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Enhancing National Park Information Knowledge to Improve Biodiversity Conservation in Bangladesh: A Study on Policy Perspectives

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Abstract In Bangladesh, biodiversity loss is a national problem, linked to the high biological productivity of parks, wildlife sanctuaries, wetlands, home forests and marine biodiversity. National Park Information (NPI) is the state centre for biodiversity conservation. Everyone exploits biodiversity but no one can conserve it effectively due to lack of systematic principles and tools. This study seeks to increase the cognitive factors of the policy towards the growth of national parks for the conservation of biodiversity in Bangladesh. It represents an analysis and review of the legal aspects to improve conservation activities in and around the National Park's current distribution, policy tools and area. Research data is collected through field surveys, literature reviews, observations, interviews and stakeholder participation. Studies have shown that existing NPs are spread in 27.13% of administrative district areas, but 72.87% of the districts in Bangladesh have no NPs which will adversely affect the conservation of biodiversity in the future. The study focuses on NPI growth between 2010 and 2020. The study further found that Lawachara National Park is in better condition than other NPs in Sylhet division. Furthermore, the study recommends that policy-making decisions on sustainable biodiversity conservation in NPs in Bangladesh should integrate national growth with the economic, social, institutional, environmental and legal domains. It concludes by highlighting conceptual changes for integrated biodiversity research in national parks.

Keywords Policy Tools, Biodiversity, National Park, Lawachara, Bangladesh

1. Introduction

Two decades after "Rio", the research community has to ask itself whether its efforts – the research questions it is concerned with, the approaches it applies, the way it organizes, coordinates its research--are suited to meet the growing challenge of biodiversity loss [1]. To date linking social and natural sciences for conserving biodiversity research remains the most important challenge. As a State hub, National park is the rethinking cornerstone of biodiversity conservation [87], [23], [25]. After the State Party signing with the Convention on Biological Diversity (CBD), biodiversity loss is tranquilly thrilling at unmatched rates. But growth of national parks increases among the most of State Parties of CBD. National park management is an equal consideration of multiple functions for the combination of relevant ecological, economic and social aspects [2]. There is a reciprocal relationship between national parks and biodiversity conservation to change in the contemporary society with effective policies. Besides, National Parks (NPs) are conservational *in-situ* instrument in supporting biodiversity conservation at national, regional and global perspectives. This is definitely a positive global sign towards achieving Aichi Biodiversity Target 11 for the world protected areas network. Due to the steady increases in coverage over the last number of years, protected areas now cover more than 15% of the world's terrestrial area and 8% of the marine areas under national jurisdiction [3]. This increase reflects the importance that countries are placing upon the conservation of biodiversity and the ecosystem services they provide. In 2010, the signatories to the

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Convention on Biological Diversity agreed on a 10-year strategic plan to halt biodiversity loss and ensure the sustainable and equitable use of natural resources. This plan set out 20 biodiversity targets to be achieved by 2020 - the Aichi Biodiversity Targets which is stated by the Convention on Biological Diversity (CBD). National Parks are the building blocks of healthy land and seascapes and are central to the achievement of these global targets. Moreover, they have played an important role in achieving the Aichi Biodiversity Targets 2020 and are well placed to do the same for the future Sustainable Development Goals [3]. Wetlands and homesteads in Bangladesh were abundant in indigenous plant, wildlife species and aquatic species but now-a-days some of them are rarely found in these conservation areas due to human-animal conflict, clear cutting of bushes and mother tree, and filling up of ditches, ponds and canals [81] as well as misusing of modern technology towards natural resources.

Moreover, an issue of a great importance in applied ecology still remains of how to find the balance between the use of renewable resources and the maintenance of biological diversity [4]. For these purposes, different approaches to systematic conservation planning have been proposed [5], [6]. The basis for estimates of the need for conservation areas rests on the principle of representatives of different ecosystems [7], and on estimates of the gaps in the area of protected forest with high conservation value needed to maintain viable populations of forest species. These approaches are generally defined as gap-analyses [8], [9], [10], [11], [12], [13]. In the social (or institutional) context, information on the needs for biological conservation must reach the right audience, so that the right decisions by society and country would be made [14].

