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Issues and Challenges of Sustainable Tourism Development: A Case Study in Kaziranga National Park of Assam, India.

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Abstract:

Kaziranga National Park of Assam has witnessed a long successful conservation history for which the earlier game sanctuary of Kaziranga becomes Kaziranga National Park subsequently and further to the present high status of world heritage site and tiger reserve. Despite such tremendous success in conservation process, the park for its survival and thriving is, however, bound to fight against a number of challenges. Some challenges originate from the natural disaster caused by the perennial floods while some others are caused by human activities. In this academic work, a modest and sincere attempt has been made to examine various challenges/threats confronted by the park and the conservative strategies and measures adopted by the park management for addressing such challenges.

Key Words: Kaziranga National Park, Challenges, Conservation practices, Park management, Flood.

1. Introduction:

The world heritage Site-Kaziranga National Park (KNP) with areas of 430sq.km situated in the midst of Assam is one of the magnificent natural habitats for in-situ conservation of biodiversity of universal value (Jayanta Gogoi & Bhaskarjyoti Bora, 2011). In addition to enriching the state's treasury since a long, the park has benefited the local communities through providing employment opportunities of varied kind .In fact, the local community and the government values the resources of the park significantly high, and also recognizes the resources' potential to boost the economic development through tourism practices. So, the conservation of its biodiversity is an essential and utmost duty on part of the KNP authority, local community and the government for its sustainable development. However, the park has confronted a number of challenges to its sustainability in the form of the decline in the number of wetland and grasslands, land erosion, habitat degradation, the frequent poaching of elephants and rhinos, encroachment of the areas of the park, higher commercialization nearby the park and the emergence of the annual flood. Though the adoption of the eco-tourism strategy since the last few years is admirable, the effort in this line seems to be confined only to a few NGOs at an unsatisfactory level.

For examining the sustainability of the park as a wildlife tourism venture, its biodiversity needs to be conserved in its originality. Again, for conserving its rich biodiversity, its ecosystem, natural environment, socio-culture and economic aspects require to be sustainable. So, for sustainable tourism development in KNP, a thorough examination of the challenges confronted by the park and the conservative practices adopted by the KNP authority have been emerging as most urgent issues to be addressed in this academic work.

1.1: Significance of the study:

Being a world heritage site, Kaziranga National Park bears much importance in the international tourism atlas. It is an urgent task to study the rich biodiversity of the park and its conservation strategies for sustainability of the park, as the park has recently confronted some challenges to the path of its sustainable development such as the gradual decline in grassland and wetland in the park, frequent poaching of fauna (particularly one horned Rhino- main resource of the park), encroachment, inhuman behaviour on fauna during perennial floods, frequent man-animal conflicts, much commercial activities at the vicinity of the park or in the animal corridors, illegal activities of the neighbouring people such as gazing and fishing. These hostile and illegal activities may degrade the high sense of this great venture and the uniqueness of the park. Again, it provides employment opportunities to a large number people of the country as well as to the local people in its vicinity in various kinds.

1.2: Review of Literature:

Laura Johnson & Brandon Schroeder have outlined how Michigan Sea Grant- a cooperative programme of university of Michigan, Michigan State University and National Ocean and Atmospheric Administration, is contributing to the ongoing regional effort for sustainable coastal tourism development in North-east Michigan. For it, the programme partners have inquired the region's needs, natural resources and coastal tourism opportunities based on inputs collected from local business owners, resource managers and community leaders (Laura Johnson & Brandon Schroeder, 2012, pp.1-24).

Chiedza Ngonidzashe Mutanga et al have examined the tourist perceptions on the threats to the sustainability of wildlife tourism in Zimbabwe, and found all the seven tested threats (illegal hunting, destruction of wildlife habitats, human-wildlife conflicts, lack of involvement of local people in the national tourism park, lack of benefits from the national park to local communities, negative attitudes towards tourism by local residents, and poor relationships between local community and national park) to be influential (Chiedza Ngonidzashe Mutanga et al, 2021, pp.895-911).

Cynthia S. Deale has emphasized on sustainability education in the fields of hospitality and tourism, and outlined several organizations assist in promoting sustainable travel, tourism and hospitality. In the paper, the author has identified the contents/themes essential for sustainability education, particularly in lodging, meetings and events, food and beverage sectors (Deale, 2013, pp.20).

Gabriel Eshum, Tembi M. Tichaawa & Divine Odame Appiah have examined several factors highly essential for sustainable coastal tourism development in Ghana. The factors are- policies to ensure clean beaches, stakeholders, participation, promotional activities, and sanitation practices. They have found frequent dumping of waste at the beaches, mainly due to inadequate refuse containers along the beaches, and the laziness of people to dispose of waste properly (Gabriel Eshun, Tembi M. Tichaawa & Divine Odame Appiah, 2019, pp.1-19).

By Peter Jones, David Hillier & Daphne Comfort have examined the challenges the tourism and hospitality industry that may encounter in the transitional process to a more sustainable future, mainly through achieving a wide range of ambitious global targets as set by United nations in 2015 (By Peter Jones, David Hillier & Daphne Comfort, 2017, pp.7-18).

A.K. Hazarika & Unmilan in their study have pointed out the disruption in the inherent livelihood pattern of the local communities largely based on the park's natural resources owing to the conservative practices in KNP. Conversely, the participation of the local community to park's conservative practices and varied employment opportunities provided by the park to them are admirable (A.K.Hazarika& Unmilan, 2109,pp.224-232).

