



## Sustainable urban planning: A Case Study of Kakarvitta in Nepal

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### Abstract:

*Kakarvitta (Kakarbhitta), a rapidly growing border town in southeastern Nepal, serves as a vital trade hub linking Nepal with India, Bangladesh, and Bhutan. Its strategic location has spurred migration, commerce, and urban expansion, but also brought challenges such as traffic congestion, informal settlements, waste management issues, and strain on infrastructure. This study examines Kakarvitta's urban development through the lens of sustainable urban planning, focusing on the balance between economic growth, environmental preservation, and social equity. The research assesses current infrastructure, identifies key urban challenges, and analyzes environmental, social, and economic impacts of rapid urbanization. It also evaluates residents' perceptions and access to essential services, including housing, transportation, education, and healthcare. Strategies explored include integrated land use management, preservation of green spaces, climate-resilient infrastructure, and participatory planning. The findings aim to provide data-driven recommendations to enhance Kakarvitta's sustainability and resilience, offering a model for other emerging towns in Nepal and similar rapidly urbanizing contexts.*

**Keywords:** Sustainable Urban Planning, Kakarvitta, Nepal, Urban Infrastructure, Environmental Impact, Social Equity, Climate Resilience.

### 1.0 Introduction:

Sustainable urban planning is the strategic process of designing and managing urban spaces in a way that balances economic development, environmental preservation and social equity. As urbanization accelerates across the globe, especially in developing countries, the need for sustainable city models has become increasingly urgent. One emerging example of such a model is Kakarvitta, a rapidly growing town located in the southeastern region of Nepal, along the border with India.

Kakarvitta (also spelled Kakarbhitta) plays a critical role as a cross-border trade hub, linking Nepal with India, Bangladesh, and Bhutan. Its strategic position has made it a focal point for migration, commerce, and transportation, resulting in growing urban pressure such as traffic congestion, informal settlements, waste management issues, and strain on public infrastructure. Despite these challenges, Kakarvitta offers a

valuable case for examining how smaller urban centers can implement sustainable urban planning strategies to support livability, inclusivity and economic resilience.

This case study aims to explore Kakarvitta's urban development trajectory with a focus on sustainable planning practices. It evaluates key areas including land use management, transportation systems, environmental sustainability, housing, and public services, while considering the town's socio-economic dynamics such as occupation patterns, educational growth, income distribution, and demographic trends. The study highlights how Kakarvitta's evolution reflects both the opportunities and challenges of sustainable urbanization in the context of a developing South Asian country.

## 2.0 Objectives:

A survey on Sustainable Urban Planning: A Case Study of Kakarvitta in Nepal was conducted to gather data and insights that help evaluate how the town is developing in terms of sustainability. The objectives are:

1. To assess the current state of urban infrastructure in Kakarvitta, including roads, housing, water supply, waste management, and public services.
2. To assess the impact of rapid urbanization on the environment and quality of life.
3. To identify key urban challenges such as traffic congestion, pollution, poor drainage, or unplanned settlements affecting the town's growth.
4. To identify infrastructural and policy gaps.
5. To understand local residents' perceptions and awareness of sustainable urban planning and their satisfaction with current urban development.
6. To analyze the environmental impact of rapid urbanization on local resources, biodiversity, and ecological balance.
7. To examine social equity and inclusion in access to urban services such as housing, transportation, education, and healthcare.
8. To support data-driven decision-making for future urban planning policies and strategies in Kakarvitta.
9. To implement innovative, technology-driven solutions.
10. To provide recommendations for improving sustainability in the town's urban growth, serving as a model for other towns in Nepal.





### 3.0 Location of Study Area:

A study in Kakarbhitta, Nepal, a bustling town located in the southeastern part of the country, within Mechinagar Municipality of Jhapa District in Province No. 1 (currently known as Koshi Province). Kakarbhitta lies close to the eastern border of Nepal, sharing an international border with the Indian town of Panitanki in West Bengal. Geographically, it is situated at a latitude of approximately 26.6486° N and a longitude of 88.1441° E, at an elevation of around 111 meters (364 feet) above sea level. This strategic location serves as a key gateway for trade, transportation, and cross-border movement between Nepal and India. The area falls within the Terai region, known for its flat plains, fertile soil, and subtropical climate, with hot summers, mild winters, and a pronounced monsoon season. Kakarbhitta is accessible by the East-West Highway (Mahendra Highway) and serves as a terminal point for both road and rail routes connecting India and Nepal. The study area includes a mix of urban and semi-urban settings with a growing population, diverse socio-economic activities, and increasing environmental and developmental concerns, making it a significant site for environmental sustainability research and planning.

### 4.0 Literature Review:

1. According to Kishan Datta Bhatta, "Critically reviews the theories of (eco) tourism development and planning with respect to the general context of developing countries and the linkage between eco tourism and sustainable community development."
2. According to Keshav Bhattarai and Ambika P. Adhikari, "Urban farming can help produce fresh food locally and help urban residents become self-reliant by engaging in healthy eating habits and practicing sustainable agriculture techniques in food-desert areas, while creating a positive impact on the environment through regenerative agricultural methods."
3. According to Pushkar K. Pradhan and Pushpa Sharma, "Nepal must integrate its three geographic or ecoregions—plains, hills, and mountains—to bring balanced and sustainable development across areas like water, forest, and biodiversity."

4. According to Sunil Babu Shrestha, “Urbanization is rapid in Nepal, and the main causes are rural-to-urban migration and the addition of municipalities in rural areas.”
5. According to Shiva Pokhrel, “The unorganized way of urban planning leads to risky zones for economic, social, and environmental sustainability. Kathmandu is the fastest-growing capital, but excessive urban growth and unplanned cities have resulted in the frequent loss of green space and vulnerability to earthquakes.”
6. According to B.J.K. Chand, “Land resources have become essential for recent urban and socio-economic development. Land management has improved due to the Ministry of Land Reform, which aims for sustainable growth while criticizing institutional fragmentation.”
7. According to Sunita Duwal and Sheri Famer, “Urbanization is a dynamic process and has gained scientific attention, but it remains uneven. Heterogeneous factors like topography, accessibility, market conditions, and population influence urban morphology and lead to varied patterns of urban growth.”
8. According to Netra Prasad Timsina and Anushiya Shresha, “Urbanization is prominent in Nepal, which is now among the top ten urbanizing countries. The country has shifted from being predominantly rural to increasingly urban, with Kathmandu’s population growing from 3.6% to 6.5%.”
9. According to Prof. Harka Gurung, “Urban development in Nepal has historically favored certain regions, leading to regional imbalance and urban primacy focused on Kathmandu Valley.”
10. According to Dipendra Gautam, “Rapid urbanization without disaster-resilient planning has increased vulnerability to floods, landslides, and earthquakes in urban peripheries.”
11. According to Anju Sah and Santosh K.C., “Sustainable urban development must include the active participation of local governments to ensure that urban growth aligns with community needs and environmental limits.”

## 5.0 Research Methodology:

In Kakarvitta, Nepal to survey how far sustainable urban planning is practicable in this particular area. The trainee teachers had undergone several survey methods, with the help of questionnaire, followed by different branches of questions such as an Environmental, Social and Economic Sustainability.

**Research Design:** This study adopts a qualitative case study approach supported by mixed methods (both qualitative & quantitative data), focusing on understanding the current sustainable urban planning practices in Kakarvitta and evaluating them through the lens of sustainability. The case study method allows for in depth investigation of the specific geographic and socio-economic characteristics of the town (Kakarvitta).

**Study Area:** The study area chosen for this case study is Kakarvitta, which is located in Jhapa district of south-eastern Nepal, which is a border town with significant cross borders trade, migration, and infrastructure development, making it a crucial area for sustainable urban planning analysis.

**Data Collection:** It is the most important work in research methodology.

**Primary Data Collection:** This survey includes primary data collection. The trainee teachers had surveyed, with the help of questionnaire, observation and Interview method. Primary data collection includes qualitative and quantitative. The questionnaire of this particular case study includes both open ended and close ended questions. Qualitative studies ensured greater level of depth of understanding, with open ended questions, observation, case studies.

**Secondary Data Collection:** The trainee teachers had also collected secondary data sources for this case study like review of literature, official and non-official reports from online resources, master plans, published reports from NGOs and INGOs which help the case study to be more descriptive.

**Market Surveys:** Structured questionnaires were administered to local residents, shop owners, customers to understand perceptions, needs and experiences regarding urban development, infrastructure and environmental quality.

**Field Observation:** This case study also includes field observation method like on -site visits to assess infrastructure, waste management, resource used, pollution level (air, water, land), biodiversity, health and education, financial resources.

**Sampling Methods:** This method has also been used for this case study. This method determined statistical analysis of predetermined number of observations. It helps a lot in research, which enables the accuracy of our survey result.

**Data Analysis:** The data and information drawn from the study area of Nepal are analyzed by the trainee teachers. Data is collected and it is forwarded for analysis. Analyzation of data for this case study has been divided into two main subgroups:

**Data Processing:** Under this subgroup the collected data and information has been coded, classified, presented, tabulated and measured with graphical presentation (bar graphs, pie charts etc.) along with appropriate interpretation for each table.

**Data Exposition:** Under this subgroup the collected data has been analyzed appropriately which help the trainee teachers to find out conclusion, findings, recommendations/ suggestions for this case study.