Lawachara National Park situated at Kamalganj sub-district of Moulvibazar district in the north-eastern part of Bangladesh, is among protected areas. About 15% of their combined areas fall under protected areas [15] which restricted human access and use within their boundaries and forced penalties on lawbreakers. Besides, deforestation, poverty, and man-made forest fires and other interferences, excessive alien species as well as species losses, in addition to land use patterns and conversions are some of the causes which adversely affected the NPs in Bangladesh. NPs are often targeted on lands with the least political resistance to their establishment, and thus typically face the least anthropogenic threats [16]. There are different actors, namely local communities, policy-makers, municipalities, union councils and others non-governmental organizations surrounding the LNP's adjacent areas. Up till now, there is no integrated model developed incorporating the diverse applicable economic, social, institutional, environmental, and legislative arena for NPs management in Bangladesh.

This research intends to make a comparative assessment of growth of national parks information (NPI) with the updated policies towards conserving biodiversity at Lawachara National Park in Moulvibazar district of Bangladesh. It points out on the analysis and review of the current distribution NPs in administrative districts, policy formulation, and legal aspects to enhance biodiversity conservation activities in the studied areas.

2. Materials and Methods

Bangladesh is a developing country with rich biodiversity as it has world largest deltaic region lies in the north-eastern part of south-east Asia. It includes 17 national parks, 21 wildlife sanctuaries and 12 other conservation sites [17]. The survey was undertaken at Lawachara National Park (LNP) at Kamalganj sub-district in Moulvibazar district in Sylhet administrative division in the north-eastern part of Bangladesh. It was declared gazette as a National Park in 1996 with the areas of 1,250 hectares of highly diverse hilly evergreen forest under the legal status of the Wildlife Preservation President's Ordinance 1974 (this Ordinance repealed now). The Government of People's Republic of Bangladesh introduced up to date Wildlife Conservation and Security Act, 2012. The LNP is situated specifically in the Union of Kamalganj, coordinates with 24°32′12″N 91°47′03″E (**Figure 1**).

Surrounded by human habitats, the park is a critical home for several primate species including the only ape of the country, the Hoolock Gibbon (*Hylobates hoolock*). The park is also a hotspot for biodiversity with several species of new and regional record for Bangladesh [18]. Presently, there are 14 villages around the LNP. The study, however, surveyed only four of these villages (two inside and other two outside the park) from January 2015 to July 2015 for data related to community involvement, biodiversity conservation awareness, legal knowledge, using technology, biodiversity conservation policy, and national park areas management perspectives. In-depth interviews were conducted with respondents who were involved in Lawachara National Park such as Park Manager, Team Leader of Co-management Committee, national and international visitors, Indigenous Community Leader, Academics, Biodiversity Specialist, Researchers, Botanists, Zoologists, Environmental Lawyers, Learners, Local Government Leaders, Key Stakeholders, Policy Makers and other relevant bodies. Both secondary and primary data were used during the study. These methods include observations, semi-structured interviews, feedback meeting and questionnaires. Semi-structured interviews were used and selected based on the opinions related to the conceptual questions [19]. Furthermore, key informants from the relevant administrative, analyst, professional, environmental lawyers and local users were interviewed on the existing phenomena. Secondary data were collected from journals, books, Bangladesh Bureau of Statistics (BBS), Forest Department (FD), Space Research Remote Sensing Organization (SPARRSO), Government institutions (Ministry of Environment, Forests and Climate Change), Bangladesh Forest Department, Forest College and Training Centres, Universities, International /National-NGOs, Stakeholders engagement, existing policies reviews and relevant other sources.