Patnaik et al in his study has outlined how the perennial floods of the Brahmaputra River bringing with adverse outcomes to the mammals have posed challenges to the park management. The misfortunes that the flood has carried are mainly displacement of the mammals from their regular habitats, victimization at the hands of poachers and at the heavy vehicles in NH-37 crossing throughout the park (N.K.D. Patnaik, Kunal Sharma & Pradeep Chaudhary, 2019,pp.8127-8141).

Daisy Das has found the local people's distress and contest towards the conservative efforts of the park. The main causes behind such agony among the poor local people are displacement, deprivation from resources, damages of crops and livestock by wild animals. Under such circumstances, many of the local people are inclined to resort some unfair and hostile affairs. The author has suggested for extension of tourism/allied activities and local community welfare measures at the adjacent areas of the park (Das, 2017,pp.36-48).

Mayuri Gogoi(2015) has also identified some threats to the biodiversity conservation practices in KNP. The threats found in her study are habitat loss due to uncontrolled encroachment, dangerous waste from the nearby standing Numaligarh Refinery Limited (NRL) and man-animal conflicts (Gogoi, 2015,pp.9).

Jasmine Bharali et al have examined the wetland ecosystem in the KNP including the physio-chemical characteristics of the water and soil, rate of primary production, and conservation practices for the same. In the study, she has found the ecosystem of the wetlands in KNP to be fairly suitable and healthy for biodiversity (Jasmine Bharali, B.K.Baruah&H.P.Sarma, 2010,pp.195-197).

A. Saikia has outlined how through a series of change in paradigms of the wildlife conservation in KNP, the park is able to witness a successful conservation history in the form of achieving present high status of world heritage site from the initial reorganization of game sanctuary at the time of establishment. Again, he has opined that more of the conservative strategies and practices in KNP relates to social and historical aspects rather than the technological aspect (A.Saikia, 2009,pp.113).

Rahul J. Shrivastava& Joel T.Heinen have examined the conservative attitudes and awareness among the people at the vicinity of the Kaziranga National Park. In the study, he has found a high variation in attitudes and awareness among the people owing to their diverse demographic and socio-economic status. Though most of the people surveyed are aware of the conservative practices in the park, they have negative attitudes towards such practices, mainly due to their threats of losing crops to wildlife and being conflicted with them (Rahul J. Shrivastava & Joel Heinen, 2007,pp.207-226).

Through the survey into the existing literature relating to sustainable tourism development, it has been found that some authors have analyzed challenges and necessary strategies and practices for sustainable coastal tourism, while some others have studied the sustainability in education and communication in the fields of hospitality and tourism. A few researchers have studied the sustainability of wildlife tourism based on tourists' perceptions. Enquiring into several pieces of literature relating to issues and challenges of Kaziranga National Park, it has been found how through a long conservative

practices the park has achieved present high status of world heritage site, how local people are harmed and get benefited from the park, and what challenges the park has confronted in the way of its biodiversity conservation.

Hence, the earlier studies have avoided the inquiry into challenges to the sustainable tourism development of this wildlife hot spot. Parallel to the in-vogue conservative strategies and practices, victimization of several challenges by this great park has been observed and acknowledged by park management, conscious indigenous people, and educated citizens of the state and country. Secondly, as regards the sustainable tourism development, such study has not so far been done in the state. So, this study is an addition to the existing literature.

1.3: Objectives:

- i. To examine the challenges confronted by KNP to its sustainability.
- ii. To examine the conservative practices and strategies adopted by the park management for its sustainability.
- iii. To suggest measures in line of the findings of the study.

2. Research Methodology:

The methodology of the study contains mainly the area of the study, data and analytical framework.

2.1: Area of the study:

The study area covers the geographical areas under Kaziranga National Park (KNP), which contains four ranges, namely, Agoratoli, Kohora, Bagori and Burapahar; and three divisions viz, Eastern Assam Wildlife Division, Biswanath Wildlife Division & Nagaon Wildlife Division. It is bounded by karbi Anglong Hills on the south and River Brahmaputra on the north.

The logics behind selecting KNP as the study area are as follows-

- i. It is a magnificent wildlife tourism venture, which is rewarded with a high status of world heritage site in 1985. It is the home to 80 percent of the world's total one horned rhinoceros, world's largest population of Asiatic Wild Buffalo and Eastern Swamp Deer.
- ii. The park has accorded the status of Tiger Reserve Forest in 2007¹ for the highest ecological density of Royal Bengal tiger.
- iii. It is only the habitat on earth giving space to the big five together. These big five are - the great Indian one horned rhinoceros, swamp deer, Asiatic wild Buffalo, Asiatic Elephant and the Royal Bengal Tiger.
- iv. The park has recorded 34 mammals and 480 species of birds, out of which 18 birds are globally threatened. Birds such as the Egrets, Pond herons, River term, Black neck Storks, Pelican Partridges, Bengal Florican Stocks, Pied horn bill, fishing eagle are found in large number².
- v. The park has also a rich flora eco system with semi evergreen forest, high land, rivulets, marshes, and extensive plains and also tall elephant grass.
- vi. The park is also famous for unique wet land ecosystem, which is the habitat of variety of mammals, amphibians, birds, reptiles and fishes. The fresh water lakes (locally called Beel) of

¹ <https://ww.assamforest/knp-osc/report.in> as retrieved in 11th august, 2020.