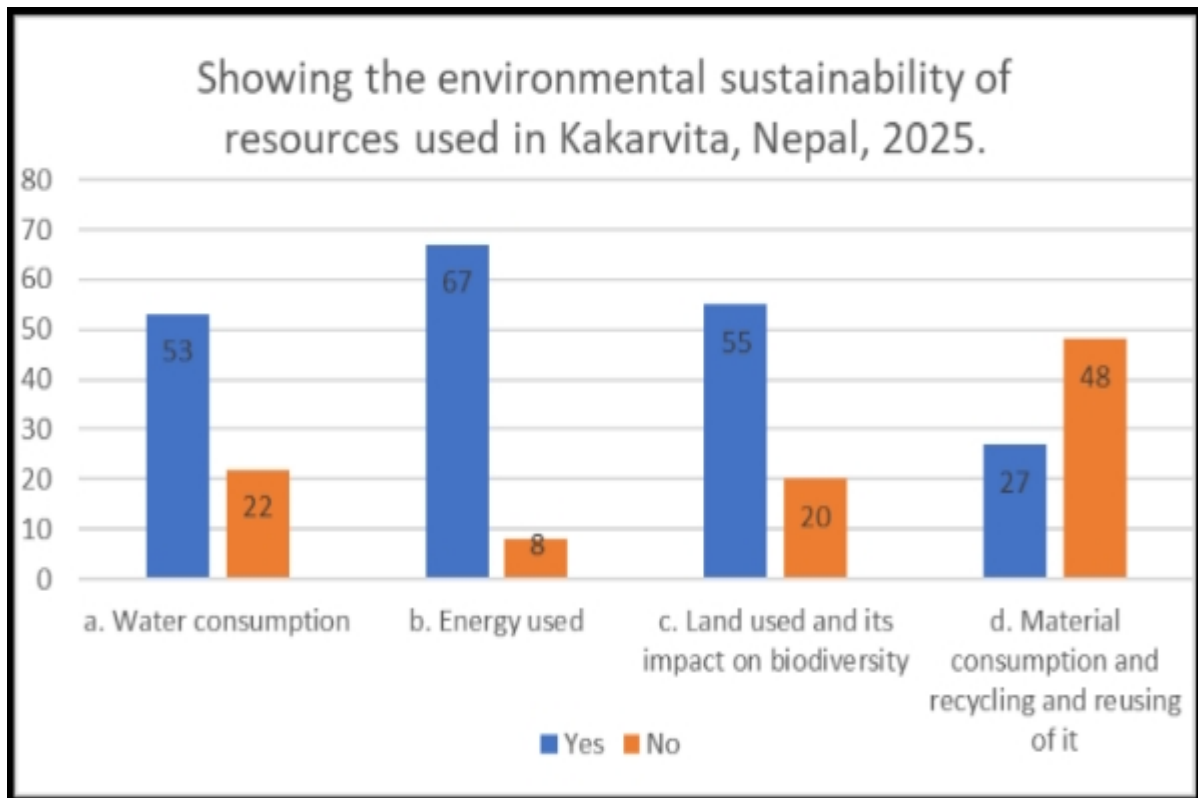
Overall, in doing so, this survey paper intends to describe urban features, urban environment and land use patterns and urban plans and policies towards initiatives for urban environmental management, urban environment case study, discussions and conclusions.

## 6.0 Data Presentation And Analysis:

### 6.1 Table 1- Environmental sustainability – Resource used

| 1 | Resource used                                           | Yes | No |
|---|---------------------------------------------------------|-----|----|
|   | a. Water consumption                                    | 53  | 22 |
|   | b. Energy used                                          | 67  | 8  |
|   | c. Land used and its impact on biodiversity             | 55  | 20 |
|   | d. Material consumption and recycling and reusing of it | 27  | 48 |

Source : Household Survey (2025)



#### 6.1.1 Analysis and interpretation of the data

The bar chart shows data on the environmental sustainability of resources used in Kakarvitta, Nepal, in 2025, categorized into four main resource types: water consumption, energy use, land use and biodiversity impact, and material consumption with recycling/reuse.

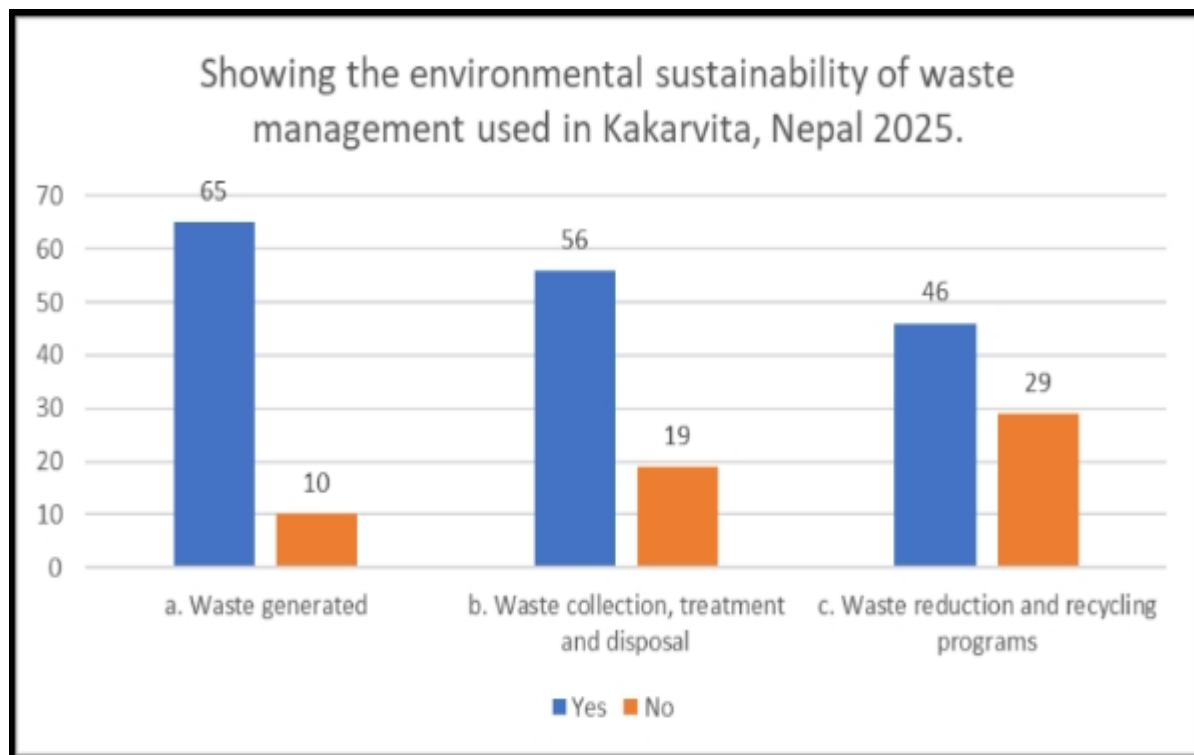
Out of the total responses, 53 indicated that water consumption is sustainable, while 22 believed it is not and on an average the households use 200 liters of water in a day and the average monthly water bill for a family comes to around 400-500 NPR. For energy use, 67 found it to be sustainable compared to 8 who did not, making it the most positively viewed category. It was also found that they used both CNG and fossil fuels like coal and also wood as an energy resource. Regarding land use and biodiversity, 55 respondents saw it as sustainable, whereas 20 did not. There seems to be growing number of population who are leaving the agricultural system and are joining in the business sector, and many households have spaces with shutter which they use as shops. However, for material consumption and recycling, only 27 considered it sustainable, while a higher 48 believed it was not, marking it as the least sustainable area and highlighting a need for better waste management practices in the region.

#### 6.2 Table 1- Environmental sustainability – Waste management

| 2 | Waste management                            | Yes | No |
|---|---------------------------------------------|-----|----|
|   | a. Waste generated                          | 65  | 10 |
|   | b. Waste collection, treatment and disposal | 56  | 19 |
|   | c. Waste reduction and recycling programs   | 46  | 29 |

Source: Household Survey (2025)





#### 6.2.1 Analysis and interpretation of the data

The bar graph shows the environmental sustainability of waste management practices used in Kakarvitta, Nepal in the year 2025.

The graph presents three key categories:

a. Waste Generated: 86% of respondents reported that waste is being generated in an environmentally sustainable way. 14% responded “No”, indicating a small portion is not following sustainable methods.

Interpretation: A significant majority are aware of and follow sustainable practices while generating waste, showing positive awareness and implementation.

b. Waste Collection, Treatment, and Disposal: 75% indicated sustainable practices are being followed whereas 25% said “No”.

Interpretation: While over 75% believe collection and disposal are sustainable, the 25% indicates room for improvement, especially in infrastructure and awareness.

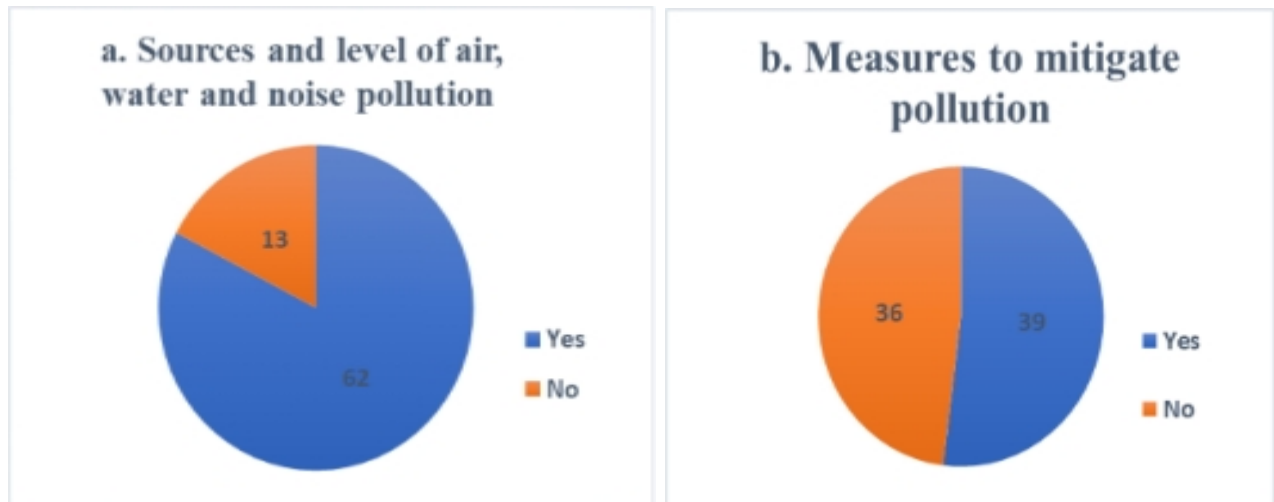
c. Waste Reduction and Recycling Programs: 61% confirmed the presence of effective programs whereas 39% disagreed.

Interpretation: This area has the lowest “Yes” response and the highest “No” response, suggesting that waste reduction and recycling are the weakest areas in the current waste management system in Kakarvitta. This reflects a need for greater investment and awareness campaigns.

### 6.3 Table 1- Environmental sustainability – Pollution

| 3 | Pollution                                              | Yes | No |
|---|--------------------------------------------------------|-----|----|
|   | a. Sources and level of air, water and noise pollution | 62  | 13 |
|   | b. Measures to mitigate pollution                      | 39  | 36 |

Source : Household Survey (2025)



#### 6.3.1 Analysis and interpretation of the data

The pie- chart shows the data on pollution in Kakarvitta, Nepal in the year 2025. The present data is based on findings on two critical aspects of environmental sustainability: awareness of pollution sources and the adoption of measures to mitigate pollution.

