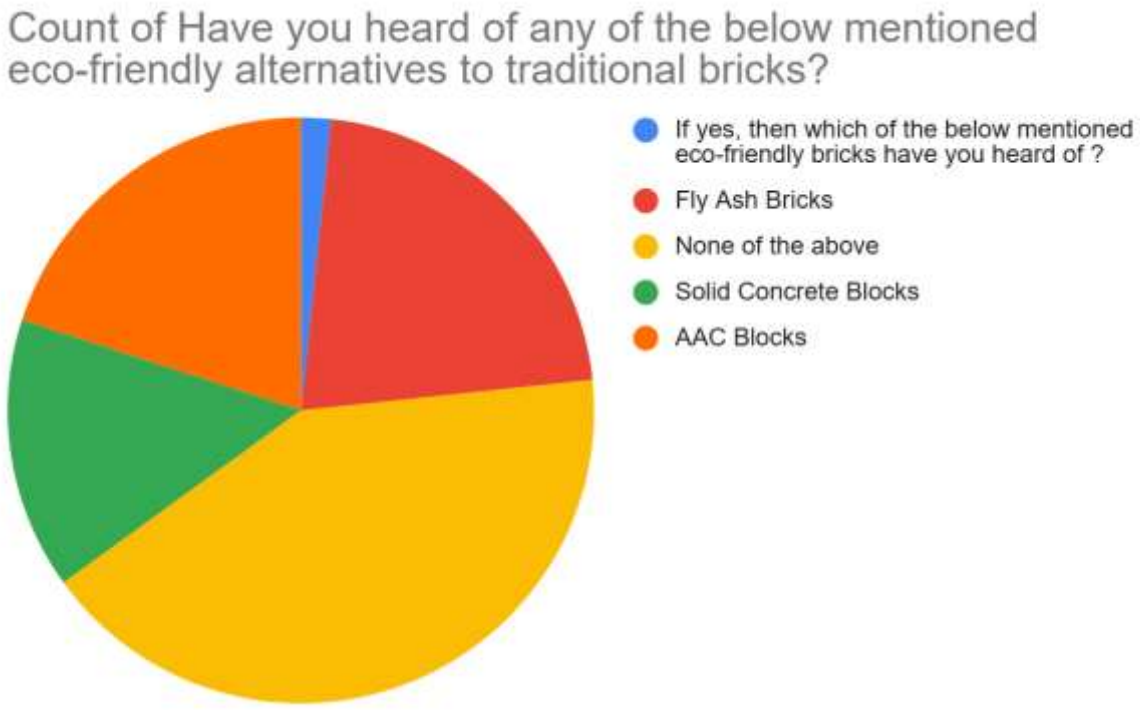
**Table 12:**

If yes, then which of the below-mentioned eco-friendly bricks have you heard of?

| Sl. No. | Factors | Values | Percentage |
|---|---|---|---|
| 1 | AAC Blocks | 13 | 22.03% |
| 2 | Fly Ash Bricks | 12 | 20.34% |
| 3 | None of the above | 25 | 42.37% |
| 4 | Solid Concrete Blocks | 9 | 15.25% |
| | Grand Total | 59 | 100.00% |

(Source: Primary Data)

The table shows respondents' familiarity with certain types of environmentally friendly bricks. The options are: AAC Blocks, Fly Ash Bricks, None of the above, and Solid Concrete Blocks.




The information in Table 12 indicates the awareness of 59 respondents on particular eco-friendly types of bricks. The most frequent kind of eco-friendly brick known to respondents is AAC Blocks (Autoclaved Aerated Concrete Blocks), with 22.03% of the respondents stating that they know of this choice. Next is Fly Ash Bricks, with 20.34% of the respondents expressing their familiarity with this green material.

Nonetheless, a considerable majority of respondents, 42.37%, responded that they hadn't heard about any of the cited green bricks, indicating an evident gap in information on these particular alternatives. This points towards the need for more education and awareness campaigns in the construction sector to introduce the public to the available eco-friendly options.

Solid Concrete Blocks, which are not generally regarded as a sustainable option in comparison to AAC Blocks and Fly Ash Bricks, were identified by 15.25% of the respondents. This may indicate some overlap or confusion in perception, as solid concrete blocks are not typically regarded as sustainable in comparison to other sustainable materials.

A comparison of the categories clearly shows that AAC Blocks and Fly Ash Bricks are the most recognized, although the category "None of the above" covers a large percentage of responses, which indicates that many respondents are either uninformed or unaware of these green alternatives. This information suggests a distinct opportunity for the promotion and education of more sustainable building materials in the industry, reducing the knowledge gap and promoting the broader use of environmentally friendly building practices.