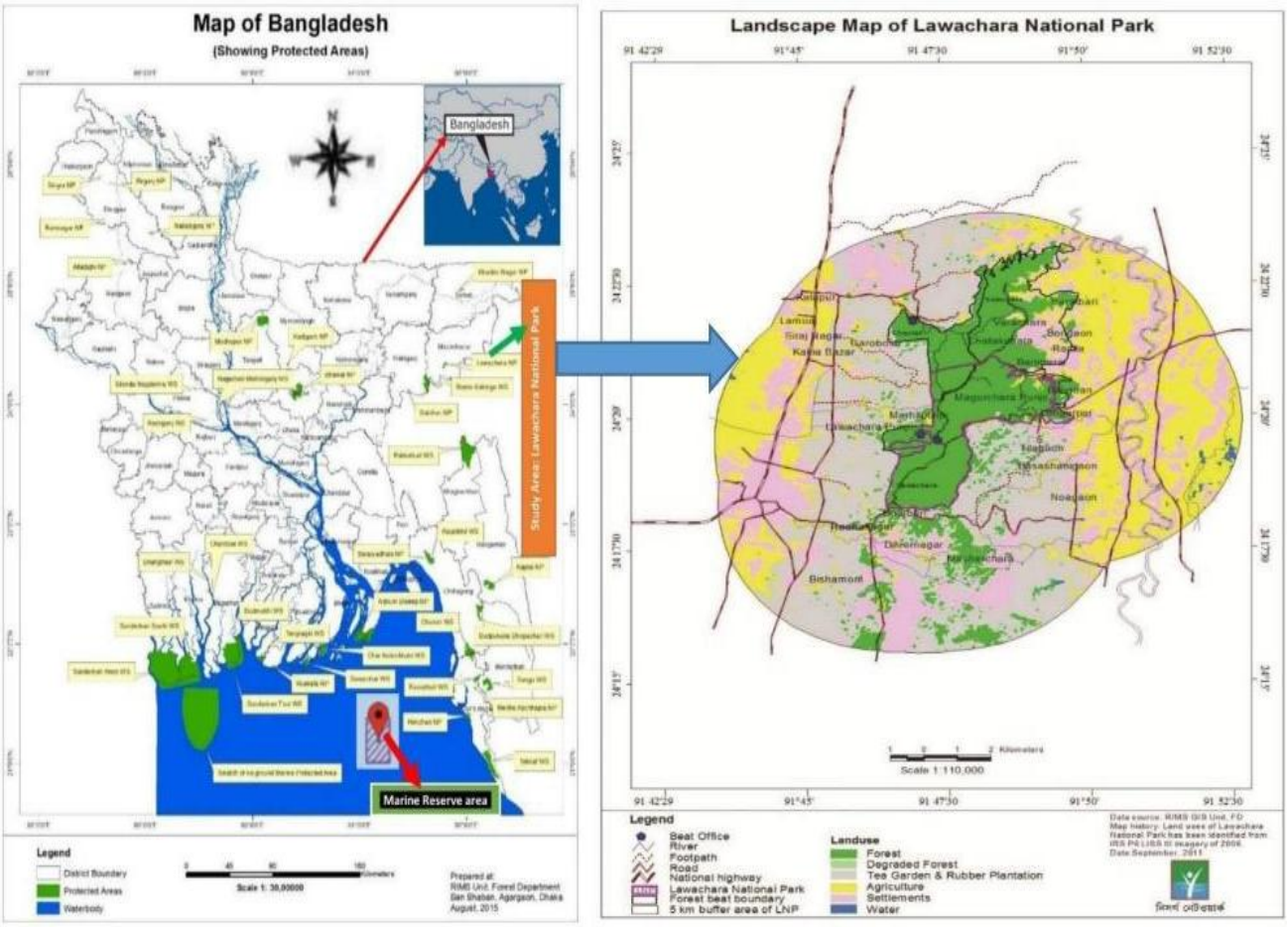


Figure 1. Landscape Map of Lawachara National Park showed the park area including inside and adjacent villages, degraded forest, tea estate, agriculture land and settlements at Kamalganj sub-district in Moulvibazar district [20]