² ibid

this park cover 24.32 sq.km, which is 5.95 percent of the total area and the oxbow lake (Earasuti) covers 3.96 sq.km. It includes 191 fresh water lakes and 45 ponds scattered in four forest zones³.

vii. KNP has lured higher percent (82 percent) of tourists visiting to the national parks in Assam⁴ as compared to other national parks in Assam.

Table-1: General Characteristics of Kaziranga National Park:

Sl.No	Attributes	Information/Data
1	Status	National Park , World Heritage Site& Tiger Reserve
2	Location	Between 26°30' N and 26°45' N latitudes, and 26°30' E and 93°40' E longitude within two districts of Assam- Golaghat and Nagoan.
3	Area	430sq.km
4	Year of establishment	Reserved Forest in 1904, Game Sanctuary in 2016, Wildlife Sanctuary in 1950, National Park in 1974, World Heritage Site in 1985 and Tiger Reserve in 2007.
5	Ranges	Four(Agoratoli, Kohora, Bagori & Burapahar)
6	Divisions	Three(Eastern Assam Wildlife Division, Biswanath Wildlife Division & Nagaon Wildlife Division)
7	Major fauna	Rihno, Wild Buffalo, Wild Boar, Swamp Deer, Hog Deer, Hog Badger, Pelican Bird, Sambar, Porcupine, Python, Tiger, Elephant and Turtle
8	Big Fives	Rhino, Swamp deer, Asiatic wild Buffalo, Asiatic Elephant and Royal Bengal Tiger.
9	Major Flora	Alluvial savanna woodlands, tropical moist mixed deciduous forests, elephant grass, spear grass, cotton tree, Indian gooseberry, kumbhi tree, sugarcane and swamplands .
10	Tourist attractions and activities	Enjoy Elephant Safari and Jeep Safari, Bird Watching, Hollongapar Gibbon Sanctuary, Visit Kaziranga National Orchid& Diversity Park, Bathe in Sparkling Water of Kakochang Waterfall, Enjoy Tea Estates, Cultural Show and Folk Dance, Ethnic Villages, Take Boat Safari to watch Endangered Gangetic Dolphins in Brahmaputra River, Rafting and Boating in West Side of Kaliabhomora Bridge near KNP, Trekking at Bandardubi and Chirang Hill and Ecotourism.
11	Accommodation	Lodges and Resorts

Source: Office of Divisional Forest Officer, Eastern Assam Wildlife Division, Bokakhat, Assam

2.2: Data:

The study is based on both primary and secondary data. For examining varied challenges confronted by the park and the conservative practices adopted by park management, the primary data has been collected through field visit and personal interview with the concerned officials of the park. For it, 5nos of the management officials of the park containing 1 divisional forest officer, 2 assistant forest conservators & 2 range forest officers have been interviewed(table-2). In addition to it, with NGOs officials (3nos) serving in the park, the relevant issues and quarries have been consulted and hence, information and data has been collected.

³ <https://www.whc.unesco.org/en/list/33>, in as retrieved in 13th august, 2020.

⁴ Ratan Bharali Talukdar: Kaziranga attracts 82 percent of national park visitors in Assam, NEZINE, as retrieved on 6th September,2016 at <https://www.nezine.com/info>

Table-2: Sample Sites visited and Respondents interviewed in the study area:

Sl.No	Particulars	Number of persons/Sites
1	Management Officials	5nos (1 divisional forest officer ,2 assistant forest conservators &2 range forest officers)
2	NGOs	3nos (Aaranyak, Kaziranga Wildlife Society &Kazinga Foundation)

The Secondary data have been collected from different government departments and environment agencies-

(i)Ministry of Environment and Forest, Government of India;(ii)Chief Conservator of Forest office, Government of Assam,(iii)Assam Pollution Control Board,(iv) Directorate of Tourism, Assam.(v)The Assam state Tourism Development Corporation(ATDC) Ltd.(vi)Divisional Forest office, Kaziranga National Park,(vii)Directorate of Kaziranga National Park, and (viii)Published environmental Reports, Government Publications, Monographs and booklets.

3. Results and Discussion:

3.1: The Challenges confronted by KNP:

Amidst of the successful conservation history, KNP has confronted a number of challenges to its sustainability. However, the park management requires fighting against these challenges for its survival and thriving.

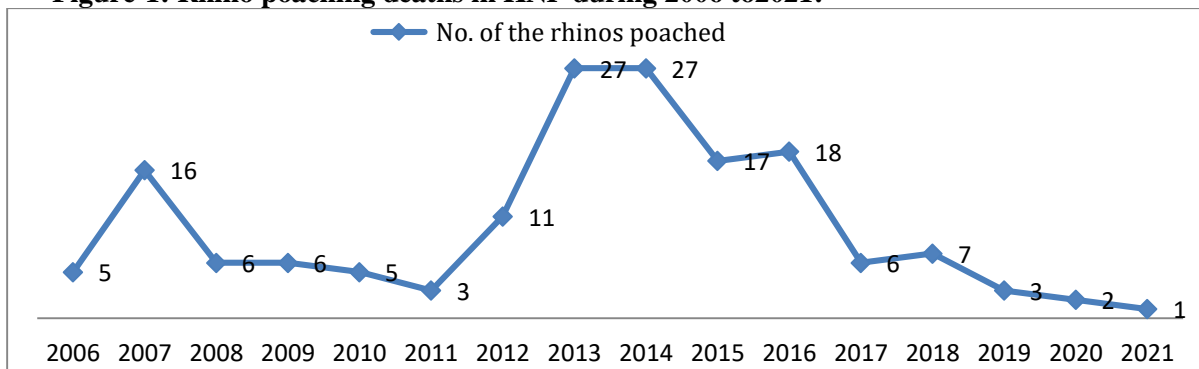
i) Poaching: Poaching of wildlife, mainly the great one horned rhinoceros is one of the big challenges to the park since a long. A total of 160 rhinos have been killed by poachers in KNP during the period from 2006 to 2021 .The number of the rhinos poaching stood at the highest of 27nos in each 2013 and 2014, and lowest in 2021(01nos)(table-3& figure-1). Assam forest officials and the directors of KNP have identified a number of cause underlying the increased poaching of rhinos in KNP such as the involvement of various insurgent groups in poaching and trade of rhinos, easy escape route via Dimapur- Moreh, availability of illegal fire arms in the region and increase in the price of rhino horns in the international market and highly porous boundary of the park.