The first set of data shows that a large majority of respondents (62 out of 75, or approximately 83%) are aware of the sources and levels of air, water, and noise pollution. This high level of awareness indicates that environmental issues are visible and acknowledged within the community, forming a strong basis for potential collective action. Only a small fraction (17%) reported no awareness, which could be addressed through targeted environmental education campaigns.

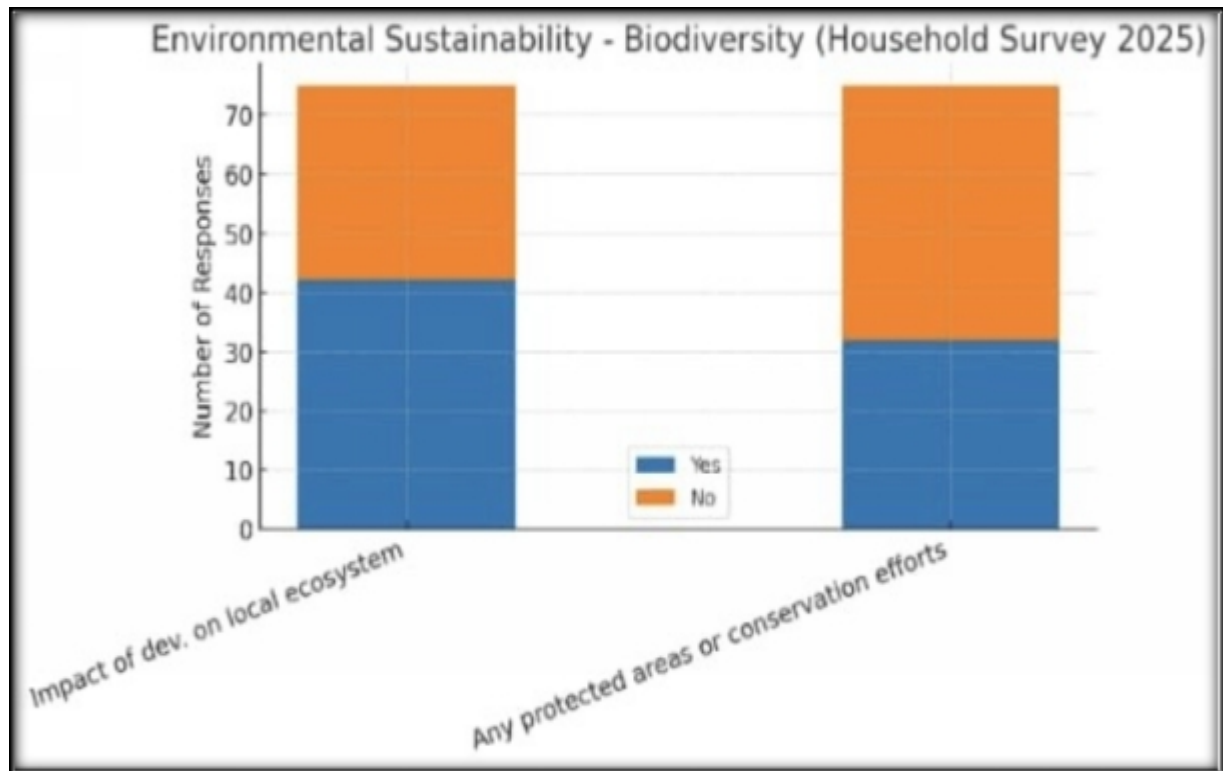
However, when it comes to actual measures to mitigate pollution, the responses reveal a notable drop in participation. Only 39 respondents (around 52%) reported taking action, while 36 respondents (48%) have not engaged in any pollution control practices. This almost even split highlights a clear gap between awareness and action. Factors contributing to this gap could include lack of resources, insufficient practical knowledge, absence of incentives, or a perception that individual efforts may not significantly impact environmental problems. Overall, the data suggests that while the community demonstrates strong awareness of pollution-related issues, this knowledge does not consistently translate into tangible action. Bridging this awareness–action gap is essential for achieving environmental sustainability. This can be accomplished through combined efforts such as practical skill-building workshops, incentive-based community programs, and policy interventions that make environmental practices more accessible and rewarding. By leveraging the existing high awareness level and addressing barriers to action, sustainable change can be promoted effectively.



#### 6.4 Table 1- Environmental sustainability – Biodiversity

| 4 | Biodiversity                                   | Yes | No |
|---|------------------------------------------------|-----|----|
|   | a. Impact of development on local ecosystems   | 42  | 33 |
|   | b. Any protected areas or conservation efforts | 32  | 43 |

Source : Household Survey (2025)



##### 6.4.1 Analysis and interpretation of the data

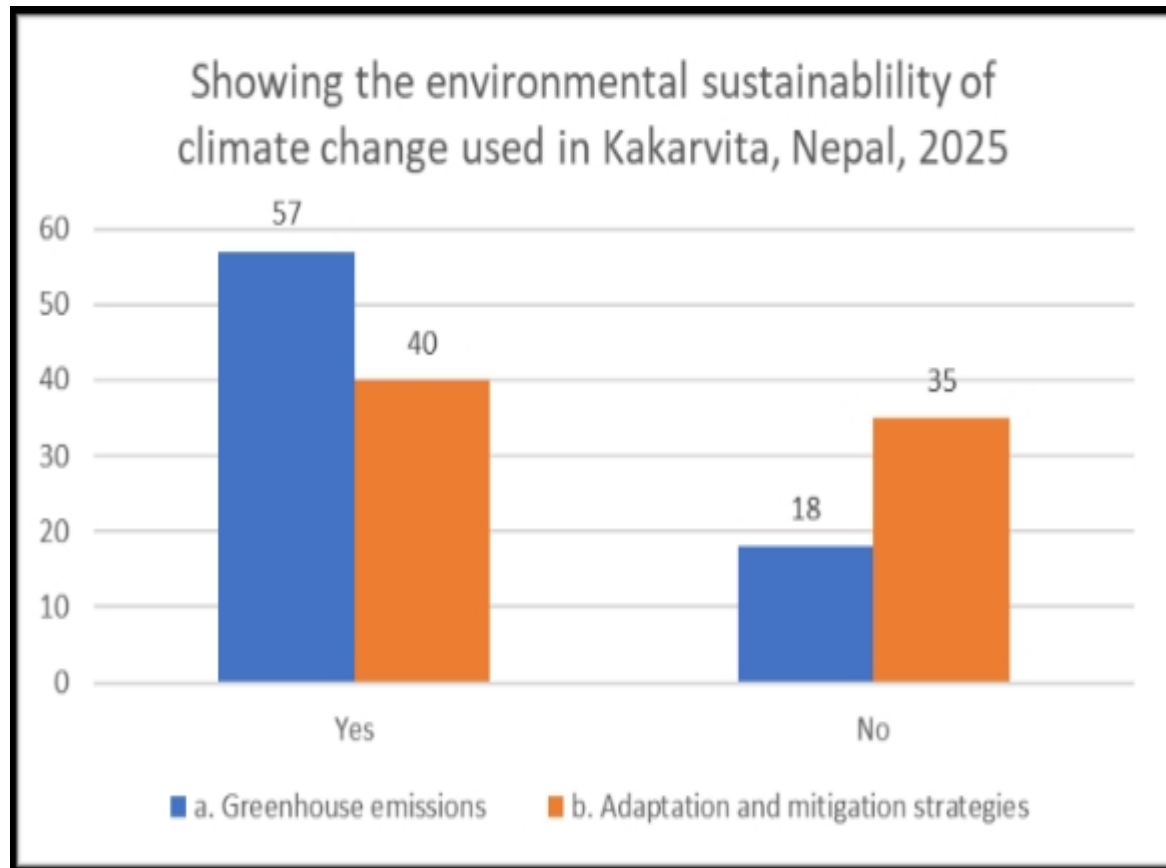
The bar graph shows 41% of respondents agree their local ecosystem is impacted by development (urban growth, deforestations, pollution )

- Only 32% disagreed, which shows that majority observe negative environmental changes around them.
- When asked about conservation efforts, only 33% said “yes” whereas 43% said No.
- Conservation programs are not visible or poorly implemented
- The relatively low “yes responses for protected areas 33% imply that people may not feel involved or informed in local sustainability efforts.
- This is a red flag for future efforts because community participation is essential for effective conservation.
- The data reflects a growing public concern over environmental degradation due to development, but also a clear shortfall in conservation visibility or implementation.

**6.5 Table 1- Environmental sustainability – Climate Change**

| 5 | Climate change                          | Yes | No |
|---|-----------------------------------------|-----|----|
|   | a. Greenhouse emissions                 | 57  | 18 |
|   | b. Adaptation and mitigation strategies | 40  | 35 |

Source : Household Survey (2025)



#### 6.5.1 Analysis and interpretation of the data

The bar chart shows data on climate change awareness and preparedness among respondents in Kakarvita, Nepal, in 2025, based on two main categories: awareness of greenhouse gas emissions and the presence of adaptation and mitigation strategies.

Out of 75 total respondents, 57 indicated awareness of greenhouse gas emissions, while 18 were not aware. This suggests a strong level of awareness among the majority, likely due to increased access to environmental education, local initiatives, and national-level campaigns promoting climate knowledge.