All the general information regarding the occurrence of biodiversity and informatics including legal systems in the national parks and their diversity, status and distribution were collected and tabulated in an organized manner. These data were checked for accuracy using the crosschecking method, i.e., checked the same information from the different sources and verified the sources of information. Information regarding the initiatives of the authority towards the conservation of biodiversity was also collected through different relevant secondary information and field survey, which were compiled and evaluated. Then the information included preparation of data master sheet and incorporated into convenient forms used in the result and discussion section. The data were compiled and analyzed using standard data analysis software. In this study, deductive strategies were used to present the results that ascertained through the interpretations made with the combined Supervisor and Investigator after collecting the data, organizing the data, classifying the data and then figuring out the relationships that existed [19] using the relevant software, like such as MS Office and SPSS. All questionnaires were analyzed using the statistical software to generate general statistics on their trends from the responses.

3. Results and Discussion

3.1. Growth of National Parks Information in Bangladesh

Protected areas consist of national parks, wildlife sanctuaries, nature reserves and relevant other areas. The total number of protected area records in the December 2016 release of the World Database on Protected Areas (WDPA) is 232,128 comprising of 213,328 polygons and 18,800 points [21]. Different parameters on protected areas of Bangladesh are mentioned with terrestrial and marine in the **Table 1**. However, national parks are the most influential tools of protected areas in national and global supporting biodiversity conservation and providing various benefits. These parks comprise the highest percentage (23%) of the total area covered by protected areas worldwide [22], [23]. In terms of coverage, the protected terrestrial areas have increased from 8.9% of the world's land surface in 1990 to 14.6% in 2012, and during this time, protected marine area have more than doubled in coverage from 4.6% to 9.7%. These Parks (NPs) are also good instruments for biodiversity conservation in Bangladesh. Government of People's Republic of Bangladesh has enhanced conservation activities

through declaring and managing national parks' biodiversity including wildlife sanctuaries, ecologically critical areas, botanical gardens, safari parks, fish sanctuaries and eco-parks since 2004 to 2015 through the Coastal and Wetland Biodiversity Management Project (CWBMP) [81].

There are 51 protected areas in Bangladesh (including 38 declared and the rest of 13 are proposed. She has 17 national parks designated and established in accordance with formal legal systems declared under the provisions of the Bangladesh Wild Life (Conservation and Security) Act 2012 [26]. Bangladesh (BD) was gained independent in 1971. From 1971 to 2014, BD contains 38 protected areas including 17 national parks and 21 wildlife sanctuaries. After 44 years, the BD has 835952 ha protected areas including 60932.33 ha national parks and 270143.82 ha wildlife sanctuaries. The growth of national parks and others illustrates with different categories to get national outputs after 44 years, showed in **Figure 2** to compare with linear and polynomial trend lines. The value of R2 is accepted if the growth of national parks information increases continuously, otherwise vice versa. These national parks are distributed in 13 administrative districts out of 64 among 7 administrative divisions in Bangladesh which is shown in the **Table 2**. These administrative districts are Patuakhali at Barisal division; Chittagong, Cox's Bazar, Noakhali, Rangamati at Chittagong division; Gazipur, Tangail at Dhaka division; Mymensingh at same division, Naogaon at Rajshahi division, Dinajpur at Rangpur division, Habiganj, Moulvibazar and Sylhet at Sylhet division. No exists national parks in 51 districts and not a single national park in Khulna division consisting of 10 administrative districts of Bangladesh.

Table 1. Different parameters on Protected Areas Country Profile for Bangladesh [24], [21]

Parameters	Terrestrial	Marine
Protected Areas	49 protected areas	2 marine areas
Total Land Area	140160.2 km^2	84563.20 km^2
Land Area Protected	6456.00 km^2	4530.00 km^2
Area coverage in percent [21]	4.60%	5.40%
Protected Area Management Effectiveness (PAME)	PAME Score 39.30% [25]	
Lawachara National Park Management Effectiveness	PAME Score 54.88% [88] and 56% [89]	

