Impact of Stray Animals on Road Safety: A Case Study of the East-West Highway Section in Bheemdatta Municipality Area, Nepal

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Abstract

This research aims to assess the impact of stray animals on traffic safety in the Bheemdatta Municipality along the East-West Highway section. Over the past seven years, the frequency of road accidents involving stray animals has escalated, resulting in increased animal-vehicle collisions, fatalities, and significant financial damages. A mixed-method approach was adopted, combining both quantitative and qualitative methods, with data analyzed using descriptive statistics and statistical charts. Data was collected from local traffic police records over the past three years, along with questionnaire surveys conducted with 154 respondents, including drivers, passengers, residents, and traffic police. The findings revealed 13 recorded animal-vehicle collisions, with 5 human deaths, 9 stray animal injuries, and 13 stray animal deaths. Additionally, 92.2% of respondents reported encountering stray animals on the roads daily. The study suggests that measures such as using reflective collars, enforcing animal ownership laws, and establishing shelters for stray animals, along with utilizing stray animals for biogas production, could reduce the adverse impact on road safety. This research underscores the need for effective animal management strategies along with sustainable solutions to enhance road safety and protect both human lives and the welfare of stray animals in the region.

Keywords: *Animal vehicle collision, road safety, stray animals, sustainable solutions*

Introduction

An accident was defined by a World Health Organization (WHO) expert group in 1956 as an "unpremeditated event resulting in recognizable damage." Although each year approximately 1.35 million annual road accidents happen seriously injuring between 20 to 50 million people worldwide (Ahmed et.al.2023), these collisions have received little attention, even though they have a significant effect on both road safety and human health (Jantan et al., 2020). Over the past seven years, road accidents caused by stray animals, particularly cattle, have become a growing concern along the East-West Highway section in Bheemdatta, Nepal.. Stray animals present substantial road safety risks, leading to an alarming rise in human and animal casualties. Local household practices, such as removing cows temporarily from streets to collect milk and subsequently releasing them with their calves when milk production ceases, contribute significantly to the problem (Mittal, 2019.). This, coupled with the lack of effective animal management systems, has fueled an increase in stray animal populations, creating continuous hazards for road users (Karadas & Dag, 2025). Countries including India, Australia, and the United States face similar issues. In the United States, deer-related accidents are a major safety concern (Jeyaratnam et al., 2024). These global examples emphasize the universal nature of this issue, although the scale, context, and solutions vary widely.

According to the Sustainable Development Goal 11.2, everyone must have access to safe, reasonably priced, easily accessible, and environmentally friendly transportation services by 2030(Kumar et al., 2020). Injuries are no longer perceived as generally preventable, but result in the deaths of over five million people yearly worldwide. 1.2 million of these enormous numbers are attributable to traffic accidents (Farooqui et al., 2013). It is crucial to protect both people and animals in public areas, especially when it comes to stray animals roaming on roads (Mittal,2019.). Although accidents between vehicles and animals are not new, traffic users and authorities are likely the least concerned about this problem. Animals have lived on this planet for millions of years, long before humans

created cars, and they have been roaming around for a lot longer than humans (Diyanah Jantan et al., 2020b).

Building on earlier research into human fatalities in animal-vehicle crashes by Khattak (2003), Mohanty et al. (2021) identified stray animals as a frequently overlooked cause of these collisions, a critical issue as road traffic accidents continue to rise in developing countries. It was stressed that human fatalities happened when animals were more active, and that unrestrained people were often killed (Khadka et al., 2025). Both people and animals suffer from collisions; in the United States, there are about 1-2 million vehicle and wild animal collisions that occur annually, resulting in at least $8 billion in property damage, 200 fatalities, and 26,000 injuries (Atheeb et al., 2021a). Stray animals are a significant social and political concern, yet meaningful governmental or group action is lacking. These animals cause traffic obstructions, leading to wasted time and increased accident risk (Mittal, 2019) . Factors influencing their movement include infrastructure type, land use, adjacent habitat, human settlements, and road traffic (Mbangiseni & Mashau, 2018). The harmonious balance of human, wildlife, and natural coexisting should be created and maintained by a linear infrastructure that is sustainable to our natural environment, manageable by our resources, and productive