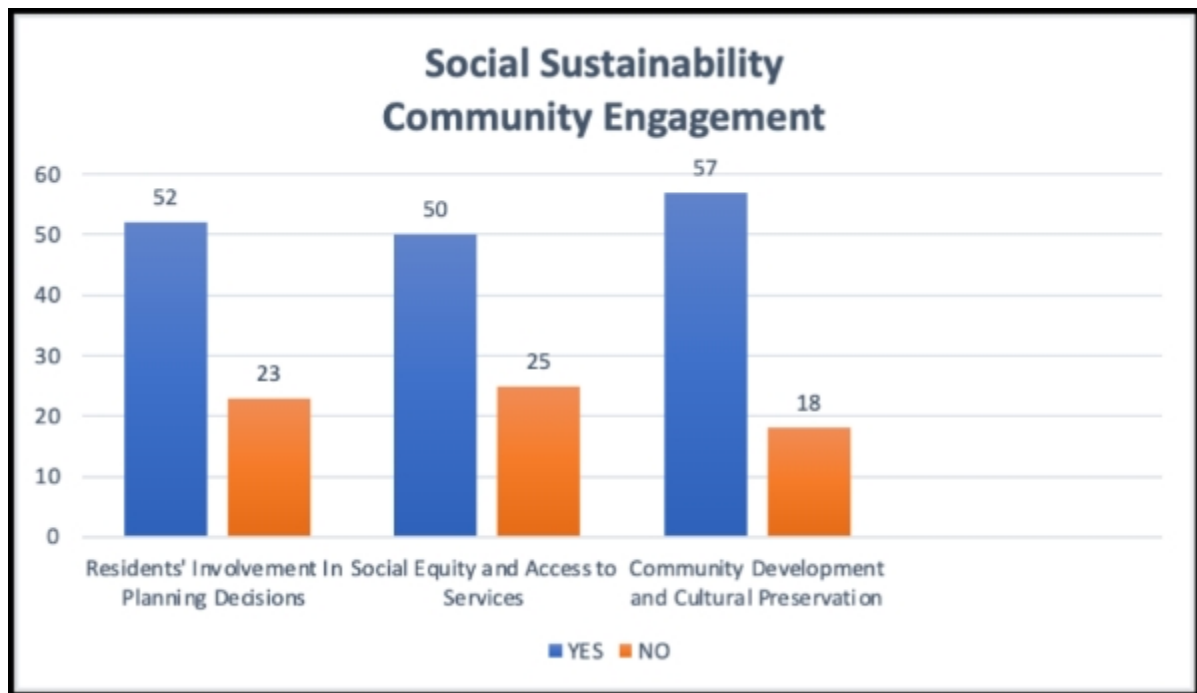
For the second category, 40 respondents stated that adaptation and mitigation strategies are in place, whereas 35 believed there are no such strategies. This near-even split reflects a gap in either the implementation or communication of climate initiatives at the local level.

Overall, the bar chart indicates that while climate change awareness is relatively high, confidence in the region's climate action strategies remains divided—highlighting a need for improved community engagement and clearer dissemination of existing efforts.

## 6.6 Table 2- Social sustainability – Community Engagement

| 1 | Community Engagement                               | Yes | No |
|---|----------------------------------------------------|-----|----|
|   | a. Are residents involved in planning decisions?   | 52  | 23 |
|   | b. Level of social equity and access to services   | 50  | 25 |
|   | c. Community development and cultural preservation | 57  | 18 |

Source: Household Survey (2025)



### 6.6.1 Analysis and interpretation of the data

**Strongest Area – Cultural Preservation** -76% of participants (57 out of 75) say the community is effectively supporting development and preserving culture—the highest “YES” rate—indicating broad confidence in heritage and cultural initiatives.

**Healthy Resident Participation** -With 69% in favor, most residents feel they have a voice in planning decisions. However, about 31% still feel left out, suggesting room to boost transparency and outreach.

**Equity & Services Access Needs Attention** -67% agree there’s fair social equity and access to services, but 33% disagree—a significant minority. Targeted improvements (e.g., service audits, community feedback loops) could help close that gap.

#### Overall Interpretation

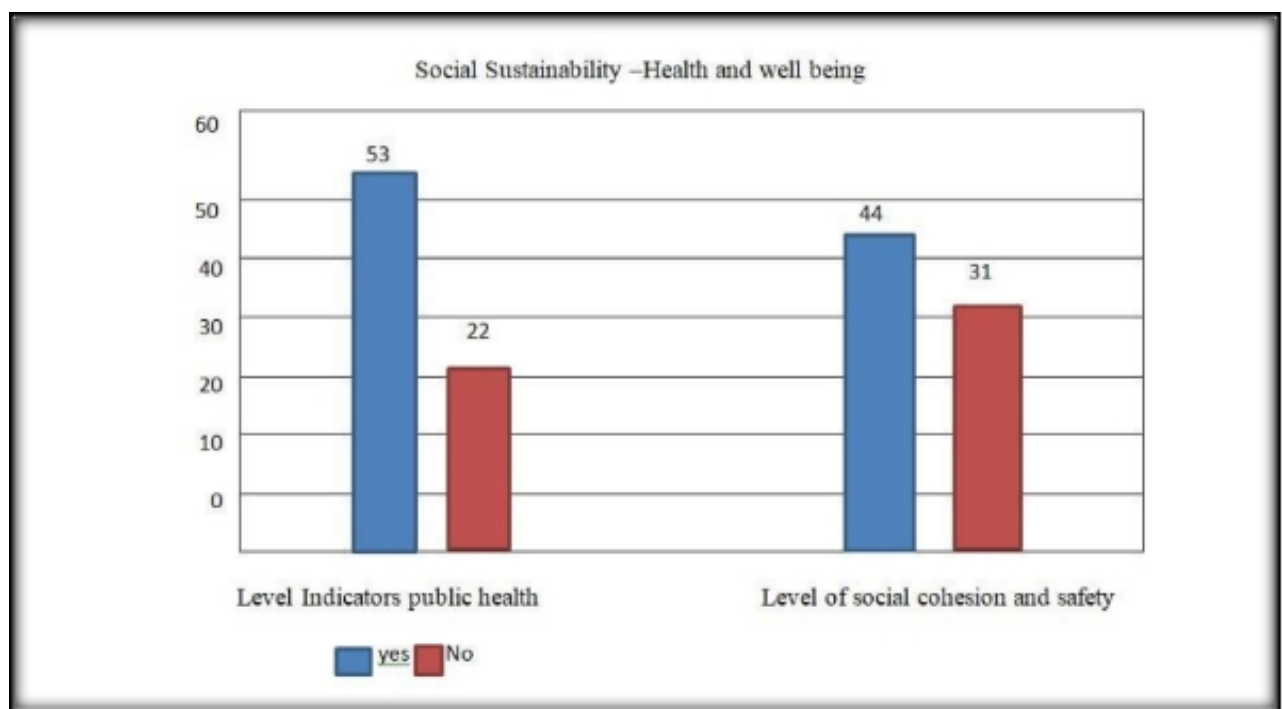
- **Positive Outlook:** In all three areas, “YES” responses outnumber “NO” by roughly 2:1 or better, reflecting generally robust community engagement.
- **Opportunities for Growth:**

- Equity & Services (33% NO) and Planning Involvement (31% NO) have the highest “NO” shares—these are priority areas for strengthening trust and inclusion.
- Strategic Focus: Leverage the success in cultural initiatives to galvanize broader participation: events, heritage projects, and local festivals can serve as entry points for deeper engagement in planning and service equity.

**6.7 Table 2- Social sustainability – Health and well being**

| 2 | Health and Well-being                  | Yes | No |
|---|----------------------------------------|-----|----|
|   | a. Indicators of public health         | 53  | 22 |
|   | b. level of social cohesion and safety | 44  | 31 |

Source: Household Survey (2025)



#### 6.7.1 Analysis and interpretation of data

Indicator of public health.

In this survey the bar chart shows, 70% participant say the indicators of public health in Kakarvitta, Nepal is good.

As part of Jhapa district, Kakarvitta falls within a district of roughly 998, 000 people in Nepal as of 2022/23there are -14, 300 health facilities 3, 778 health post, 7, 582 basic survive centers. 55% of facilities have internet. Connected computer FCHVS track birth/deaths for SDG monitoring many residents travel to Siliguri, India for more advanced treatment due to infra-structure limitations.

The level of social cohesion and safety

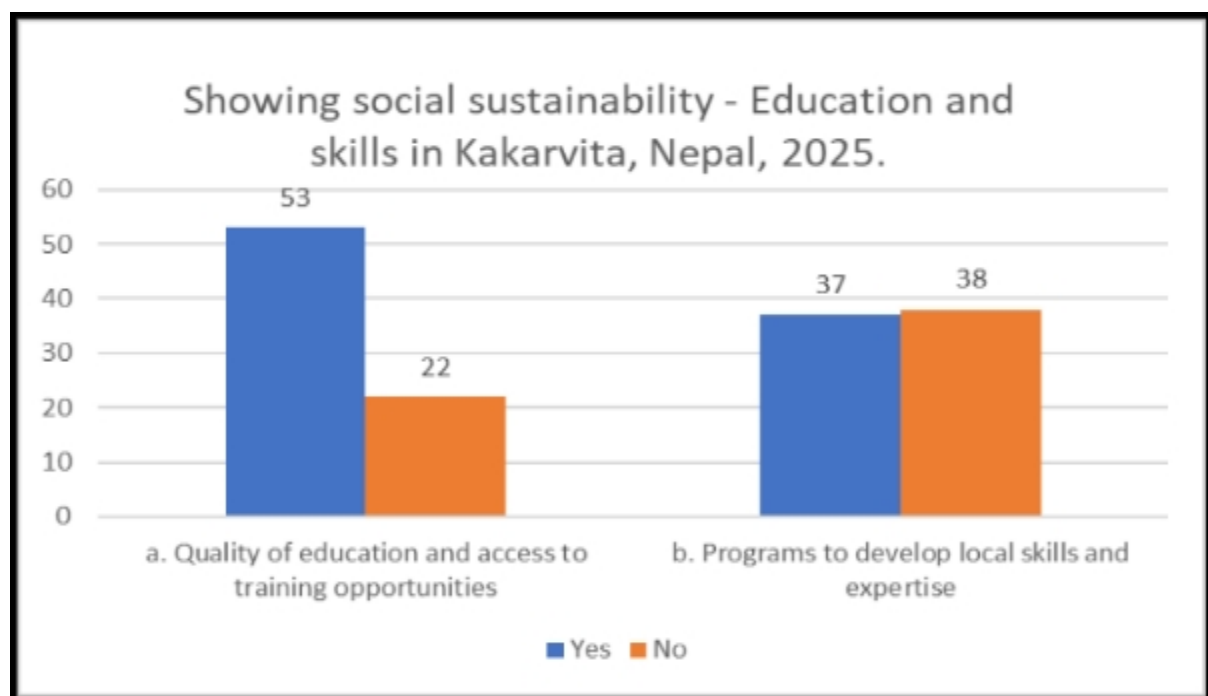
In this survey -58% people gave positive response about social cohesion and safety in Kakarvitta, Nepal.

National studies highlight that social cohesion in Nepal includes vertical trust (citizen- state) Which may be fragile in parts of the eastern Tarai due to unequal access and periodic friction among marginalized groups, Fake news and rumor especially during shock like COVID -19 can disrupt communal trust filling suspicion between religious or linguistic group as seen in eastern Tarai tensions during 2020.