## 4. Conclusion:

The public attitudes and practices survey helps to gauge people's attitudes and practices towards sustainability. It is essential in understanding how people engage with the environment during their daily lives and in areas such as the construction industry. Information collected from 59 participants' samples summarizes their attempts at minimizing their effects on the environment, reasons behind accepting or declining green practices, understanding of sustainable building practices, and opinions concerning the significance of sustainability in the construction industry. One of the biggest discoveries in the survey is that most of the respondents actually try to minimize their input into the environment, where 44.07% do so occasionally and 30.51% on a weekly scale. This indicates that although most are dedicated to sustainability, it may be challenging for others to be able to sustain the effort constantly. Even a meager 3.39% said they never do something to minimize their environmental footprint, showing overall a positive attitude towards sustainability among the respondents. When asked for the main reasons why they made or did not make the switch to sustainable living, the survey showed that habit or convenience was the most frequent reason, with 37.29% of the respondents naming it as their main driver. Environmental consciousness was the second major incentive, and 33.90% of the respondents cited this as the most important reason. Economizing acted as an incentive for 18.64% of the respondents. This underscores the need to make sustainable action cost-saving and convenient to promote its wider adoption. There was variation in

familiarity with sustainable practices among construction respondents. More than half, 49.15%, claimed to have some level of awareness of green materials and energy-efficient building shapes, though 22.03% noted high awareness. However, 25.42% were not very aware, and very few, 3.39%, did not know. This calls for more education and exposure to sustainable building to enable them to practice. The questionnaires also sought the opinions of respondents on the importance of sustainability in the construction industry. The highest percentage, 52.54%, thought that sustainability is extremely important, while 27.12% said it was somewhat important. This high rate of support suggests that there has been a growing awareness of the benefits of sustainability in the construction sector. It is, however, surprising that some individuals think it is somewhat less important because it implies ongoing education and persuasion are needed. When questioned whether sustainability must come first in future building projects even if it costs more, the interviewees were divided nearly half and half. Approximately 44.07% of them thought that sustainability must come first at any cost, whereas 45.76% would like it if the costs are not excessive. This is a reflection of the desire to implement sustainable methods but also indicates the necessity to consider costs. The greatest impediments to the uptake of sustainable building materials were cost (35.59%) and lack of awareness (42.37%). 16.95% of the respondents identified limited availability as a problem. This indicates that education initiatives and fiscal incentives would be key catalysts for the use of sustainable materials in building construction. The survey also measured the respondents' level of awareness regarding the environmental impact of the construction sector. Whereas 42.37% were aware but not very informed, and 30.51% stated they were highly informed. The awareness gap here implies that further education campaigns have to be organized to educate people and induce the use of green practices. Last but not least, the participants were asked how they perceive conventional brick kilns as air polluters. A majority of 45.76% believed that they contribute a lot to pollution, while 25.42% believed that they contributed but not on a large scale. This indicates the necessity for campaigns and education to assist in curbing pollution from such sources.

## Key findings:

- Most respondents try to minimize their environmental footprint, but few do so daily, suggesting that day-to-day commitment is not easy.
- Habit, convenience, and environmental concern are the key reasons for practicing sustainable methods, and cost and lack of awareness are the key reasons for not practicing.
- Most respondents are not very familiar with sustainable building practices, suggesting that awareness needs to be raised.
- There is a general consensus to give greater emphasis to sustainability in future construction, though at a higher cost, but cost is also an important factor.
- Ignorance has been cited as the largest deterrent towards the use of green building products.
- Although everyone knows something about the ecological implication of the building sector, people as a whole are not that aware practically.
- The majority of the respondents are not aware of the eco-friendly options that can replace conventional bricks.
- Environmental Actions: 44.07% never take environmental actions, 30.51% weekly, and 22.03% daily, while 3.39% of the respondents never try.
- Drivers of Sustainability: Convenience (37.29%) and concern for the environment (33.90%) are the strongest drivers of sustainable action.
- Knowledge Gaps: 49.15% have some kind of knowledge about sustainable construction, but most of them do not have in-depth knowledge.
- Construction Sustainability: 45.76% adopt cheap sustainability in construction, while 44.07% need it at any price.
- Green Material Challenges: Ignorance (42.37%) and extremely high price (35.59%) are the top challenges to the adoption of sustainable materials.
- The article ends by noting the importance of education initiatives, heightened consciousness, and policy advocating and facilitating the adoption of sustainable actions in the building sector.

## Suggestions:

- Analysis of Attempts to Reduce Environmental Impact: As per the survey, the majority of the respondents make some attempt to reduce their environmental impact occasionally, while some do so weekly. It shows that many people are eco-friendly but might not be in a position to take up sustainable behaviors regularly. There is potential to study plans that promote frequent commitment towards sustainable behaviors.
- Motivation and Inhibitors for the Adoption of Sustainable Habits: Habit or convenience is the main motivation for the adoption of sustainable habits and then environmental concern. Saving money is the inducement for the respondents, and lack of interest or awareness is an inhibitor. This indicates that there must be training programs as well as inducements for inducing sustainable behavior.
- Knowledge of Sustainable Construction Techniques: A great percentage of the respondents are fairly knowledgeable about sustainable construction techniques like the use of green materials and energy-efficient measures, and there are a few who know them very well. It is an integrated consciousness, but at the same time requires more learning to improve further and encourage adoption.

- Obstacles to Utilizing Sustainable Building Materials: The largest obstacle in the utilization of sustainable building materials is a lack of knowledge, followed by them being too expensive. This means that cost incentives and public awareness campaigns are the key drivers of their utilization and thus should be prioritized.
- Environmental Impact of Construction Awareness: Although most respondents are aware of the environmental impact of the construction sector, only 30.51% possess detailed knowledge. This would suggest that there is a need for more detailed education and easily accessible information on the topic.

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