In Nepal, wildlife traffic accidents have become a problem for the administration of protected areas, impacting both animal numbers and human safety. The East-West Highway in Nepal is greatly impacted by stray animals, both domesticated and wild, which can raise public health concerns and increase roadkill incidents and roadblockages (Mbangiseni & Mashau, 2018). In Kanchanpur, a district in the Terai region of Nepal's Sudurpaschim Province, local units are struggling to manage stray animals, particularly cattle. These animals cause damage to crops, lead to traffic accidents, and diminish the aesthetic appeal of urban and rural areas, negatively impacting residents. Municipalities in Kanchanpur district including Bheemdatta, Bedkot, Shuklaphanta, and Krishnapur have attempted to address the problem by investing between NRs 5 million to NRs10 million in building cow sheds (Gaushalas) and maintaining records. Despite these efforts, the issue of stray animals remains inadequately handled. The primary source of stray animals is abandonment, which is followed by unchecked reproduction, leading to several generations of street animals and a subsequent growth in the population.

Vehicle-animal collisions are a significant issue in Bheemdatta, exacerbated by local customs and regional regulations (Kalašová & Stacho, 2006). India's ban on cow slaughter has led to unmanaged cattle roaming freely in Nepal, frequently crossing highways, especially at night. Despite measures like ear tags and reflective collars, authorities have struggled to find lasting solutions (Mbangiseni & Mashau, 2018). Qualitative surveys and traffic police records indicate the problem is widespread and often unaddressed, with accidents frequently unreported due to a lack of accountability and victim reluctance. In addition to the dangers on the roads, residents are becoming increasingly irritated due to the financial losses resulting from crop and property damage (Mbangiseni & Mashau, 2018). Additionally, the accumulation of dung, urine, and other solid waste from stray cattle is accelerating the deterioration of pavements and public infrastructure, in turn lowering the aesthetic quality of the city. In contrast to nearby Dhangadhi city, where the installation of shelters and health monitoring initiatives has yielded encouraging outcomes, Bheemdatta continues to lack a comprehensive and coordinated strategy for managing stray animals, putting road users at risk of collisions and subjecting animals to needless suffering. Despite investing millions of rupees, the municipalities of Kanchanpur have failed to establish a sustainable solution to control stray animals. Responsibility for overseeing the management of stray animals has been assigned to the deputy mayors or vice-chairpersons of these municipalities.

Objectives

This research evaluates the impact of stray animals on road safety along the East–West Highway in Bheemdatta Municipality, Nepal, through accident data analysis, field observations, and public perception studies, and recommends sustainable management measures.

Study Area

This study focuses on assessing the impact of stray animals on road safety in Bheemdatta municipality specifically along the East-West Highway. By analyzing traffic police records, conducting surveys, and gathering qualitative insights from field interviews, it seeks to uncover the root causes of stray animal-related accidents and propose sustainable solutions tailored to the local context. The research highlights the urgent need for proactive management systems that not only enhance road safety but also improve animal welfare, drawing lessons from successful interventions in other regions. By addressing these challenges, this study aims to provide actionable recommendations that will help local authorities and policymakers mitigate the risks posed by stray animals. Ultimately, the findings will contribute to the development of long-term strategies to ensure safer roads and a better-managed urban environment for Bheemdatta.