**6.8 Table 2- Social sustainability – Education and skills**

| 3 | Education and Skills                                         | Yes | No |
|---|--------------------------------------------------------------|-----|----|
|   | a. Quality of education and access to training opportunities | 53  | 22 |
|   | b. Programs to develop local skills and expertise            | 37  | 38 |

Source : Household Survey (2025)



#### 6.8.1 Analysis and interpretation of the data

##### Survey Finding:

1. Quality of Education and Access to Skills: Out of 75 people, 53 (71%) said education and skill access is good, while 22 (29%) said it is not good. This shows that most people think schools and learning opportunities are available and improving.
2. Programs to develop Local Skill and expertise: Out of 75 people, 37 people (49%) said there are programs to develop local skills, while 38 people (51%) said there are no such programs. This shows that many people feel there are not enough training programs to learn practical skills.

##### Interpretation:

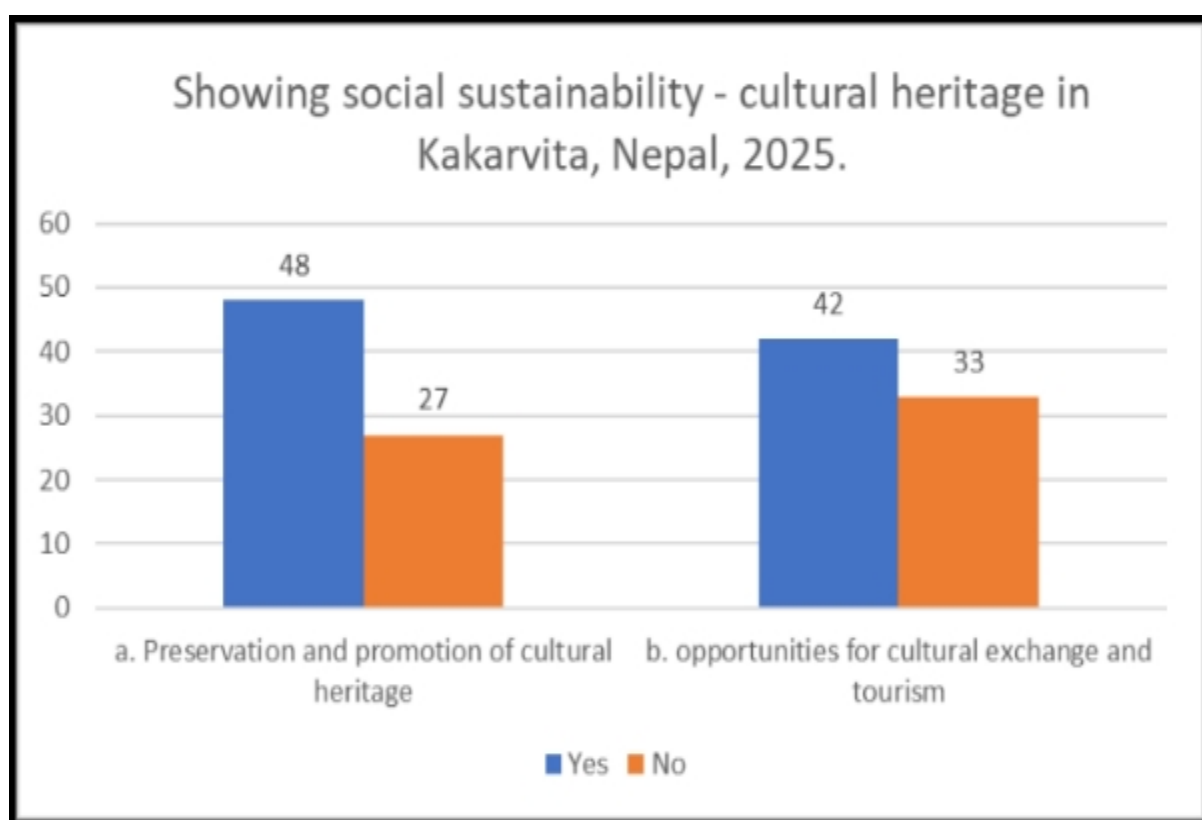
These survey results reflect the progress Nepal has made in education over the years. In 2001, Nepal's literacy rate was 48.6%, with a large gap between males (62.7%) and females (32.9%). By 2021, this improved to 71.2% overall, with male literacy at (81%) and female literacy at (63.3%). This shows strong

improvement, although the gender gap still exists. In Jhapa district, where Kakarvitta is located, the literacy rate is even higher at 82.83%, which supports the 71% of survey respondents who said that education and skill access in their area is good. However, when it comes to local skill development programs, only 49% said such programs exist, while 51% said they do not. This indicates that while formal education is improving, practical skill training opportunities are still lacking, especially at the local level, and this may affect both employment and empowerment, particularly for women.

**6.9 Table 2- Social sustainability – Cultural heritage**

| 4 | Cultural Heritage                                  | Yes | No |
|---|----------------------------------------------------|-----|----|
|   | a. Preservation and promotion of cultural heritage | 48  | 27 |
|   | b. opportunities for cultural exchange and tourism | 42  | 33 |

Source : Household Survey (2025)



#### 6.9.1 Analysis and interpretation of the data

1. Out of 75 respondents, 48 indicated that preservation and promotion of cultural heritage are not considered.
2. The following bar chart visually represents 'Yes'(48) with the dark blue segment, and the smaller light blue segment represents 'No'(27). This indicates that the majority of respondents are considered preservation and promotion of cultural heritage.
3. Out of 75 respondents, 42 indicated that there are opportunities for cultural exchange and tourism, while 33 indicated there are no opportunities for cultural exchange.

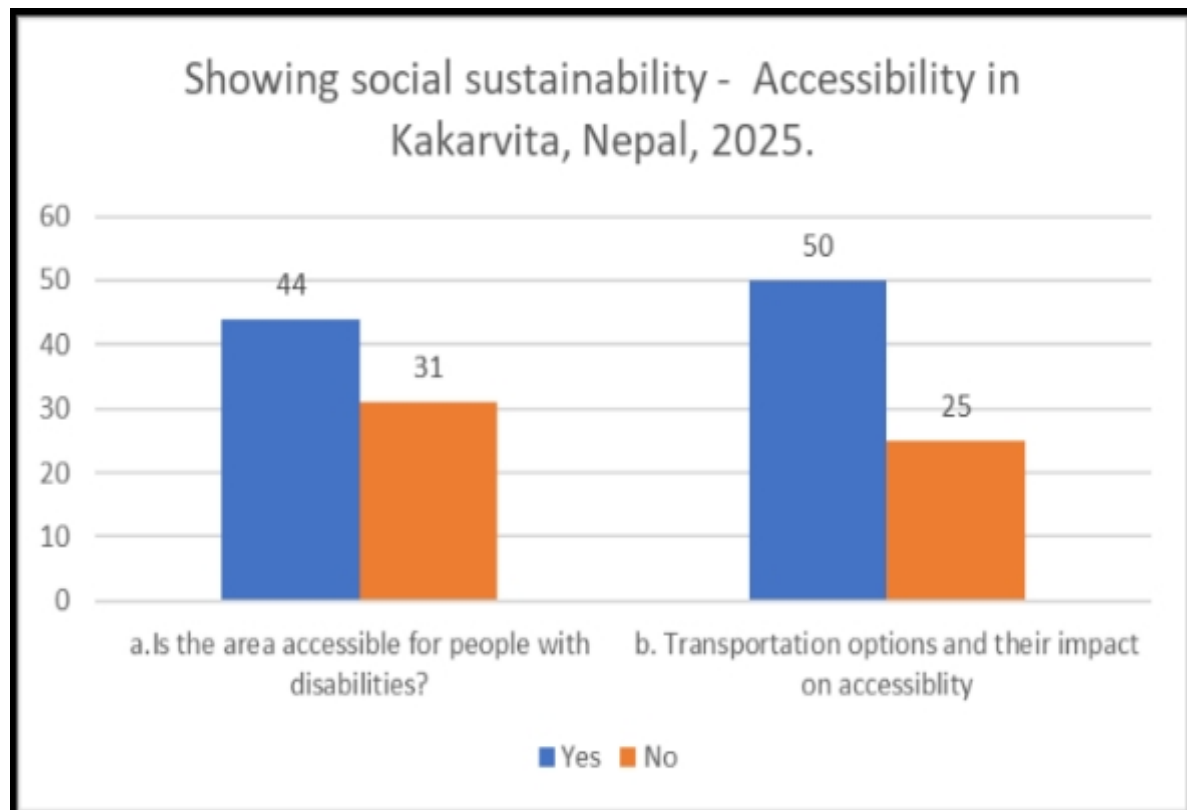


4. The bar chart suggests a significant lack of incentive for the opportunities for cultural exchange and tourism.

**6.10 Table 2- Social sustainability – Accessibility**

| 5 | Accessibility                                               | Yes | No |
|---|-------------------------------------------------------------|-----|----|
|   | a. Is the area accessible for people with disabilities?     | 44  | 31 |
|   | b. Transportation options and their impact on accessibility | 50  | 25 |

Source : Household Survey (2025)



#### 6.10.1 Analysis and interpretation of the data

The survey results indicate that a majority of respondents perceive the area as accessible for people with disabilities, with 44 participants (58.7%) answering “Yes” compared to 31 (41.3%) saying “No.” This suggests that while accessibility is relatively good, there is still a significant proportion of people who find the area lacking in this regard.