Table-3: Rhino poaching deaths in KNP during 2006 to2021:

Year	No. of the rhinos poached	Year	No. of the rhinos poached
2006	05	2014	27
2007	16	2015	17
2008	06	2016	18
2009	06	2017	06
2010	05	2018	07
2011	03	2019	03
2012	11	2020	02
2013	27	2021	01
Total (2006-2021)		160	

Source: Government of Assam, Department of Environment and forest

Figure-1: Rhino poaching deaths in KNP during 2006 to2021:



Source: Drawn from the data given in table-3:

ii) Encroachment:

Encroachment of the areas under KNP is another big challenge which needs to be addressed immediately for its sustainability. As per the forest official report, the park has not suffered from any recorded instance of encroachment on its initial core area, while some of the new additions to the park are burdened with the encroachment. The 6th addition area has been encroached at the largest of 7100 hectares, followed by 1st addition area with 650 hectare and 4th addition with 40 hectare encroached by tea garden (Misra, 2005)(table-4).

Table-4: Encroachment in KNP and its addition areas:

Area	Encroached areas(,in hectare)	Remarks
i.KNP	00(nil)	
ii.1st Addition area	650	7 H/H evicted during May/June 02
iii.6th Addition Including Panpur R.F	7100	162 H/H evicted During May/June-02
iv.4th Addition area	40	Encroached by Tea Garden
Total	7790	

Source: Manuj Kumar Misra(August,2005): Improving Protection and Building Capacity of the staff at Kaziranga national Park, UNESCO-IUCN-WII,Delhi,pp.18

iii) Flood:

Being located in the floodplain ecosystem of the Brahmaputra River, the flood is the annual feature of the park that drains through the park and return to the river refreshing all the water bodies in the park. However, the high intensity earth-quake of 1950 and the gradual silt deposition have raised the river-bed of the Brahmaputra. During the monsoon, the overflow of the Brahmaputra River results in a heavy flood in KNP. Moreover, breach in the dykes on the eastern side of KNP sometimes resulting a sudden rise of water level create flood problem in the park. Though the mild flood is desirable for maintaining the habitat of the Park, the high intensity floods causing the death of wildlife, damage of infrastructure and disorder of the management staff become a curse to the park.

The recurrent annual flood in the KNP brings a curse to its animals destroying their habitats which has caused higher casualty of them. The line transect data, 2012 has indicated that the animal casualty caused by floods has stood at around 1 percent of the total population. The Hog Deer with 512 nos, whose population is estimated at 40-50 thousand, are observed to be the highest casualty among the wild animals (Baruah, 2015). During floods, many animals of the park get deaths in varied forms such as through drowning, vehicle hit at NH-37, snake bite and by stuck in mud. The number of animals reaching their deaths during floods is found to be the highest (812nos) in 2012. Then, it tends to decline and reaches the minimum at 21nos in 2015. But, again, the deaths of wildlife during floods started to rise up to 475 nos in 2016, and then, it marginally declined to 291nos in 2017, to 223nos in 2019 and 157nos in 2020. In each of the reported year, among all the animals, Hog deer is the largest in number reaching deaths during floods (table-5).

Table-5: Animal deaths during floods in KNP and Adjacent Areas over the period from 2012 to 2020:

Year	2012	2013	2014	2015	2016	2017	2019	2020
Animal species								
i. Rhino	47	03	02	09	32	24	21	19
ii. Swamp Deer	14	02	01	01	15	04	07	04
iii. Wild Buffalo	10	00	02	00	09	05	04	06
iv. Hog Deer	647	17	20	11	380	232	153	109
v. Sambor	27	00	00	00	06	14	13	01
vi. Wild Boar	52	01	03	00	21	04	20	12
vii. Porcupine	06	00	00	00	08	01	04	04
viii. Hog Badger	03	00	00	00	02	00	00	00
ix. Python	02	00	00	00	01	00	00	01
x. Fox	01	00	00	00	00	00	00	00
xi. Elephant	02	03	01	00	00	05	01	01
xii. Barking Deer	01	00	00	00	00	00	00	00
xiii. Tiger	00	00	00	00	00	01	00	00
xiv. Pelican Bird	00	00	00	00	01	01	00	00
xv. Turtle	00	00	00	00	00	00	00	00
Total	812	26	29	21	475	291	223	157

Source: Office of the Divisional Forest Officer, Eastern Assam Wildlife Division, Bokakhat

iv) Land Erosion:

Land erosion due to floods is one of the major challenges to the biodiversity conservation and sustainability of the park. The perennial floods of Brahmaputra River wash away large chunks of land from the Northern boundary. The perennial floods have eroded the land area of the park that has been observed to be in an increasing trend considerably since the last three decades. The erosion points change owing to the change of course of the river. The intensity of erosions is heavy near Erasuti and Moklong Camps of the park (Jadava, 2014). As per the KNP report 2001, the park has incurred a loss of land by 0.7 sq. km in almost annual flood by Brahmaputra River. As against the notified area of 42,993 hectares in 1974, the area of the park was found to be only 40,790 hectares in 1998. During 1912-1916 to 1972, the land loss for the park was estimated to be 84.87 sq. km, which has declined to 44.7 sq. km during the period 1972-1998, and further to 20.41 sq. km for the period of 1998-2008. Hence, the park had incurred a heavy land loss (149.98 sq. km) during 1912-1916 to 2008 (table-6).

Table-6: Size of Land lost in KNP due to the floods during 1912-1916 to 2008:

Year/ Period	Land Lost (sq. km)
1912-1916 to 1972	84.87
1972 to 1998	44.70
1998 to 2008	20.41
TOTAL	149.98

Source: M K Jadava (5th August, 2014): Detailed report on issues and possible solutions for long Term protection of the greater one horned rhinoceros in Kaziranga National Park, Government of Assam, Kaziranga National Park, pp.46

v) Invasive Weeds:

The existence of several invasive weeds in the park creates a serious challenge to its biodiversity conservation and sustainability. Through various water channels, one of the dangerous invasive weeds called Mimosa enters into the park from the tea gardens at the vicinity of the park and seizes the grasslands of the park. As per the report from KNP management, this invasive weed affects around 170 hectares of tall grass land. Another invasive species available particularly in the wet grazing lands of the park is Wild Rose. This invasive weed with its thorny sprawling shrub disturbs highly the movement of animals, even for large mammals such as elephants, buffalos and rhinoceros. It has, however, laid manifold harmful effects on the park. It damages of swamplands, habitats and grazing areas of animals and birds and reduces of the diversity of other plant species.

vi) **Habitat Degradation.**

Kaziranga has numerous water bodies (locally called as Beels) that constitute around 7 percent of the total area of the park. At present, the park has 92 perennial water bodies and more than 250 seasonal water bodies. These are the key habitat for most endangered species such as Rhinoceros, Swamp deer, Asiatic Wild buffalo and elephants. However, these important water bodies have now confronted some challenges. These are as follows-

- i) Contraction in size and deepness of the water bodies owing to deposition of heavy silt carried in by the Bramaputra and its tributaries.
- ii) Ruthless of water bodies by water hyacinths.

Besides, the recurrent floods depositing heavy sand in short grass areas have also degraded the suitability of such areas for the herbivorous. Brahmaputra river erodes large areas along the northern boundary of KNP which reduces the total geographical area of the park and thereby the habitat for the wildlife⁵. As a result, the number of grassland and wetland in the park are gradually declining. Hence, continuous siltation and growth of invasive species in the water bodies and the grass lands have posed a serious problem on the existence of these important habitats in the park. However, beside the land erosion and siltation caused by the flood and invasive weeds, the increased human activities of different kinds mainly at the areas nearby the animal corridors and commercialized activities along the NH-37; the habitats in the park have been declining.

vii) **Gazing by domestic Livestock:**

Threat from over gazing by the domestic live-stock is ever present in the park. The palatable short grasses cover only 3% of the total area in the park. During the dry season, the villagers often push their live-stock into the park for fodder which affects the amount of food available to the huge number of herbivorous living in the park. Such infiltration of domestic cattle increases the risk of spread of diseases among the wild animals as most of the cattle are not properly immunized. There is also a risk of losing genetic distinctness of the wild buffaloes due to entry of domestic buffaloes.

viii) **Effluents from Numaligarh Refinery:**

Another threat from Numaligarh Refinery situated nearby the KNP in Golaghat district has already been identified as a potential danger, being positioned upstream from the park on the Dhansiri River. The oil exploration activity around the park has posed a big challenge to conserving the values of this park as it has the potentiality of polluting the park's land and water bodies through the effluents from this refinery.

ix) **Land Use Change:**

KNP is surrounded by 23 villages and at least 4 tea gardens with around 30,000 people towards the south, east and south-west. Another 30 villages with more than 40,000 people are very close by. As results of the acute poverty among its residents, the villagers often enter the park for illegal fishing and for firewood. Threat from over gazing by the domestic live-stock is ever present.

x) **Heavy traffic and Growth of commercial activities along NH-37:**

The existence of the park nearby the NH-37 is also a challenge to its conservation practice. 54 km length of the NH-37 running parallel on the southern boundary of KNP between Bokakhat to Ghorakati range divides the landscape between the low-lying grasslands in the north and the elevated Karbi Anglong hills in the south. Heavy traffic on the NH- 37 often disturbs the wild animals in crossing the road and hence stands as a hindrance against the free movement of animals. During flood in KNP, the wild animals have no way out but to move south wards to elevated grounds, many wild animals have been heavily injured and led to deaths by the fast vehicles while attempting to cross NH-37. During the

⁵ idib

period from 2012 to 2020, the number of animals getting deaths at accident while crossing the NH-37 was highest (45nos) in 2012, which tends to decline to 03nos in 2014. But, again it started to rise to 09nos in 2015 and to 15nos in 2016. It has reached the lowest at only 03 nos in 2017. But again, it has increased to 22nos in 2020(table-7).