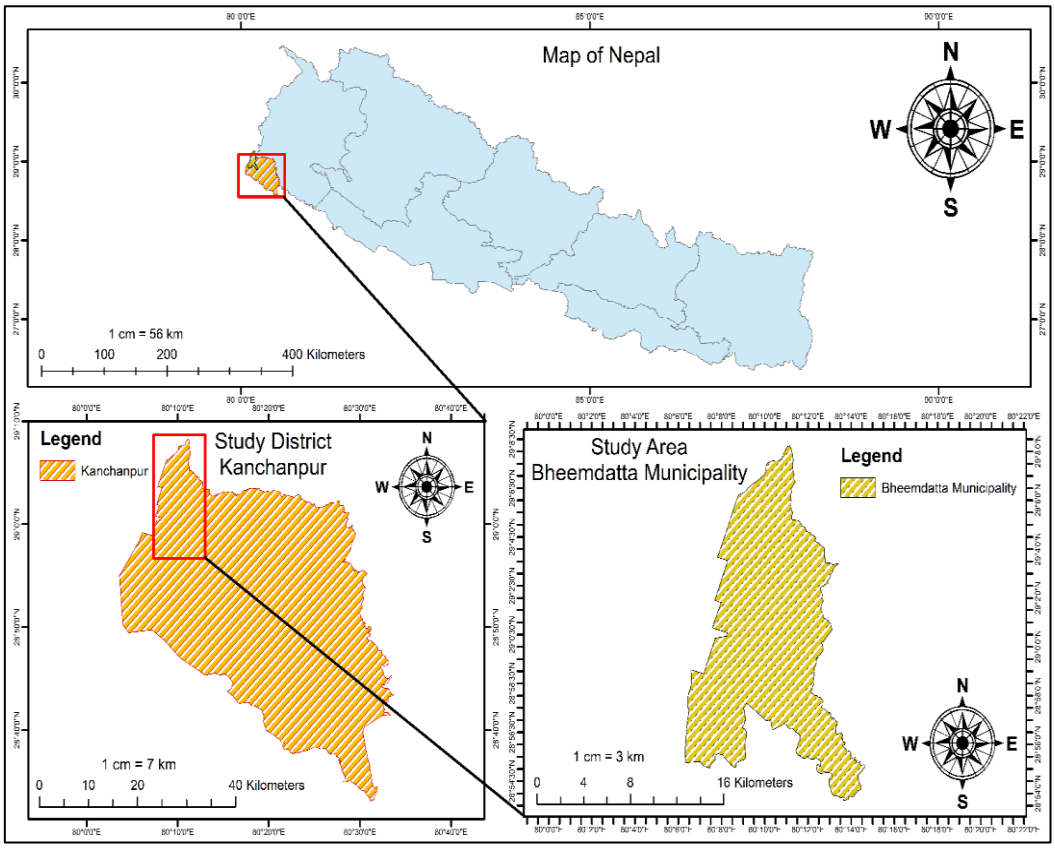

Figure 1:Location map of the study area.

Methodology

This research adopted a mixed-method approach to comprehensively analyse the impact of stray animals on road safety along the East-West Highway section in Bheemdatta, Nepal. The study integrated quantitative and qualitative data to identify the underlying causes of stray animal-related accidents and assess current mitigation measures.

Data Collection Methods

Quantitative Data

To quantify the prevalence and consequences of animal-vehicle collisions, official traffic accident data were collected from the District Traffic Office in Bheemdatta, Kanchanpur. The data covered three consecutive fiscal years: 2079/80, 2080/81, and 2081/82 BS. This dataset included records of road accidents, human fatalities, animal injuries, and deaths.

Qualitative Data

Qualitative data were gathered through two primary methods:

Questionnaire Survey: A survey was designed and distributed using the Kobo tool to target residents, passengers, and drivers. Survey links and QR codes were distributed in key areas, reaching 250 individuals, from which 155 complete responses were collected for analysis. The survey included questions about the frequency and timing of encounters with stray animals, perceived safety risks, and opinions on potential solutions.

Field Observations and Interviews: Site visits were conducted at high-risk locations ("blackspots") identified through official records and local consultations, including Gaddachauki, Bhasi, and the Mahendranagar market area. Observations focused on traffic disruptions, driver behaviour, and animal activity during peak hours. These observations were supplemented with informal interviews with daily commuters, local shopkeepers, and traffic police to gather contextual insights.

Figure 2: Traffic obstruction by stray animal movement at different locations of the study area

Data Analysis

The collected data were analyzed using descriptive statistics. Quantitative data from traffic records and survey responses were used to generate frequencies and percentages, which are presented using bar charts and pie charts. Qualitative insights from observations and interviews were synthesized to support and explain the quantitative findings.

Results and Discussion

This section presents the findings from the analysis of traffic police records and the questionnaire survey.

Traffic Incident Records

According to data from the District Traffic Office, a total of 13 road accidents involving stray animals were officially recorded over the three fiscal years. Over the three fiscal years (2079/2080–2081/2082), accidents involving stray animals showed a declining trend, dropping from 7 cases to just 2. While the frequency of accidents reduced, the severity remained concerning, with human fatalities fluctuating 3 in 2079/2080, none in 2080/2081, and 2 in 2081/2082. Stray animal casualties were consistently high, with multiple injuries and deaths each year. This indicates that although road safety improved in terms of fewer accidents, both human and animal lives continued to face significant risks from such incidents.

