



Human-Monkey (*Macaca Radiata*) Conflict in Chamundi Hill - Mysuru, Karnataka

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ABSTRACT

The human-monkey conflict has historical roots due to habitat encroachment and crop raiding. The current status varies, with conflicts continuing in areas of habitat overlap, requiring mitigation measures. Posing safety concerns and necessitating wildlife authorities' intervention for protection. The study area for the survey was Chamundi Hill, located in Mysore in the state of Karnataka, India, and possesses distinct geographical properties that contribute to its scenic beauty and ecological significance. Chamundi Hill (Latitude: 12.2741° N Longitude: 76.6652° E) rises to an elevation of approximately 1,070 meters (3,510 feet) above sea level. The human-monkey conflict survey is a systematic study conducted to assess and understand the issues arising from the interactions and conflicts between humans and monkeys. The survey data on conflict incidents aimed to analyze the frequency, intensity, and characteristics of monkey attacks on humans at Chamundi Hill. The aggressive and fearless monkeys caused numerous attacks, leading to a high human attack rate. Incidents involved scratching and biting, necessitating treatment for the injured. Proposed mitigation measures are required. The people used various techniques for this, the most unique of which was the use of a doll of a tiger or leopard. The crop raiding of monkeys is seen in the villages within 5 km of the forest ranges, and the monkey attack on humans was observed in the villages within a 2 km radius of forest ranges.

Keywords: Conflict, Monkey, Farmers, Villages, Damage

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INTRODUCTION

Urbanization leads to frequent and contentious encounters between humans and monkeys, highlighting the issue of human-primate conflicts (Dore, 2018). Competition, habitat loss, crop damage, and safety concerns impact human-monkey conflict. Understanding dynamics aids coexistence and minimizes negative impacts (Budenkova *et al.*, 2021; Howells *et al.*, 2022). Intelligent and adaptable, monkeys interact with humans in various environments (Kondratenko *et al.*, 2021; Pino *et al.*, 2021). Essential for pollination, conflicts arise due to habitat loss and easy access to food in settlements (Emery, 2005). Primate-human conflicts: rural crop raiding leads to food scarcity and disease (Sotnikov *et al.*, 2021). Urban scavenging necessitates wildlife authorities' protection due to safety concerns (Dixon *et al.*, 2009). Study bridges conflict information gap. Long-term solutions: habitat conservation, wildlife corridors, sustainable farming, community education, involving conservation organizations, local groups, and governments (Dittus *et al.*, 2019). In India, human-monkey conflict results from habitat encroachment. Monkeys adapt and scavenge, damaging crops and entering homes as natural habitats disappear, impacting farmers' livelihoods and causing city

disruptions (Jabbar *et al.*, 2021; Novak, 2021). To lessen human-monkey conflicts, use deterrents, translocation, and eco-friendly crop protection. Crucial: educate the public on monkey behavior and ecological importance. The long-term resolution requires understanding habitat needs and promoting coexistence (Fuentes, 2012). To address the Indian human-monkey conflict: use deterrents, sustainable farming, and public awareness. Bonnet macaque: versatile, adaptable in southern India, hierarchical troops, dominant males prioritize resources, social grooming fosters group harmony (Amano *et al.*, 2021). Bonnet macaques aid ecological balance through plant-based diet and seed dispersal. Conflicts result from human settlements offering alternative food. Deforestation, agriculture, and urbanization force adaptation, causing conflicts and health risks (Albert *et al.*, 2014). Bonnet macaque conservation needs habitat protection, awareness, and reduced human interactions. Protected areas, community projects, education, tourism, and research aid preservation (Gallup Jr., 1982). Southern India's bonnet macaques face conflicts and conservation challenges. Habitat protection, awareness, and coexistence promotion are vital for survival and biodiversity preservation (Estrada *et al.*, 2023). Chamundi Hill, near Mysore, Karnataka, India, is a vibrant forest with religious significance, diverse flora, and rich wildlife. Tourist attraction faces human-monkey conflicts due to urbanization and habitat encroachment. Macaque crop raiding leads to agricultural losses, property damage, safety concerns, hostility, and disease transmission in human-populated areas.

The objective of the study is as follows: To quantify the conflict between humans and the bonnet macaque (*Macaca radiata*); identify the causes of the conflict through its activities; take notice of people's attitudes towards wildlife, and recommend mitigation measures for human-wildlife conflict.