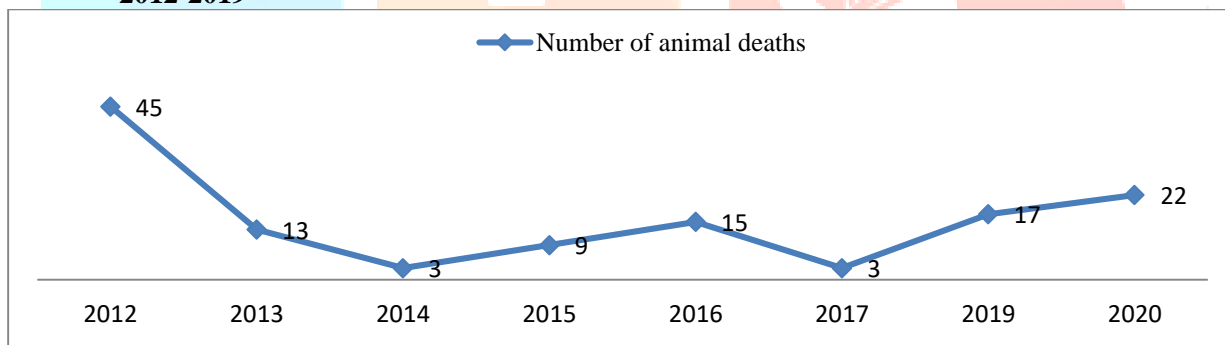
Similarly, the commercial activities along the NH-37 has been growing significantly that along with leading to the fragmentation of the animal corridors, disturb free movement of the wild animals in crossing the roads. Since early times, for wildlife, Karbi Anglong and Kaziranga have been a single landscape that has now been altered by dint of sporadic, unplanned and mushrooming growth of commercialization along the NH-37. Again, it, creating unusual noise, has broken the peaceful atmosphere in the park that is highly essential for the animals. Again, the increased use of the garbage has been observed to pollute the park areas. Most of the hotels/restaurants have not the solid waste management protocols.

Table-7: Animal deaths in KNP at vehicle hit on NH-37 during floods over the period from 2012-2019:

Year	Number of animal deaths	Year	Number of animal deaths
2012	45	2016	15
2013	13	2017	03
2014	03	2019	17
2015	09	2020	22

Source: Office of the Divisional Forest Officer, Eastern Assam Wildlife Division, Bokakhat.

Fig-3.2: Animal deaths in KNP at accidents on NH-37 during floods over the period from 2012-2019



Source: drawn from the dataset as given in table-3.5:

xi) Human-Animal Conflict:

Due to the human-animal conflicts, a number of both human and wild animals have got heavy injury and even deaths in some cases entailing huge loss to the park management. The main causes of such conflicts are the reduction of the habitats in the park, fragmentation of the animal corridors, and damage of crops and other valuable properties of the local people by the wild animals of the park.

xii) Existence of tea Gardens:

The existence of the tea gardens nearby/ surrounding the park also create some problem to the biodiversity conservation and sustainability of the park. The establishment of tea gardens results in human habitations and agricultural activities at the vicinity of the southern boundary of the park that disturb the wild animals to move across to the Hills during floods, and hence the animals get captured in poachers' trap. Moreover, the pesticides used by the tea gardens entering into the wetlands and grassland of the park through the water channels are risk factors for the wildlife of the park. Again, the tea gardens as a source of invasive species such as mimosa and wild rose create many problems for the park management.

xiii) **Crop raiding:**

Crop raiding is another serious concern for the park management for which the management has to incur a sizable amount of revenue in compensating loss/damages made by the wild animals. Moreover, it sometimes leads to man-animal conflict and creates adverse attitude among the vulnerable local people towards the conservative practices of the park

xiv) **Inadequate Strength and Skills of the working staff :**

For smooth functioning of varied managerial tasks, adequate working staff is highly required in the park. As per the report of the management officials of the park, in many tasks such as patrolling, particularly during flood seasons, many local people have been deployed on casual basis in the absence of sufficient permanent workforce. Inadequate skills of the park staff, particularly those of forest guards needed highly for fighting against the poachers with sophisticated weapons is another weakness in the park.

xv) **Inadequate Welfare Assistances:**

The management of the park has reported that the working staff of the park has not received the welfare assistances adequately. The medical/financial aids provided to the concerned guard personnels and to their families for the major injuries and deaths are not sufficient. Moreover, other fringe benefits such as bonus and gratuity are also much small and subject to a longer period of time.

xvi) **Partial park-people relation:**

A favourable relationship between the park authority and the local people is highly essential for successful implementation of various conservation agenda. Though the park authority has tried best to maintain a friendly and close relation with the local people through the formation of the eco-development committees at the fringe villages, many local people are yet remaining aloof and have not cooperated with the park authority. However, many local people get benefited from the park through engaging in various activities related with the tourism, while many others are yet to come with the terms and conditions of the park authority for varied reasons such as deprivation of resources and damage of crops and inadequate compensation received from the park authority.

4. The conservative practices and strategies adopted by the park management:

Through the incessant and protracted endeavour on the part of the park management, the earlier protected area of Kaziranga with an area of 232 sq.km (1904) and subsequent Kaziranga Reserve Forest (1908) has become the World Heritage Site in 1985 and subsequently Kaziranga Tiger Reserve in 2007. It has evidently witnessed the successful conservative practices of the park to its rich and unique biodiversity that has come cross one hundred year of conservation history.