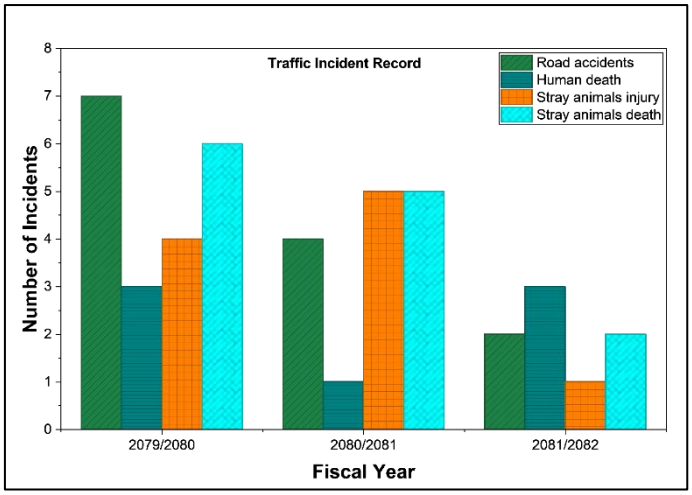

Figure 3: Traffic incident record

Perceptions and Experiences of Road Users

The survey of 154 road users provided insight into the public's daily experience with stray animals and their perception of the associated risks. Figure 4 shows the community's overwhelming sense of insecurity due to stray animals, with 91% of respondents feeling unsafe on roads. Daily life impacts are equally severe, as 78% reported significant disruption and 22% reported some disruption, highlighting stray animals as a major threat to mobility and safety.