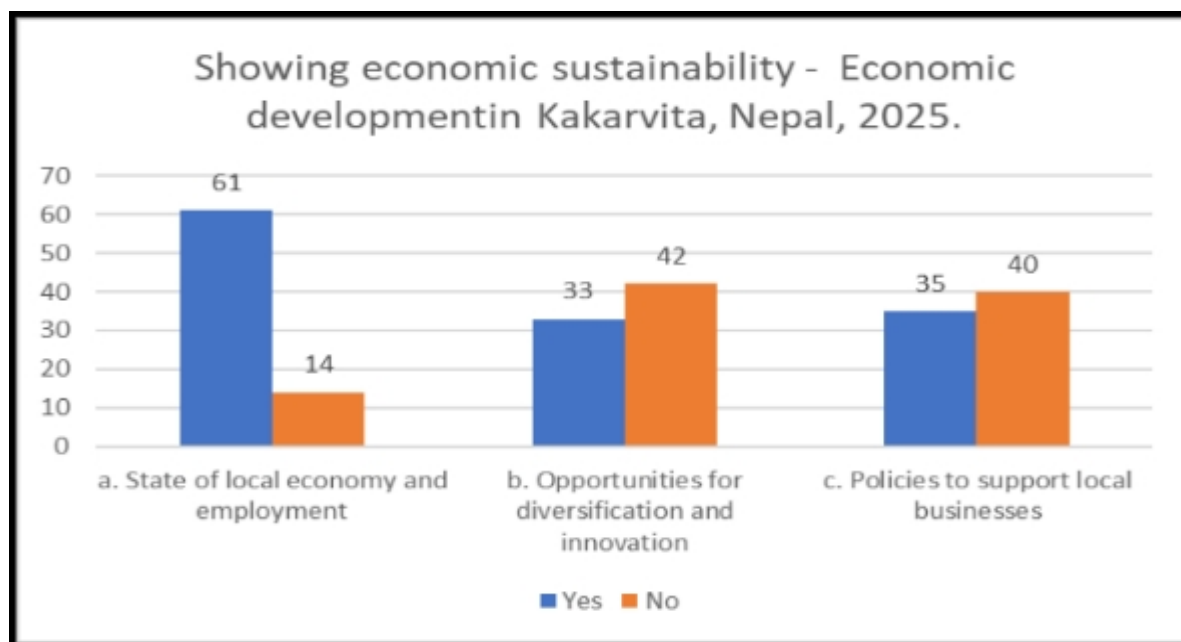
When asked about transportation options and their impact on accessibility, 50 respondents (66.7%) answered “Yes,” indicating they believe transportation positively supports accessibility. Meanwhile, 25 respondents (33.3%) disagreed, highlighting that transportation challenges still exist for a third of the surveyed population.

Overall, the findings suggest that both the physical accessibility of the area and transportation services are viewed positively by the majority, but notable gaps remain that may hinder full inclusion for people with disabilities.

**6.11 Table 3- Economic sustainability – Economic development**

| 1 | Economic Development                                | Yes | No |
|---|-----------------------------------------------------|-----|----|
|   | a. State of local economy and employment            | 61  | 14 |
|   | b. Opportunities for diversification and innovation | 33  | 42 |
|   | c. Policies to support local businesses             | 35  | 40 |

Source : Household Survey (2025)



#### 6.11.1 Analysis and interpretation of the data

The bar chart titled “Economic Sustainability- Economic Development” presents data related to three key areas:

1.State level of economy and employment: This category shows a high “Yes” response (around 65%) and low “No” response (around 15%). Kakarvitta, being a border town in Nepal’s Jhapa district, likely have an economy heavily influenced by cross- border trade with India and agriculture. Remittances also play a significant role in Nepal’s overall economy, potentially impacting household income and consumption in Kakarvitta.

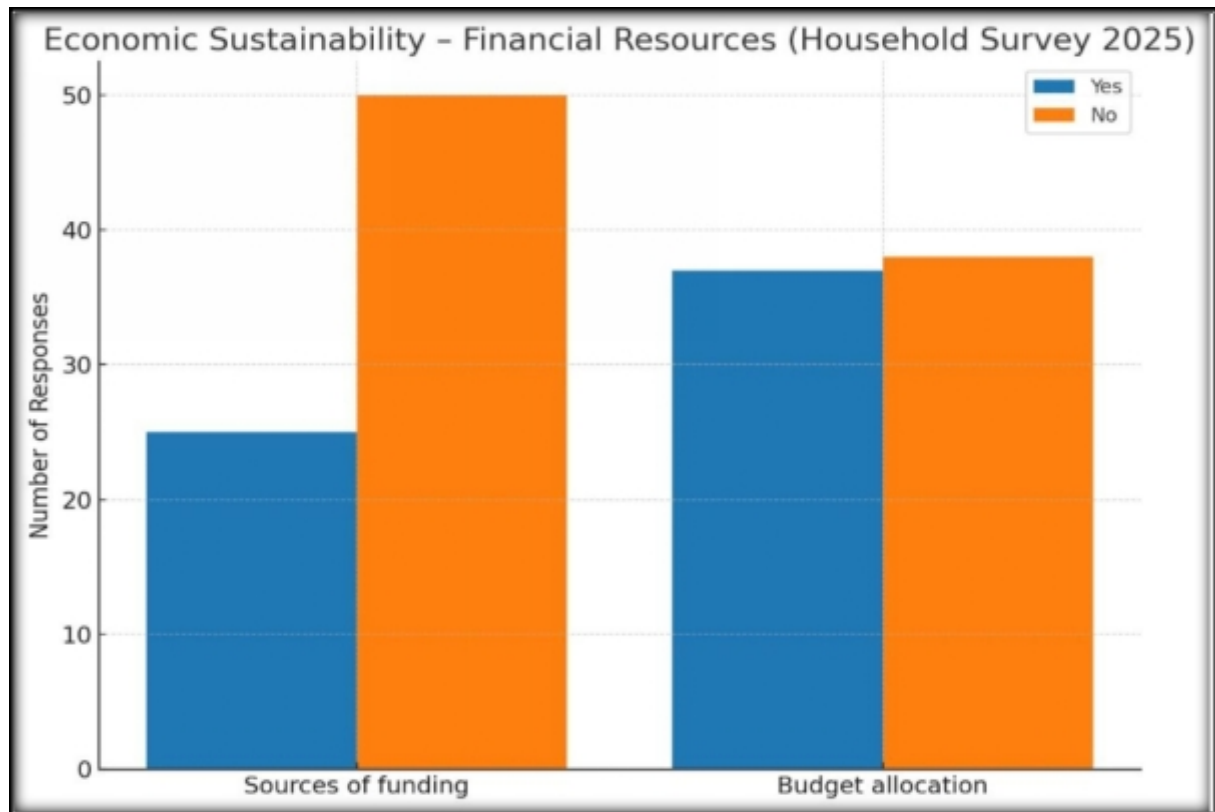
2.Opportunities for diversification and innovation: This category indicates a more balanced but still positive outlook “Yes” response slightly higher than “No” response (around 40%vs.35%).As an agriculturally dominant region, Kakarvitta could explore diversification in agro-based industries, value-added products, and potentially tourism given its border location and proximity to areas like Darjeeling. Innovation in agricultural practices and local business would be crucial for sustainable development.

3. Policies to support local business: Similar to the previous category, “Yes” responses are slightly higher than “No” responses. The effectiveness of policies in Kakarvitta and Jhapa district would directly impact the growth of small and medium- sized enterprises (SMEs), investments, and job creation beyond traditional sectors.

**6.12 Table 3- Economic sustainability – Financial Resources**

| 2 | Financial Resources                               | Yes | No |
|---|---------------------------------------------------|-----|----|
|   | a. Sources of funding for sustainable initiatives | 25  | 50 |
|   | b. Is budget allocated to different areas?        | 37  | 38 |

Source : Household Survey (2025)



#### 6.12.1 Analysis and interpretation of the data

Table 3 – Economic Sustainability: Financial Resources

Sources of funding for sustainable initiatives: 25 households reported Yes, while 50 reported No.

Budget allocation to different areas: 37 households responded Yes, while 38 responded No.

The data highlights a financial challenge in achieving economic sustainability. A majority of households (50 out of 75) indicated that there are no reliable sources of funding for sustainable initiatives. This suggests that sustainable projects may lack financial backing, making long-term implementation difficult.

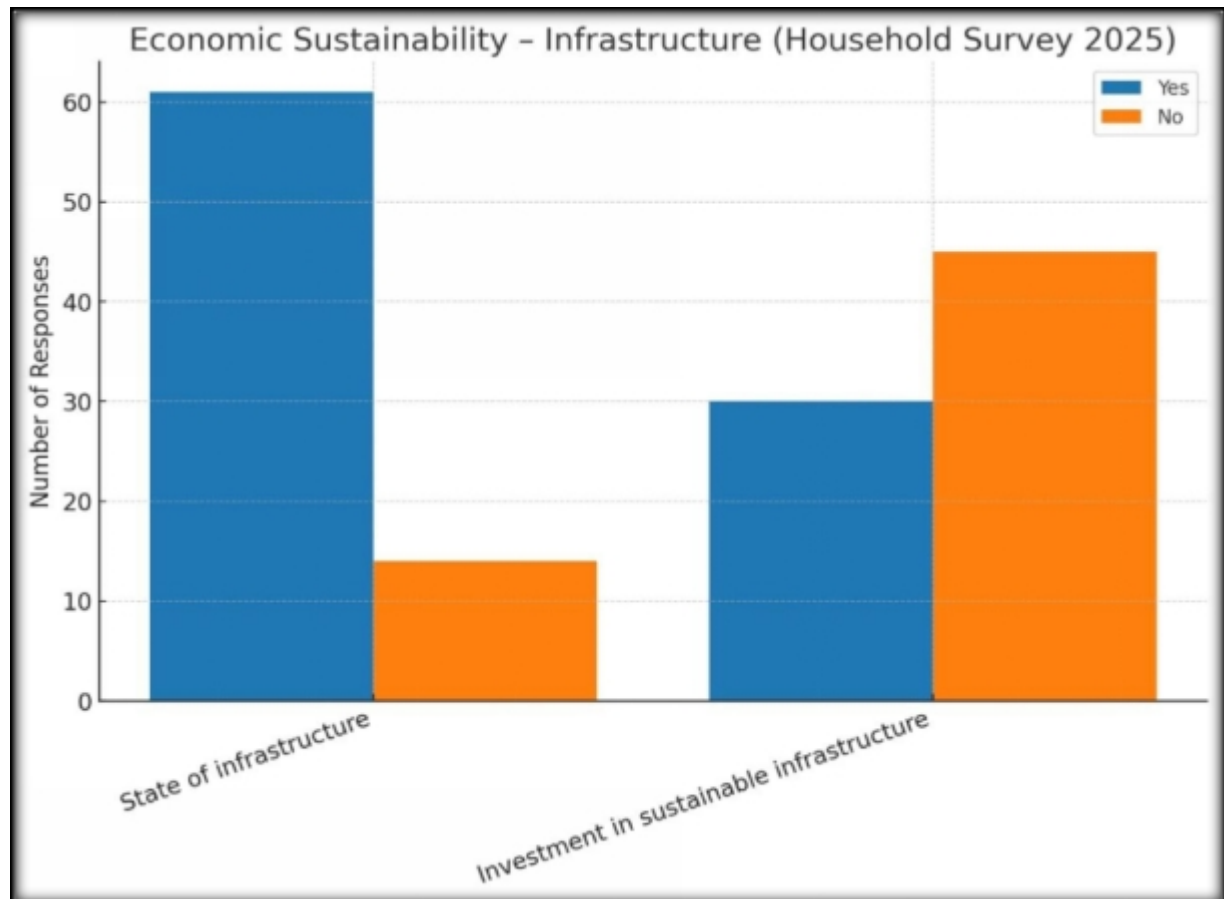
On the other hand, responses regarding budget allocation are almost evenly split, with 37 households affirming that budgets are allocated to different areas and 38 denying it. This indicates inconsistency in financial planning, where some households prioritize balanced resource distribution while others do not.