KNP is famous for the big five namely-Rhinoceros, Tiger, Elephant, Asiatic Wild Buffalo and the Eastern Swamp Deer. For its excellent conservation process, the number of the big five in the park is in an increasing trend as shown table-8. In early in 1966, the number of rhino was estimated at a small figure of only 366nos, which has now reached at a big figure of 2413nos in 2018, indicating a significant increase in rhino population in the park by 6.59 times within a time span of 52 years. Tiger population in the park has increased significantly from 80 nos in 1997 to 121nos in 2019. The population of swamp deer has increased from 398 no in 1999 to 907 nos in 2018 with a small fluctuation. The number of elephant has grown up from 945 nos in 1997 to 1089 nos in 2017 showing an increasing trend. Similarly, the population of wild buffalo is also in a rising trend (table-8).

Table-8: Growth of the five major fauna in KNP for period of 1966 to 2019:

Year	Rhino	Tiger	Swamp Deer	Elephant	Wild Buffalo
1966	366	-	-	-	-
1993	1164	-	-	-	-
1997	-	80	-	945	-
1999	1552	-	398	882	1192
2000	-	86	468	-	-
2001	-	86	-	-	1431
2002	-	-	-	1048	-
2005	-	-	-	1246	-
2006	1855	-	-	1246	-
2007	-	-	681	-	1048
2008	-	-	-	1293	1937
2009	2048	-	-	-	-
2010	-	-	-	1165	-
2011	-	91	1168	-	-
2012	2290	98	-	-	-
2013	2329	108	836	-	-
2015	2401	-	1129	-	-
2016	-	-	1148	-	-
2017	-	104	-	1089	-
2018	2413	108	907	-	-
2019	-	121	-	-	-

Sources: i. Department of Environment and Forest, Government of Assam.

ii. Office of the Divisional Forest Officer, Eastern Assam Wildlife Division, Bokakhat.

For enlarging the habitation areas for the wildlife, the park management in collaboration with the state government continues to expand the legal boundary of the park from the earlier 430sq.km under KNP to 1307.47sq.km under Kaziranga Tiger Reserve. This has been shown below in table-9.

Table-9: Expansion in the legal boundary of the KNP:

Division	Park/Addition Areas	Areas(in sq.km)
Eastern Assam Wildlife Division	Kaziranga National Park	429.93
	1 st addition (Burapahar)	43.79
	2 nd addition (Sildubi)	6.47
	3 rd addition (Panbari RF)	0.69
	4 th addition (Kanchanjuri)	0.89
	5 th addition (Haldibari)	1.15
	7 th addition to KNP	1.76
	8 th addition to KNP	3.07
	Panbari Reserve Forest	07.65
	Kukurakata Reserve Forest	15.93
	Bagser	33.67
	EAWL Sub Total	545.00
Biswanath Wildlife Division	6 th addition (Panpur RF and stretch of Brahmaputra river on the north)	401.5
	9 th addition to KNP	25.7
	10 th addition to KNP	4.52
	BWLD Sub Total	431.72
Nagaon Wildlife Division	Laokhowa Wildlife Sanctuaries	70.14
	Burhachapori Wildlife Sanctuaries	44.06
	1 st Addidition to Burachapori	195
	Kochmara	21.55
	NWLD Sub Total	330.75
Grand Total		1307.47

The wildlife in the park is provided maximum protection under Indian conditions under various wildlife protection acts and environment conservation acts ranging from the Assam Forest Regulation of 1891 to the Biodiversity Conservation Act of 2002. All these protective acts ensure legal protection to the park.

However, the management techniques for conservation of biodiversity and sustainability of the park have been divided into the groups as follows:

- | | |
|---|-------------------------------|
| i. Anti- poaching management, | ii. Flood season management, |
| iii. Habitat management, | iv. Tourism management, |
| v. Eco-development, | vi. Animal health management, |
| vii. Research, Monitoring and Training. | |

4.1: Anti-poaching Management:

Poaching of Rhinoceros in KNP has always been a threat since a long time. However, due to the excellent protection measures taken by the park management in coordination with the local people, there has been a considerable increase in the rhino population from a few dozens of 1966 to 2413 nos in 2018(table-9).For controlling poaching, many steps such as maintenance of existing and construction of new poaching camps, adequate staffing, patrolling, intelligence gathering, firearms and control over use of firearms around the park have been strictly prohibited (Singh, 2017). The park has 174 anti-poaching camps spread throughout the park up to 2014. Note that some camps are permanent in nature, some are semi-permanent, some temporary and some other are floating in nature. Again, for patrolling in the Brahmaputra River, the park has deserved several speed boats and country boats. There are 123 country boats, 6 mechanized boats, 4 speed boats (OBM), 20 motor vehicles, 2 motor launchers and 47 departmental elephants to assist the anti poaching squad. There are about 800 personnel consists of about 200 forest guards, game protection force and temporary staff who guard the park round the clock⁶.