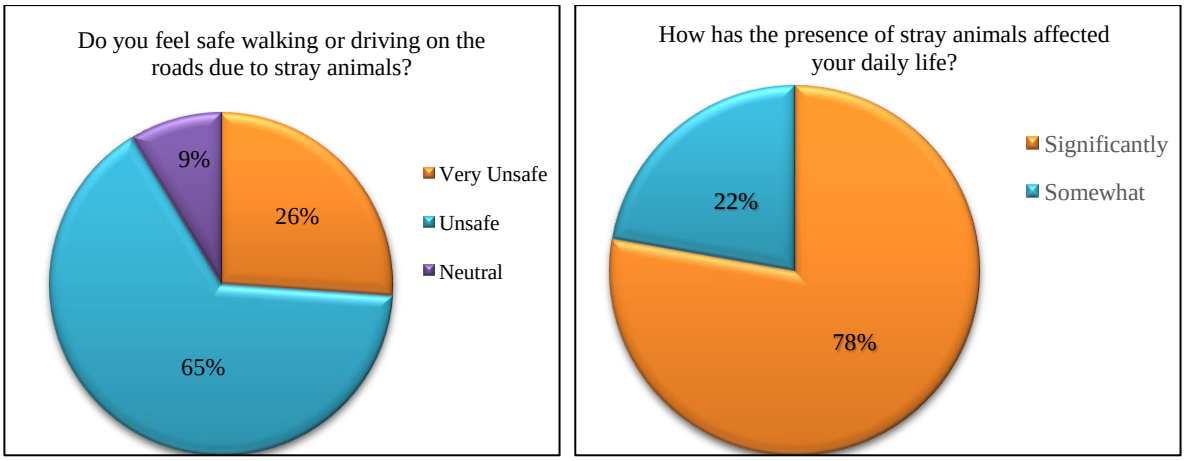

Figure 4: Perception of safety

Road Impact and Accident Records

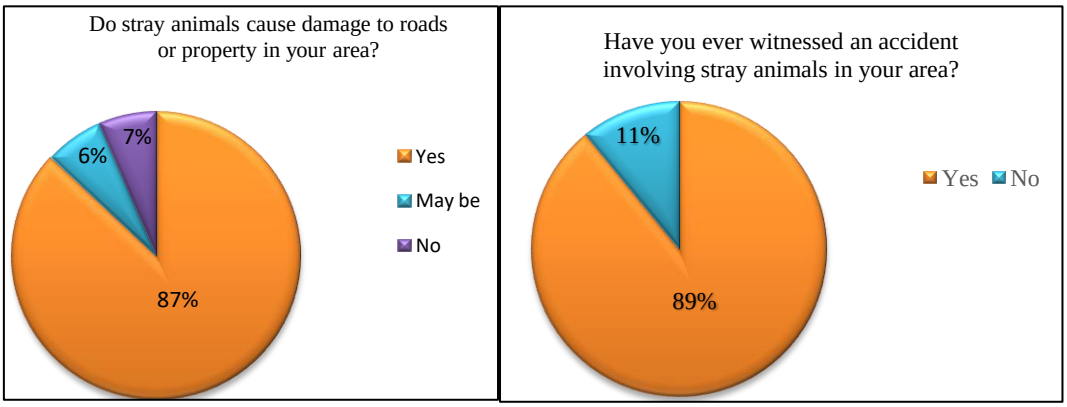

Figure 5: Human response and reporting behavior

Figure 5 highlights the serious risks that stray animals pose to road safety and infrastructure. A large majority of respondents of 87% reported road or property damage due to stray animals, while 89% had personally witnessed accidents involving them. These results clearly establish stray animals as a frequent and visible contributor to road accidents and infrastructural damage in the study area.

Human Response and Behavior

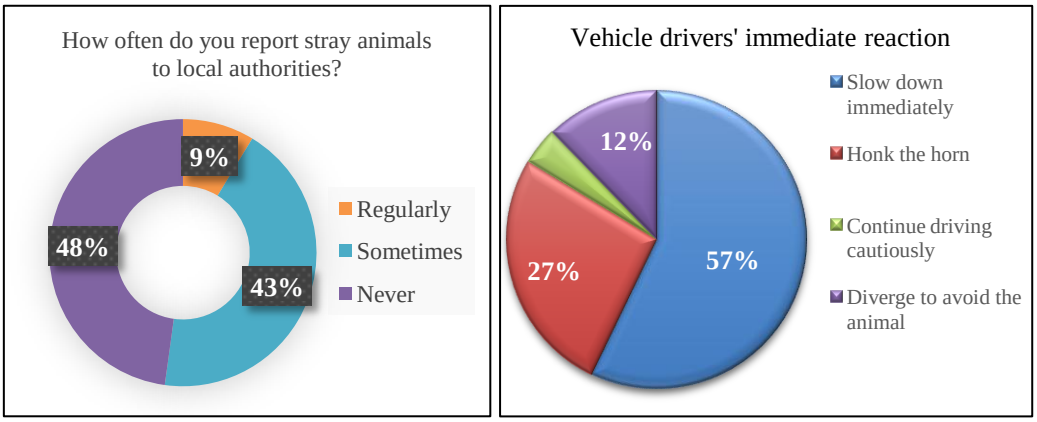

Figure 6: Vehicle involvement and encounter timing

Figure 6 shows limited reporting of stray animals and varied driver responses during encounters. Nearly half of respondents (48%) reported incidents to authorities only sometimes, while 43% never reported, reflecting weak institutional communication. In terms of driver reactions, 57% slowed down immediately, while 27% honked, and smaller groups either diverged 12% or continued cautiously 4%. These behaviors highlight reactive rather than preventive responses, increasing accident risks.

Responsibility and Awareness

Figure 7 highlights public views on accountability and preparedness. A large majority 77% believe that both owners and local authorities share responsibility for stray animals on streets, while 20% blame only owners, and just 3% point to authorities alone. On awareness, 93% of respondents reported never receiving any training on handling stray animals, showing a critical gap in community preparedness and safety education.

Peak Hours of Stray Animal Occurrence on the Highway

The questionnaire survey asked respondents about the times of day when they most frequently encounter stray animals on the road. The responses from 154 participants revealed the following distribution of encounters:

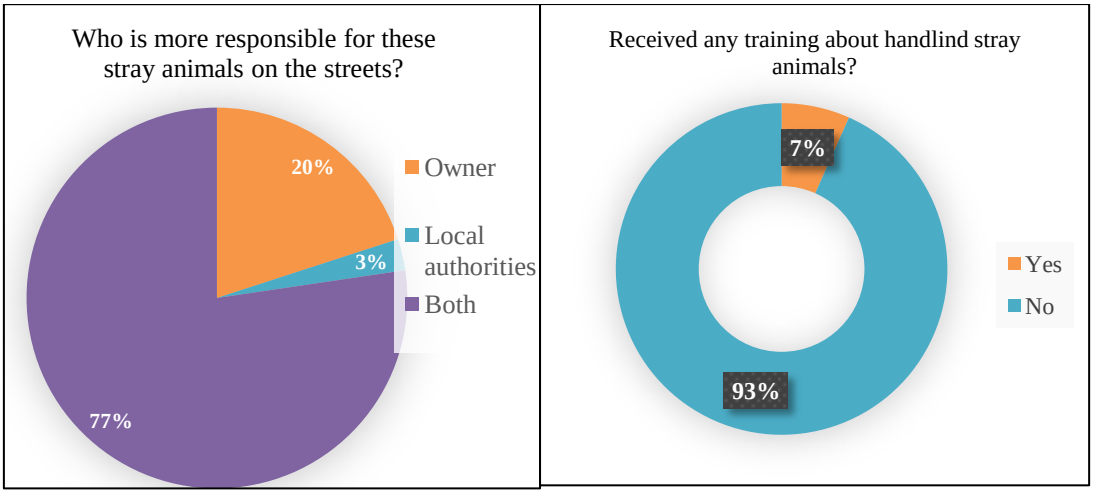

Figure 7: Responsibility and awareness

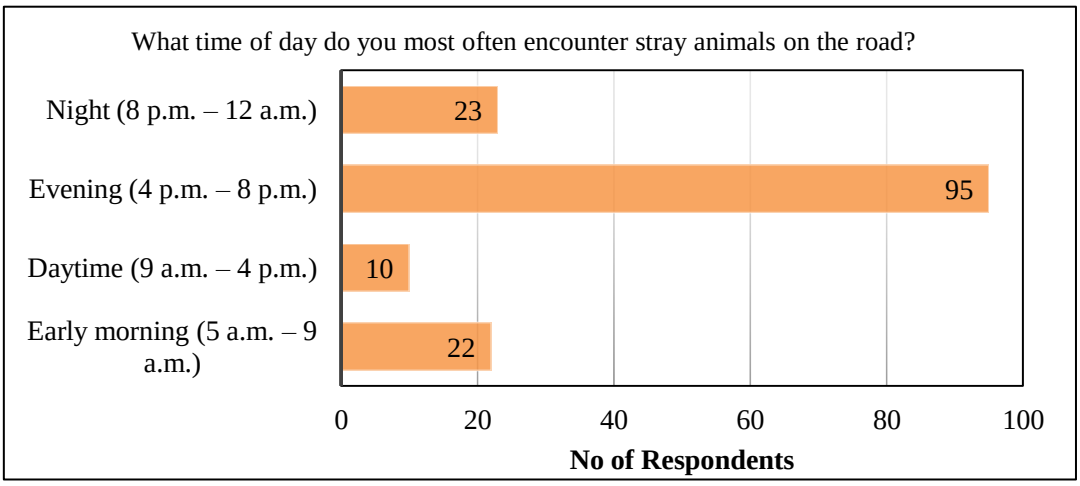

Figure 8: Responsibility and awareness

Figure 8 shows the timing of stray animal encounters. Most respondents, about 95, reported encounters during the evening (4–8 P.M.), followed by night with 23, and early morning of 22. Daytime encounters were minimal (10). This indicates that low-light periods, especially evenings, pose the highest risk for road users. These results demonstrate that stray animals pose a significant infrastructure and safety concern, indicating their frequent presence on roads and the associated risks to road users.

Despite the high number of reported encounters and the clear risks posed by stray animals, the survey also highlighted the issue of underreporting. Many accidents, especially minor ones, go unreported, often due to the lack of a clear responsible party for the animals and the reluctance of residents to engage with authorities. This underreporting means that the actual number of accidents and injuries involving stray animals is likely higher than what is reflected in the official records. As a result, the full extent of the problem is not fully understood, making it difficult for local authorities to implement effective solutions. The absence of these shelters contributes to the growing number of stray animals on the roads, which in turn increases the frequency of accidents. This suggests that without proper facilities to manage stray animals, the problem will likely persist or worsen over time. The study also highlighted a perceived gap in the responsibility of animal owners.

Many respondents felt that animal owners should be held accountable for their livestock, especially in cases where animals are allowed to roam freely after being used for milk production. This lack of accountability contributes to the increase in the stray animal population and, consequently, the

number of accidents. Strengthening animal ownership laws and enforcing them more strictly could help reduce the number of stray animals on the roads and decrease the frequency of accidents. Finally, the study found that the absence of a clear reporting mechanism for stray animal-related accidents further complicates efforts to address the problem. With no formalized system in place, residents are less likely to report incidents, and authorities are unable to gather comprehensive data on the scope of the issue. Implementing a more transparent and accessible system for reporting accidents involving stray animals could help authorities better assess the problem and take timely action to reduce the risks associated with these animals.