MATERIAL AND METHODS

Study area

The study area for the survey was Chamundi Hill, located near Mysore in the state of Karnataka, India, and possesses distinct geographical properties that contribute to its scenic beauty and ecological significance. Chamundi Hill (Latitude: 12.2741° N Longitude: 76.6652° E) rises to an elevation of approximately 1,070 meters (3,510 feet) above sea level. The hill forms a prominent landmark in the region, offering panoramic views of the surrounding landscapes. The topography is characterized by undulating slopes, rocky outcrops, and valleys, creating a visually captivating terrain. Also, the villages near Chamundi Hill within a radius of 5 km were chosen for the survey.

The human-monkey conflict survey is a systematic study conducted to assess and understand the issues arising from the interactions and conflicts between humans and monkeys. Such surveys aim to gather data on the frequency, intensity, and nature of conflict incidents, identify contributing factors, and propose appropriate mitigation measures. These surveys play a crucial role in informing decision-making processes and developing effective strategies for managing human-monkey conflicts. Methods and methodologies used in a human-monkey conflict survey in Chamundi Hill typically involve a combination of quantitative and qualitative techniques to gather data, analyze patterns, and understand the underlying factors contributing to the conflict. The survey was conducted on the human-monkey conflict, bonnet macaque (*Macaca radiata*). The questionnaire included questions on such topics as the type, use, and extent of land ownership; the type of species having an impact on the property; and general opinions on monkeys, as well as experiences with the frequency and purpose of primate visits. Questions also touched on the type of damage caused to property by monkeys, as well as suggestions on approaches to minimizing such damage. The survey results were tabulated and subsequently analyzed using Microsoft Excel.

Sampling methods

Surveys and Questionnaires: Surveys and questionnaires are effective tools for collecting quantitative data from many participants. Structured questionnaires can be designed to capture information about the frequency and intensity of conflict incidents, locations, and perceived impacts. Surveys may be administered in person or through online platforms to gather data from residents, tourists, and other relevant stakeholders. **Interviews:** In-depth interviews with key informants, such as residents, forest department officials, and community leaders, can provide valuable qualitative insights. These interviews can help understand personal experiences, perceptions, attitudes, and beliefs about the human-monkey conflict. **Semi-structured or open-ended interview formats** allow for a detailed exploration of the issues and capture nuanced information. **Direct Observations:** Direct observations of human-monkey interactions and conflict incidents can provide first-hand information about the behavior, movements,

and patterns of monkeys in different contexts. Trained observers or researchers can record data on the number of monkeys, their activities, feeding patterns, and interactions with humans. This method can help assess the spatial and temporal dynamics of the conflict. The data was collected by survey method, different locations near Chamundi Hill were selected for this. The villages and agricultural land within a radius of 5km and 2km were chosen for this the radius was of air distances. The people were very cooperative during the survey, and the information provided by the respondents was almost legit. The people were hoping for the remedies when we went for the survey. The respondents were chosen randomly for the survey.

RESULTS AND DISCUSSION

The study was conducted from April 2023 to May 2023. The areas were selected according to the distances from the Chamundi hill ranges. The people residing in the villages were questioned and their responses were recorded. Some of the responses were entirely different from the others. We had an experience where the response from one house was that there were no monkey attacks in that region whereas the neighboring house had an incident of monkey attack. On the first day of our survey, we noticed a monkey attack in person, the monkeys were on the roofs of the houses in Hosahundi. The monkeys were climbing on top of trees near the houses and entering the houses and making disturbances for the people. The people were chasing the monkeys with sticks and making sounds. There are 100 respondents in total from different villages near Chamundi Hill, Hosahundi, Bandipalya, Uttanahalli, Tavarekatte, Lalithadripura, Chamundi Hill (residential area), Marasetihalli are the locations chosen for the survey.

Socio-demographic data of the respondents

Tavarekatte and Chamundi Hill were the locations with no agricultural land, other villages had agricultural land and most of the people residing in these villages had agricultural backgrounds. A questionnaire was prepared for the survey. The questions were asked in Kannada and were entered into the Google form. The people aged 15 to 75 were asked for the survey. The respondents are classified based on their age categories (**Table 1**), 13% of the respondents were in the age group of 15-35 age. Most of the respondents are in the age group of 35-55 (50%) years of age. The respondents of age 55-75 are 37%. The survey was conducted in different villages near Chamundi Hill, a total of 100 responses were recorded in which females (33%) and males (67%) were present.