Overall, the survey findings suggest that while some households attempt to manage resources sustainably, the lack of consistent funding sources and uneven budget allocation practices pose a barrier to long-term economic sustainability.

**6.13 Table 3- Economic sustainability – Infrastructure**

| 3 | Infrastructure                              | Yes | No |
|---|---------------------------------------------|-----|----|
|   | a. State of infrastructure                  | 61  | 14 |
|   | b. Investment in sustainable infrastructure | 30  | 45 |

Source : Household Survey (2025)



#### 6.13.1 Analysis and interpretation of the data

A majority of respondents (61) reported that the infrastructure in their area is in a good or acceptable state, while only 14 indicated otherwise.

This suggests that the community generally perceives existing infrastructure as sufficient to meet their needs.

Only 30 respondents agreed that there is investment in sustainable infrastructure, while a larger group of 45 said there is none.

This indicates a significant gap between the current state of infrastructure and long-term sustainable development practices.

#### Overall Interpretation

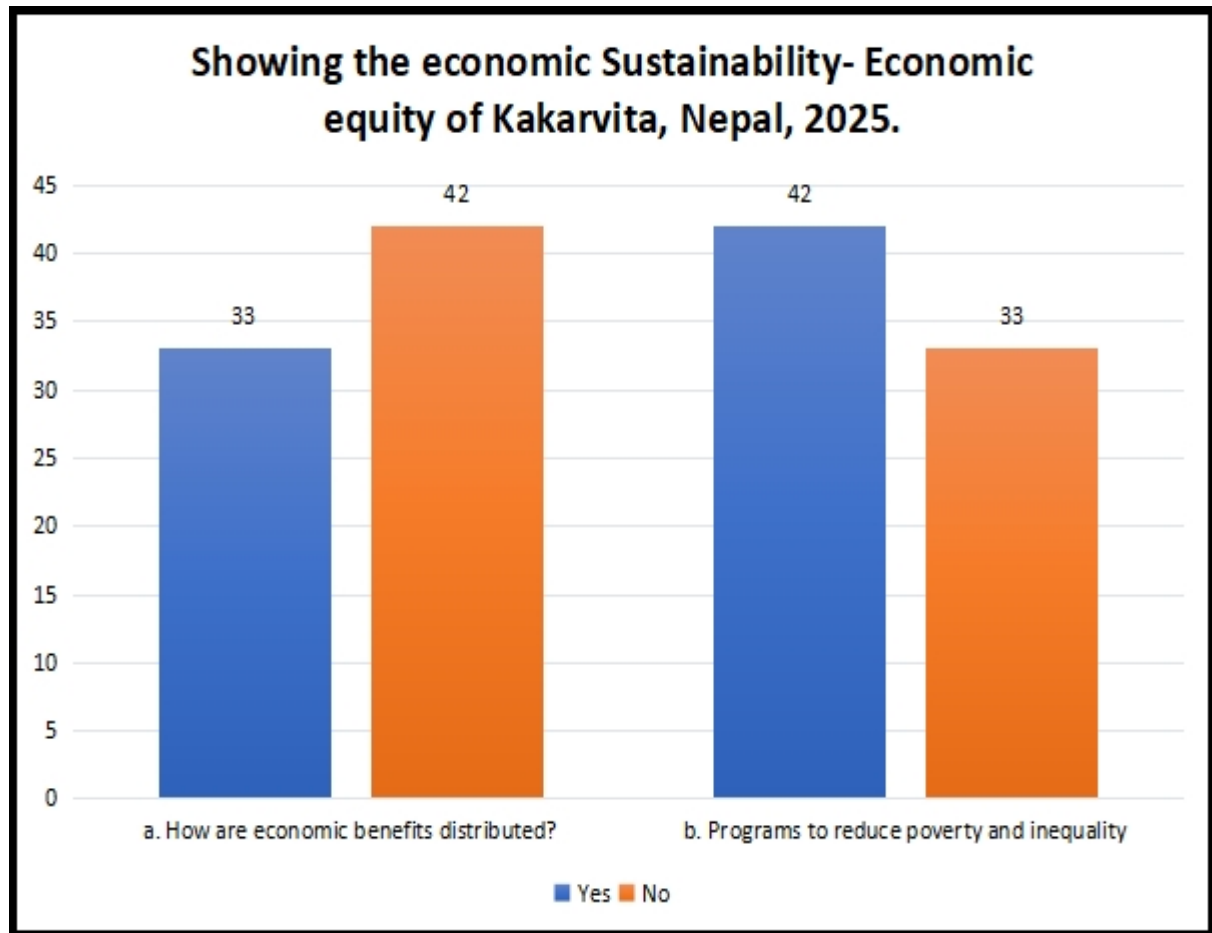
While the existing infrastructure is largely considered adequate, the lack of sufficient investment in sustainable infrastructure highlights a potential risk for future development. This imbalance suggests that

although current needs are being met, there is limited focus on sustainability, which may affect long-term economic resilience and environmental balance.

**6.14 Table 3- Economic sustainability – Economic equity**

| 4 | Economic Equity                              | Yes | No |
|---|----------------------------------------------|-----|----|
|   | a. How are economic benefits distributed?    | 35  | 45 |
|   | b. Programs to reduce poverty and inequality | 45  | 35 |

Source : Household Survey (2025)



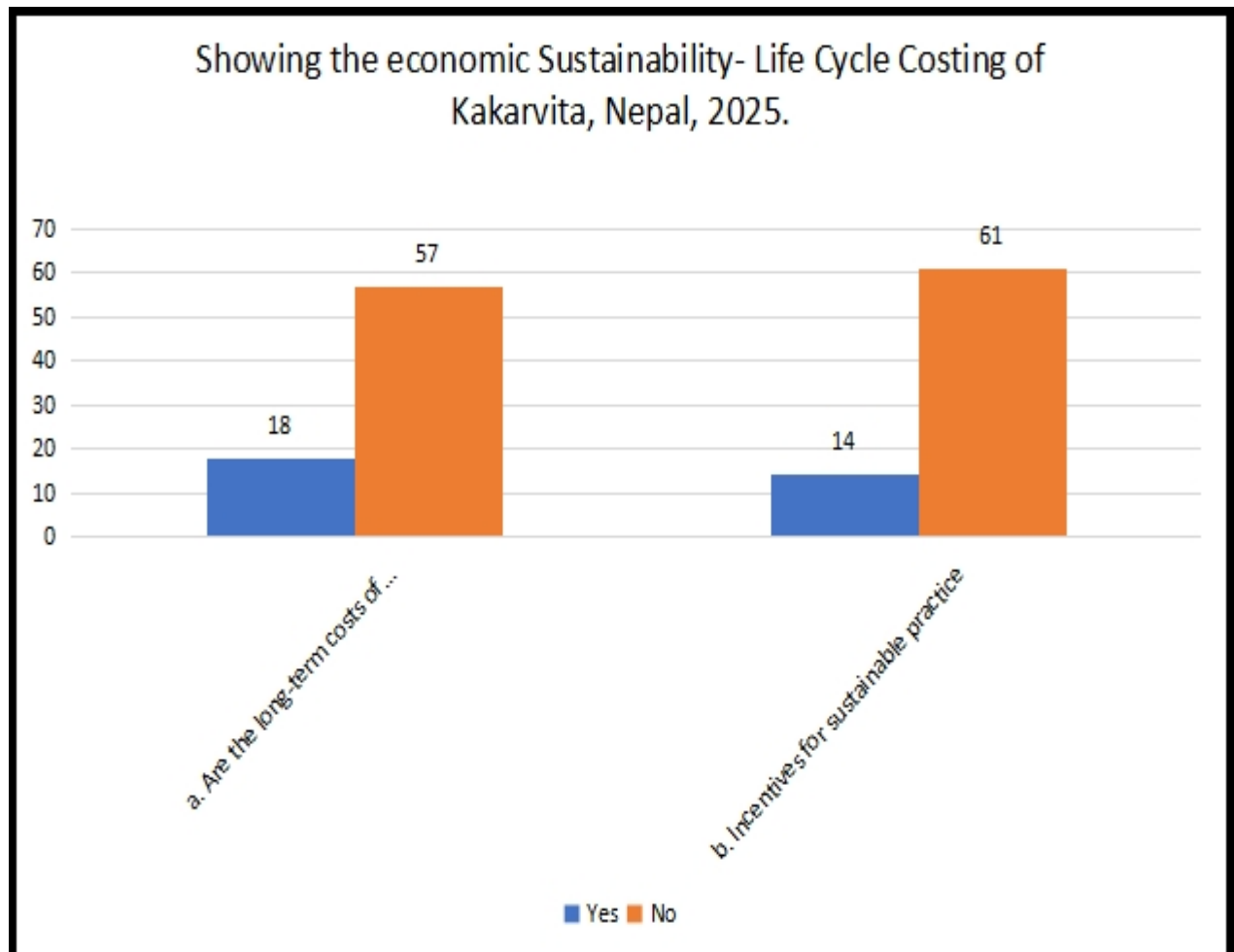
#### 6.14.1 Analysis and interpretation of the data

1. Out of 80 respondent 45 agreed that the economic benefits are not disturbed and rest 35 stated the economic problem and the ways the economic benefits are getting disturbed.
2. There are 45 respondent who stated that there are programs and schemes that allows the people who are under poverty line are getting the opportunity to grow financially and rest 35 stated that there are no such programs from the side of government.
3. This graph represents a financial status of the area and depicts the lack of financial facilities and the problem faced by below poverty people.