Conclusion

In conclusion, stray animals are not merely a nuisance but a major road safety hazard in Bheemdatta. Addressing this issue requires a balanced approach combining regulation, infrastructure, awareness, and sustainable utilization of animals. By implementing these measures, local authorities can reduce accidents, safeguard lives, and create a safer, more sustainable urban environment for both humans and animals. The findings of this study also underline the significant road safety risks posed by stray animals, particularly cattle, along the East-West Highway in Bheemdatta. Despite a decrease in the frequency of accidents over the past three fiscal years, the number of incidents involving stray animals remains alarmingly high, with notable casualties both among humans and animals. The survey results indicate that a large portion of these accidents occur during low-visibility hours, specifically in the evening and night, when drivers face challenges in spotting stray animals. This highlights the urgent need for improved visibility measures, such as the implementation of reflective collars and the installation of streetlights, to mitigate the risks associated with these animals on the road. Furthermore, the study reveals that a considerable number of accidents go unreported due to a lack of accountability and a clear reporting mechanism. This underreporting, coupled with the absence of effective infrastructure to manage stray animals, underscores the need for immediate action by local authorities. The lack of shelters or cowsheds in Bheemdatta, as compared to neighboring districts, further exacerbates the problem, as it allows stray animals to roam freely on the roads, posing a continuous safety hazard. The results also point to the growing presence of stray animals, largely attributed to the practice of releasing cattle back onto the streets after their use in milk production. This cycle contributes to the increasing number of stray animals, which in turn escalates the frequency of accidents. Strengthening laws regarding animal ownership and care, along with enforcing stricter regulations, will be crucial in reducing the stray animal population and minimizing related road accidents. Additionally, while the safety concerns are paramount, the study also proposes alternative approaches to manage the stray animal issue, such as utilizing stray cattle for biogas production and dairy improvements. These measures could provide both a solution to the problem of stray animals and a potential boost to the local economy, reducing the pressure on road safety while contributing to environmental sustainability.

In conclusion, the issue of stray animals in Bheemdatta requires a multifaceted approach that includes not only stricter regulations and infrastructure development but also innovative solutions that can turn stray animals into an asset for the community. By integrating animal management practices with road safety measures, the local authorities can significantly reduce the risks posed by stray animals, ensuring a safer and more sustainable environment for both road users and animals.

Actionable Recommendation

The findings from Bheemdatta make it clear that stray animals, which are widespread along the East–West Highway, require urgent attention to reduce their impact on road safety. To address these challenges, a multi-pronged strategy is recommended:

Infrastructure Measures

Improving infrastructure is crucial to mitigating the risks posed by stray animals on highways. Installing street lighting at accident-prone locations can enhance visibility during low-light hours, reducing the chances of collisions. Establishing designated animal shelters, such as Gaushalas or cowsheds, will help prevent stray cattle from roaming freely on busy roads. Additionally, better

roadside waste management is essential to reduce the attraction of animals to traffic corridors, thereby lowering their presence in high-risk zones.

Policy and Enforcement

Effective policies and strict enforcement are central to managing the stray animal issue. Strengthening and enforcing animal ownership and control laws will hold owners accountable for their livestock. A transparent reporting mechanism must be established to ensure accurate documentation of stray animal-related accidents. Furthermore, stricter regulations on breeding and release practices are necessary to control the growth of the stray population and prevent recurrence of the problem.

Safety Interventions

Targeted safety interventions can directly reduce the likelihood of accidents. Introducing durable reflective devices, such as high-quality collars or ear tags, can improve the visibility of animals at night. Complementing these measures with road safety awareness campaigns will prepare drivers to handle stray animal encounters more effectively, minimizing accident risks and promoting safer driving practices.

Sustainable and Innovative Solutions

Beyond immediate interventions, sustainable strategies are needed to transform the challenge into an opportunity. Stray cattle can be utilized for biogas production and dairy improvements, creating economic value while reducing their presence on roads. Encouraging community-driven animal management programs, supported by municipal efforts, will ensure shared responsibility and long-term sustainability. Such integrated approaches not only address safety concerns but also enhance environmental and socio-economic outcomes.

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Conflict of Interest

The authors declare that no conflict of interest.

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