The occupation of the respondents is also recorded in the survey 35% of the respondents are farmers and 29% of the respondents are homemakers. 9% of the respondents are shopkeepers they know very much about the region, and the villagers in the locality will visit the shops. 8% of the respondents were drivers. 5% of the respondents were tourists who visited the Chamundi temple. The students, 4% from the villages were also surveyed. The respondents included 4% of teachers 2% of bank employees and businessmen.

The level of education of the respondents was also recorded during the survey, the majority of the respondents 37% had basic education. 20% of the respondents were illiterate and had

no basic education. 33% of respondents studied above 9th class. Only 10% graduated. The land owned by the people was also recorded from the survey and was categorized accordingly, 27% of the respondents were tenants and didn't own land, some people did agriculture on others' land and by land for lease. 21% of the people owned land below 1 acre, and the least was 3 Cent of land. 34% of the respondents owned land of 1-3 acres. The number of people with land above 3 acres was 15%.

Table 1. Socio-demographic data of the respondents

Sl. No.	Particulars	Percentage	
1	Age	15-35	13%
		35-55	50%
		55-75	37%
2	Gender	Male	67%
		Female	33%
3	Education	Illiterate	20%
		1-8 class	37%
		9-12 class	33%
		Graduate & above	10%
4	Occupation	Farmer	35%
		Homemaker	29%
		Shopkeeper	9%
		Driver	8%
		Tourist	5%
		Student	4%
		Teacher	4%
		Business	2%
		Bank Employee	2%
		Tenant	27%
5	Land owned	Below 1 acre	21%
		1-3 acre	34%
		Above 3 acre	15%

Crop raiding of monkeys

The monkey-human conflict was more recorded in the areas very near the Chamundi forest ranges. The crop-raiding mentality of monkeys was seen in the agricultural areas which are within a 5 km radius of Chamundi hill. The agricultural land was a bit far from the forest ranges compared to other villages. For farmers, crop damage brought on by monkeys can be a serious issue. Monkeys can destroy crops when they enter agricultural areas, leading to significant financial losses. These cunning critters have a history of plundering fields and orchards, eating or harming grains, fruits, and vegetables. Because of their speed and dexterity, they may get over fencing and other obstacles, making it difficult to properly safeguard crops. Farmers frequently use a variety of techniques to scare away monkeys, including scarecrows, noisemakers, and even hiring people. For farmers looking to protect their livelihoods, finding long-term solutions to reduce crop damage brought on by monkeys remains a top issue.

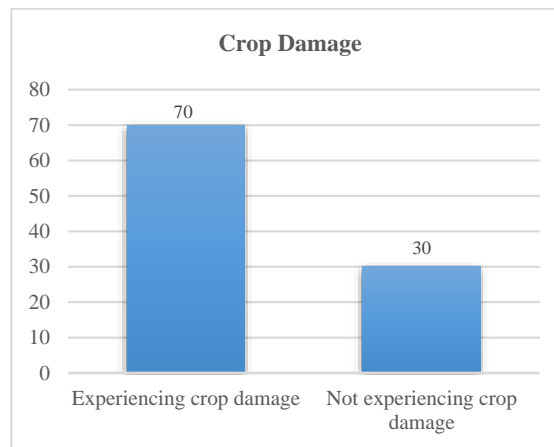


Figure 1. Crop damage caused by the monkeys.

From the above graph, we can find that the monkey attack is present in every village, and is mostly seen in the villages which are very near to the forest ranges. From the graph above (**Figure 1**) we found out that 70% of the respondents are experiencing crop damage by the monkeys. 30% of the villagers said there are no monkey attacks on the crops in their region. The crop damage is more in the region far from the forest ranges within 5 km, the crop damage is much less in the regions within the 2 km radius of the Chamundi forest ranges.

Crops cultivated in different villages

The crops cultivated in the different villages are shown (**Table 2**). The most common crops cultivated are coconut, rice, ragi, corn, tomato, onion, etc.