**6.15 Table 3 – Economic Sustainability – Life Cycle Costing**

| 5 | Life Cycle Costing                                                       | Yes | No |
|---|--------------------------------------------------------------------------|-----|----|
|   | a. Are the long-term costs of infrastructure and development considered? | 18  | 57 |
|   | b. Incentives for sustainable practice                                   | 14  | 61 |

Source : Household Survey (2025)



#### 6.15.1 Analysis and interpretation of the data

1. Out of 75 respondents, 18 indicated that long-term costs of infrastructure and development are not considered.
2. The following bar graph visually represents 'yes' (18) with the blue segment, and the larger orange segment represents 'No' (57). This indicates that the majority of respondents do not consider long-term costs in infrastructure and development.
3. Out of 75 respondents, 14 indicated that there are incentives for sustainable practice, while 61 indicated there are no incentives for sustainable practice.
4. The bar graph suggests a significant lack of incentives for sustainable practices among the surveyed group.

## 7.0 Findings:

Here are the findings based on the

**Table 1- Environmental sustainability – Resource used:**

1. Water consumption – Out of the respondents, 53 indicated “Yes” and 22 “No”. This shows that water is widely consumed as a resource, but around one-fourth of the cases do not significantly rely on it.
2. Energy used – With 67 “Yes” and only 8 “No”, energy is the most commonly used resource. This indicates heavy dependence on energy for functioning, making it a critical factor in sustainability concerns.
3. Land used and its impact on biodiversity – 55 “Yes” responses and 20 “No” indicate that land use is a major factor, and its impact on biodiversity is significant. This highlights the need for sustainable land management practices.
4. Material consumption and recycling/reusing – Only 27 responded “Yes” while 48 responded “No”. This shows that recycling and reusing of materials are not widely practiced, which points to a gap in sustainable practices and an area requiring improvement.

Environmental sustainability – Waste management:

1. Waste generated – With 65 “Yes” and only 10 “No”, it is clear that waste generation is a major issue, showing that most activities contribute to environmental waste.
2. Waste collection, treatment, and disposal – 56 “Yes” responses compared to 19 “No” indicate that although waste management systems exist, there are still noticeable gaps in effective collection and disposal methods.
3. Waste reduction and recycling programs – With 46 “Yes” and 29 “No”, the data shows that waste reduction and recycling initiatives are present but not fully implemented, suggesting that awareness and participation need to be strengthened.

Environmental sustainability: Pollution:

1. Sources and level of air, water, and noise pollution – With 62 “Yes” and only 13 “No,” the data shows that pollution from these sources is widely prevalent and poses a significant environmental challenge.
2. Measures to mitigate pollution – The responses (39 “Yes” and 36 “No”) indicate that while some measures to control pollution are in place, they are not adequate or uniformly implemented. This reflects a gap between recognizing pollution and effectively addressing it.

Environmental sustainability: Biodiversity:

1. Impact of development on local ecosystems – With 42 “Yes” and 33 “No,” the data shows that development activities are having a noticeable impact on local ecosystems, though the responses also suggest that the extent of this impact varies across areas.



2. Protected areas or conservation efforts – Only 32 “Yes” responses compared to 43 “No” indicate that conservation initiatives and protected areas are limited, reflecting a lack of strong biodiversity protection measures.

Environmental sustainability: Climate Change:

1. Greenhouse emissions – With 57 “Yes” and 18 “No,” the findings show that greenhouse gas emissions are a significant environmental concern, highlighting their widespread presence and contribution to climate change.
2. Adaptation and mitigation strategies – The responses (40 “Yes” and 35 “No”) indicate that while some adaptation and mitigation measures are being undertaken, they are not sufficiently adopted or uniformly implemented.

**Table 2 – Social Sustainability: Community Engagement:**

1. Residents’ involvement in planning decisions – With 52 “Yes” and 23 “No,” the findings show that a majority of residents are involved in planning decisions, though nearly one-third are still excluded, indicating scope for greater inclusivity.
2. Level of social equity and access to services – 50 “Yes” and 25 “No” suggest that social equity and service accessibility are fairly well maintained, but a considerable section of the community still faces inequalities or limited access.
3. Community development and cultural preservation – With 57 “Yes” and 18 “No,” the data indicates that community development efforts and cultural preservation practices are relatively strong, reflecting positive social sustainability initiatives.

Social Sustainability: Health and Well-being:

1. Indicators of public health – With 53 “Yes” and 22 “No,” the data suggests that public health indicators are generally positive, though there are still areas where health conditions need improvement.
2. Level of social cohesion and safety – The responses (44 “Yes” and 31 “No”) show that while many people experience a sense of social cohesion and safety, a significant portion does not, pointing to concerns regarding social trust, community bonds, and security.

Social Sustainability: Education and Skills:

1. Quality of education and access to training opportunities – With 53 “Yes” and 22 “No,” the findings suggest that education quality and access to training opportunities are relatively strong, though some gaps in accessibility and inclusivity remain.
2. Programs to develop local skills and expertise – The nearly equal responses (37 “Yes” and 38 “No”) indicate that skill development initiatives are not consistently implemented, reflecting a lack of sufficient programs to enhance local expertise.

Social Sustainability: Cultural Heritage:

1. Preservation and promotion of cultural heritage – With 48 “Yes” and 27 “No,” the findings show that efforts to preserve and promote cultural heritage are present but not comprehensive, leaving room for stronger initiatives.

2. Opportunities for cultural exchange and tourism – The responses (42 “Yes” and 33 “No”) suggest that while some opportunities for cultural exchange and tourism exist, they are not fully developed or accessible to all.

#### Social Sustainability: Accessibility:

1. Accessibility for people with disabilities – With 44 “Yes” and 31 “No,” the data shows that while accessibility for people with disabilities is available in many cases, there is still a significant gap that needs to be addressed to ensure inclusivity.
2. Transportation options and their impact on accessibility – The responses (50 “Yes” and 25 “No”) indicate that transportation facilities play a positive role in improving accessibility, though not all areas benefit equally from these options.

#### **Table 3 – Economic Sustainability: Economic Development:**

1. State of local economy and employment – With 61 “Yes” and only 14 “No,” the findings suggest that the local economy and employment conditions are generally strong, reflecting economic stability in the area.
2. Opportunities for diversification and innovation – The responses (33 “Yes” and 42 “No”) show that opportunities for diversification and innovation are limited, indicating reliance on a narrow set of economic activities and less focus on creative or modern industries.
3. Policies to support local businesses – With 35 “Yes” and 40 “No,” the findings reveal that policies for supporting local businesses are weak or not consistently implemented, leaving small enterprises with fewer growth opportunities.

#### Economic Sustainability: Financial Resources:

1. Sources of funding for sustainable initiatives – With only 25 “Yes” and 50 “No,” the data shows that funding sources for sustainability-related initiatives are very limited, which restricts the implementation of long-term sustainable projects.
2. Budget allocation to different areas – The responses (37 “Yes” and 38 “No”) are almost evenly split, suggesting that while some budget allocation is happening, it is not consistent or sufficient across all sectors.

#### Economic Sustainability: Infrastructure:

1. State of infrastructure – With 61 “Yes” and only 14 “No,” the findings indicate that the overall state of infrastructure is fairly strong and supports local development.
2. Investment in sustainable infrastructure – The responses (30 “Yes” and 45 “No”) show that investment in sustainable infrastructure is relatively low, pointing to a gap between maintaining existing infrastructure and transitioning to eco-friendly, future-ready systems.

#### Economic Sustainability: Economic Equity:

1. Distribution of economic benefits – With 33 “Yes” and 42 “No,” the findings suggest that economic benefits are not evenly distributed, indicating inequality in how resources and opportunities reach different groups in society.

2. Programs to reduce poverty and inequality – The responses (42 “Yes” and 33 “No”) show that some efforts and programs to reduce poverty and inequality exist, but they are not sufficient to fully address disparities.

#### Economic Sustainability: Life Cycle Costing:

1. Consideration of long-term costs of infrastructure and development – With only 18 “Yes” and 57 “No,” the findings reveal that long-term economic and environmental costs are largely neglected in development planning, which may lead to future sustainability challenges.
2. Incentives for sustainable practice – The responses (14 “Yes” and 61 “No”) show that incentives to encourage sustainable practices are very limited, discouraging individuals and businesses from adopting eco-friendly approaches.

### 8.0 Conclusion:

The survey results provide a comprehensive picture of the sustainability situation in Kakarvitta, Jhapa district, reflecting the perspectives of residents on economic, social, and environmental aspects of development.

From a social standpoint, education, health indicators, and access to services are reported as relatively strong, and many respondents acknowledge the importance of cultural preservation and community participation in planning decisions. However, gaps persist in areas such as inclusivity for people with disabilities, social cohesion, and skill development opportunities, suggesting that certain groups remain marginalized or underserved.

In terms of environmental sustainability, the data points to significant challenges. Water, energy, and land are heavily consumed resources, but recycling and reuse practices are weak, with most respondents indicating poor adoption of sustainable material management. Waste generation is high, and while some waste collection and treatment systems exist, they are not comprehensive. Pollution—whether air, water, or noise—is widely acknowledged, but mitigation measures are insufficiently implemented. Biodiversity is under pressure from development activities, and conservation efforts are limited. Climate change concerns such as greenhouse gas emissions are recognized, but adaptation and mitigation strategies remain inconsistent and underdeveloped.

On the economic front, the findings reveal that the local economy benefits from trade, agriculture, remittances, and relatively strong infrastructure. Employment opportunities appear stable, yet diversification and innovation remain limited. Policies to support small businesses are inconsistent, and funding for sustainability initiatives is scarce. While infrastructure is generally maintained, investments in sustainable and eco-friendly infrastructure are lacking. Economic equity is another concern, as benefits are unevenly distributed and poverty reduction programs are not sufficient to bridge disparities. Importantly, the consideration of long-term costs in development planning is minimal, and incentives for sustainable practices are largely absent.

Taken together, the data shows that while Kakarvitta is progressing in education, community development, and basic infrastructure, there are significant shortcomings in sustainability planning. Environmental pressures, weak policy support, and inadequate financial incentives threaten to undermine future growth. To achieve balanced and lasting development, greater efforts must be made to strengthen environmental protection, promote equitable economic opportunities, and expand inclusive social initiatives. Only by

addressing these gaps can Kakarvitta ensure that its development trajectory benefits both current and future generations.

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