4.2: Flood Season Management:

For managing the flood season effectively, the park management has adopted many measures for protecting the wildlife from vulnerability. These are as follows-

- i) Increase in patrolling duty with additionally appointed local people at the vicinity of the park,
- ii) Maintenance of existing floating camps and acquiring of new speed boats,
- iii) Control the speed of vehicles on NH-37 by adopting several measures such as rumble strips/ speed breakers, traffic light, speed monitoring device and time cards. Moreover, to mitigate the deaths of wildlife on NH-37 during the floods, the management has adopted many steps such as ensure the animal corridors, construction of road signage road awareness campaigns and intensive night patrolling.
- iv) Construction and maintenance of highlands at different locations in the park for sheltering the wildlife.
- v) Equipped well the flood management control room in each range with the essential amenities such as rescue vehicles, early warning systems, quarantine, relief and rehabilitation, and first aid amenities.

4.3: Habitat management:

Since the wetlands and grasslands of the Park are the fundamental for survival of the many important fauna such as Rhinos, Wild Buffalo, Swamp Deer and myriad bird species. For maintaining the existing habitats and promoting these, the management of the park is much enthusiastic in adopting several measures. These are as follows-

⁶ Department of Forest and Environment, government of Assam and the director of the KNP, Bokakhat.

- i) Monitor the grassland using fire as tool, on an annual basis.
- ii) Prevent spread of epidemic grazing of domestic livestock through effective enforcement by the staff and through EDC activities at the peripheral villages.
- iii) Immunization of the cattle in adjoining villages on regular basis for avoiding spread of diseases from domestic cattle to wild herbivores.
- iv) Plan for withholding the incoming flood waters in the park for longer periods, considering current water scarcity in the park largely in the dry seasons.
- v) Extend the habitat of wildlife through adding constantly some new areas to the park. Till now, 10 addition areas has been notified and coupled with the landmass of the park.

4.4: Tourism management:

For managing properly the tourism activities in the park largely operated by the private sector, the park management has adopted various measures as follows-

- i) It has planned to evaluate the carrying capacity of the park and regulate tourism with enforcement of government laws for hotels and restaurants.
- ii) It has suggested for the government intervention to regulate the unprecedented growth of catering and accommodation centers along the NH-37.
- iii) It has maintained a close connection with the tourism operators to enhance visitor experiences and project park values.
- iv) It has designed a list of do's and don'ts for the tourists in the park and weighed for its strict enforcement.

4.5: Eco-development:

For reducing the dependency of neighbouring people on the forest resources and raising their awareness towards the importance of the existence of the park in its unique form, and hence deriving their active cooperation for biodiversity conservation, the park management has formed Eco-Development Committees (EDCs). Through EDCs, it is planned to provide sustainable development to the fringed villages of the park. For improving their economic condition, along various kinds of basic amenities, they have been given employment opportunities in the park. At present, KNP has 33 registered EDC under the Eastern Assam Wildlife Division and 26 proposed EDC under Golaghat district and Koliabor subdivision.

4.6: Animal health management:

The management officials of the park view that there is a great risk of spread of disease from domestic animals of the nearby villages to the important herbivores of the park such as rhino, wild buffalo and swam deer. So, for preventing any out-break of communicable diseases from the cattle to wild animal, the park management carries out regular immunization of domestic animals in the adjoining villages in collaboration with the local veterinary department officials, and makes it a mandatory requirement. For livestock immunization, the park has maintained mobile van and lab equipments.

However, the park is now in need of several infrastructure and facilities for better management and long term conservation of wildlife.

4.7: Research, Monitoring and Training:

The research and development work on various management aspects of the park such as anti-poaching, habitat management, and flood and flood season management is highly essential for developing its biodiversity and maintaining its sustainability in future. In the absence of essential equipments, books, stationary and other logistics in adequate quantity and quality, the research and development work in the park is at an unsatisfactory stage. However, for developing lab to land schemes for local communities and providing scientific inputs into the management practices, the research department of the park needs to be developed and linked it with research institutions across the world.

5 .Conclusion and Policy Prescription:

Despite a long successful conservation history, KNP has confronted a number of challenges/threats to its biodiversity conservation and sustainability. The management for the survival of the park with its spectacular thriving amidst of these threats is really admirable. Though the park management has incessantly fighting against these challenges through adopting various conservative measures, the threats are yet to mitigate to a reasonable extent for the long-run survival of the park in its unique form. Under such circumstances, the following has been suggested for policy prescription-

- i) For protecting the wild animals from the incidence of poaching, the anti-poaching camps require to be made more strengthen with sufficient number of guards and security forces equipped with high quality weapons and equipments such as effective arms, wireless, and solar light.
- ii) The local people and the concerned guard personnel should be encouraged with additional attractive rewards for fighting against the poaching.
- iii) The animal corridors along the NH-37 need to be secured for facilitating the movement of animals to the Karbi Hills. For it, some flyovers may be constructed over the major animal corridors along the NH-37. The human activities in /around the animal corridors need to be banned.
- iv) More highlands should be constructed in the fringe and addition areas of the park instead of the core areas of the park.
- v) The government needs to enhance the resources, basic amenities, equipments and manpower of the park for enabling the park to manage the flood seasons properly.
- vi) The civil administration, NGOs and local people should provide active hands to the park management in relief and rehabilitation of the flood affected animals.
- vii) Various measures adopted on NH-37 during the floods need to be implemented strictly. The clock round patrolling duty mainly in the animal corridors and more speed breakers/ rumble strips may be more effective measures for lessening traffic jam and the speed of the vehicles during the floods.
- viii) The government should adopt appropriate scientific measures to reduce the erosion of the river bank on the northern boundary of the park.
- ix) The government and the park management should give more emphasis on the eco-tourism practices for the sustainability of the park.

COMPETING INTERESTS

Authors have declared that no competing interests exist

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