Table 2. Crops cultivated in different villages

Banana	12%
Mangoes	8%
Papaya	10%
Coconut	5%
Tomato	9%
Leafy vegetables	8%
Corn	9%
Millet	8%
Onion	6%
Ground nut	8%
Ragi	7%
Sugar cane	10%

Infrastructure damage caused by the monkeys

The infrastructure damage caused by the monkeys was widespread and more severe in the residential area of Chamundi Hill. The monkeys in this region are very aggressive and dangerous because they are not afraid of humans and have been seeing humans for a very long time. All the villages in this area have infrastructure damage due to monkeys (**Figure 2**). 68% of the respondents experienced infrastructure damage, but the remaining 32% of the respondents said there was no infrastructure damage in their area. The monkeys enter the

houses, destroy the interior of the house, and make a mess in the house. Especially the houses with mud roofs which can be easily moved by the monkeys. This incident mainly occurs when there are no people in the house, by the time they come back the house will be destroyed by the monkeys. For cleaning itself it will take 2, 3 days. The monkeys also destroy the flower pots, can't dry anything outside the house the monkeys will take them all. The monkeys will make the newly painted walls dirty.

When compared to the regions within 2 km and 5 km from Chamundi Hill, the infrastructure damage was comparatively the same. However, the damage was very high in the residential area of Chamundi Hill. Everyone in the locality reported infrastructure damage.

The infrastructure damage is almost the same, the house raiding of the monkeys is predominantly seen in every village but the frequency of the house raid will be higher in the regions in the villages within the 2 km radius whereas in the villages within a 5 km radius, the frequency of the attack is comparatively low.

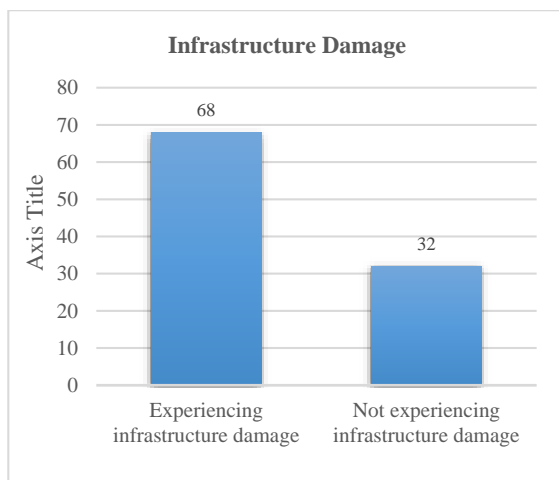


Figure 2. Infrastructure damage caused by monkeys in different villages.

The harm caused by monkeys on humans

While monkeys are generally known for their playful and curious nature, certain circumstances can lead to aggressive behavior toward humans. The attacking mentality of the monkeys is now very increasing because the monkeys are not afraid of humans now. The monkeys won't go away when they are chased or when making sounds. And in some cases, the monkeys will scratch and may even bite humans. By teasing, feeding, or attempting to interact with monkeys, some people may unknowingly or purposefully provoke them. Such behaviors may cause monkeys to become defensive and take aggressive actions toward people.

In the responses from the villagers 25% of the respondents faced an attack from the monkeys and the remaining 75% of the respondents said that they have not faced an attack from the monkeys. The people who faced the attack were the people from the residential area of Chamundi Hill.

The monkey attack on humans was most seen in Chamundi Hill, the monkeys here are very aggressive and dangerous they are not afraid of humans (Figure 3). The human attack rate was very high in Chamundi Hill of the people in the locality faced

attacks from monkeys. The monkey attack included scratches and biting, and the injured people were given treatment for this. The monkeys attacking humans is a very common problem in Chamundi Hill, we surveyed the tourists and the shopkeepers they said they are also being attacked by the monkeys. The monkeys will snatch the food and pooja materials from the people. In another village, the attack rate is very low and less, and the cases reported are very low. It is because the monkeys in Chamundi Hill got used to humans and are not afraid of humans. This results in human-monkey conflict in Chamundi Hill.

The monkey harming humans is very less in the villages far from the forest range. These monkeys are from the forests and are not adapted to humans and are afraid of humans. This situation creates no interaction between humans and monkeys, contradictory to which monkeys either will run or be chased away. The villages within a 2 km radius are facing most of the monkey attacks, the monkeys in the Chamundi residential area are aggressive and dangerous and most cases of human attacks are reported in this region. The regions which are far from the forest range face very less monkey attacks on humans.

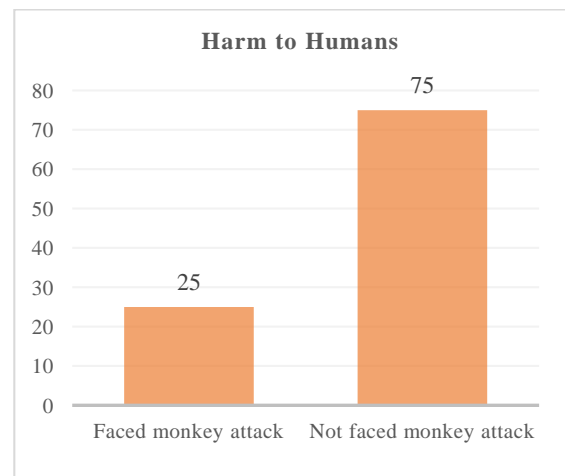


Figure 3. The harm caused by monkeys to humans.

Mitigation measures being used by the villagers

The mitigation measures used by the villagers are almost the same in all the villages, it doesn't vary from place to place. The people used various techniques for this, the most unique one was using a doll of a tiger or leopard. The monkey is scared of these big cats and does not come near the doll or the houses near the doll. Another interesting way to chase the monkey is to use a slingshot, the people just show the slingshot aims at the monkey and won't release it just aims at the monkey only. This won't harm the monkey, it will get scared and run away. The mitigation measures are the same used in all the locations, almost every house has dogs which will help to chase the monkeys also there will be street dogs, these dogs will chase away the monkeys and also will bark when they see the monkeys. The people will be guarding the farmland from the monkey attack, and also chasing them away. Some villagers use bows and arrows (Table 3) to scare the monkeys, they won't fire at them just by aiming at the monkeys will scare the monkey and running away. The same with using a slingshot, the people just aim at the monkeys, and they'll run away. Then playing of

alarms is also used to scare the monkeys. When the sound is played the monkeys will run away.

The farmers use fences that are tall and monkeys won't be able to climb onto it and the nearby trees near the fences are cut down. Some respondents said that they use dolls and painted individuals to scare the monkeys, by seeing these objects they'll get scared and won't enter the field or houses.

Almost 44% of the houses have dogs in their houses, or else the villages will have street dogs these dogs will also chase the monkeys. The most common measures used are making noises and shouting (77%). 66% of the people use stone slingshots and bows and arrows, the people won't hurt but just aim at the monkeys. 56% of the respondents do guarding and chasing as mitigation from the monkeys.

Table 3. Mitigation measures are being used by the villagers.

Dogs	44%
Guarding	56%
Chasing	56%
Making noises with bells	77%
Shouting	77%
Using stones and slingshots, bow and arrow	66%
Playing alarms	23%
Using fences	37%
Painting individuals	12%

The suggestion of the villagers for mitigating human-monkey conflict

During the survey, some suggestions for mitigation measures were asked by the respondents. 50% of the respondents want the monkeys to be relocated to other places like forests and zoos which are far from their places. This will help in the reduction of human-monkey conflict in the villages. 30% of the respondents said that the government should provide proper food and water to the monkeys in the forest or near the forest, this will help in the crop raiding of monkeys and the monkeys won't go outside the forest ranges and enter the village areas and the human settlements.

About 18% of the respondents said that they'll take care of the monkeys on their own and do not need any help from others. 2% of the respondents said that to kill the monkeys, there won't be any problems again and it's a one-time process and can be easily done.

Bonnet macaques cause crop damage not only in Chamundi Hill but also in various parts of India and other countries (Saraswat *et al.*, 2015), the study done by Saraswat *et al.*, shows the crop-raiding character of monkeys. Their natural foraging behavior leads them to target crops, resulting in significant losses for farmers and potential conflict. Understanding and mitigating crop damage by bonnet macaques is crucial for coexistence and farmer livelihoods (Dutta *et al.*, 2015). Found that crop-raiding by Rhesus macaques was a significant issue in Barak Valley, Assam. Crop damage was a major driver of conflict, while monkeys also showed aggression towards humans.

The crop raiding of monkeys is seen in regions near the forest lands, since there are no farmlands within 2 km from Chamundi forest ranges, the agricultural land is within 5 km from the forest ranges (Naughton-Treves *et al.*, 1998; Chapman *et al.*,

2012) found that farms closer to forests had higher macaque crop raiding rates. Agricultural lands near forest edges suffered more damage than those surrounded by neighboring farms. Fields with forest cover on one side were particularly susceptible to macaque crop damage.

Human-wildlife conflict arises from the conversion of habitats and the encroachment of monkeys, as seen in studies by Musyoki (2009) and Gemeda and Meles (2018). As the forest land near the Chamundi hill is converted for human need and settlements the natural habitat of the wild animals is depleted and this results in the encroachment of the wildlife. Increasing spatial overlap between humans and wildlife contributes to conflicts stemming from crop-raiding incidents.

Local perceptions of wildlife are pivotal in determining conflict situations (Lee & Priston, 2005) stressing the importance of understanding people's attitudes and acceptance of mitigation strategies. Effective conflict resolution relies on aligning strategies with community beliefs and values, making assessing and considering local perceptions crucial for addressing human-wildlife conflict. The perceptions of the villages are almost the same in every village, the majority of the respondents don't want to kill the monkeys but want them out of their places.

Some respondents suggested using sterilization methods to decrease monkey populations, despite being a minority. Successful cases in Hong Kong involved surgical neutering of female macaques alongside a ban on feeding, resulting in population reduction (Wolfe *et al.*, 1991; Arroyo-Fernández *et al.*, 2023). Localized sterilization programs could be applicable in larger countries. Given religious sentiments against killing monkeys in India, implementing birth control measures may be a socially acceptable solution. 75% of the respondents suggested controlling the population of monkeys.

Management strategies for crop-raiding primates encompass a range of approaches such as translocation, culling, sterilization, crop guarding, and the use of fences or fire to deter animal entry (Sprague, 2002). These management strategies are being used in the villages near the Chamundi Hill. Additional techniques include establishing buffer zones with preferred food sources, implementing physical barriers, cultivating primate-averse crops, employing sound or chemical repellents, and modifying cropping practices to minimize crop losses (Priston & Underdown, 2009). The modification of the cropping practices will help in reducing the crop raiding of the monkeys.

While cultural values in India are often seen as beneficial for primate conservation (Medhi *et al.*, 2007), this study reveals that these values can be undermined during conflict situations. Many individuals felt that macaques were previously associated with religious attributes but no longer hold such significance. However, a larger group of respondents believed that macaques are companions of the monkey-god Hanuman, potentially due to the enduring belief that primates embody Hanuman, which is reinforced through personal experiences. The villagers in the Chamundi region believe that monkeys are gods, so the people won't hurt or kill the monkeys, but they want the monkeys out of their villages and farmlands.

The absence of natural predators and a high birth rate among Rhesus monkeys has resulted in an annual increase in their population. This population growth has subsequently led to an escalation in conflicts between humans and monkeys. The root cause of these conflicts lies in the destruction of forests and the loss of natural habitats for the monkeys. As human settlements

expand and encroach upon their habitats, the majority of monkeys in the country have been forced to become ecological refugees, seeking alternative environments for survival.

CONCLUSION

From the survey, we can find that there is a major problem with humans and monkeys in the villages near Chamundi Hill. The crop raiding of monkeys is seen in the villages within 5 km of the forest ranges, the monkey attack on humans was seen in the villages within the 2 km radius of forest ranges, and the cases of biting and scratching were reported more in the Chamundi Hill residential areas. Because the monkeys in this region are used to human interactions and are not afraid of humans the monkeys attack when they are teased or provoked. The infrastructure damage caused by the monkeys is common in both categories within a 2 km and 5 km radius. This is more evident in the villages within the 2 km radius, since its very near to the forest ranges.

In conclusion, the conflict between people and monkeys in Chamundi Hill is a complex issue that calls for a diversified solution. Monkey encounters are unavoidable due to the stunning scenery and proximity to natural habitats. However, proactive actions can help to promote peaceful cohabitation. To reduce conflicts, it is essential to secure food sources, increase knowledge, and put in place infrastructure that is friendly to wildlife. Finding sustainable solutions also necessitates community involvement and expert collaboration. It is critical to address the situation with empathy, recognizing the monkeys' instinctive behaviors while emphasizing the security and well-being of the local populace. By implementing these tactics, we can work to achieve a harmonious coexistence of people and monkeys in the enthralling Chamundi Hill.

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