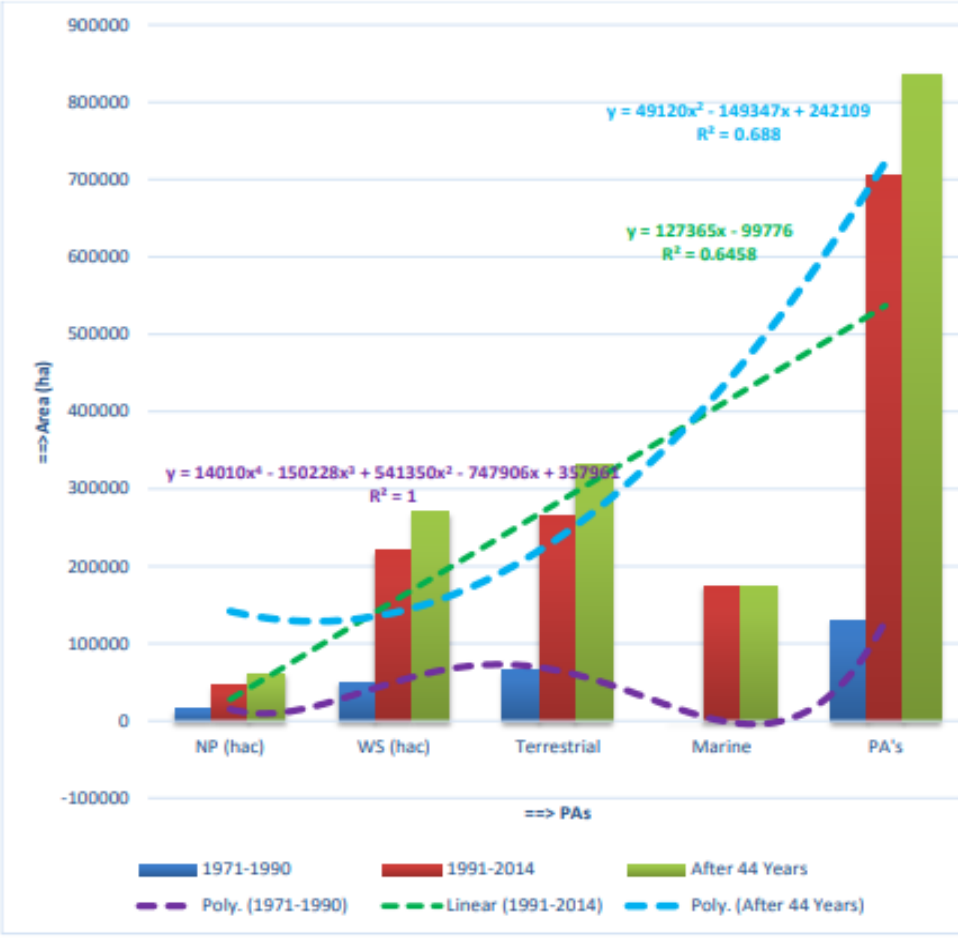


Figure 2. A comparative analysis on different types of protected areas in Bangladesh

Table 2. Distribution of National Parks among different Administrative Districts with Administrative Divisions in Bangladesh

Sl. No.	Administrative Districts	Administrative Divisions	National Parks	Sl. No.	Administrative Districts	Administrative Divisions	National Parks
a	b	c	d	e	f	g	h
1	Barguna	Barisal	0*	33	Jessore	Khulna	0
2	Barisal	Barisal	0	34	Jhenaidah	Khulna	0
3	Bhola	Barisal	0	35	Khulna	Khulna	0
4	Jhalokati	Barisal	0	36	Kushtia	Khulna	0
5	Patuakhali	Barisal	+	37	Magura	Khulna	0
6	Pirojpur	Barisal	0	38	Meherpur	Khulna	0
7	Bandarban	Chittagong	0	39	Narail	Khulna	0
8	Brahmanbaria	Chittagong	0	40	Satkhira	Khulna	0
9	Chandpur	Chittagong	0	41	Jamalpur	Mymensingh	0
10	Chittagong	Chittagong	+	42	Mymensingh	Mymensingh	+
11	Comilla	Chittagong	0	43	Netrakona	Mymensingh	0
12	Cox's Bazar	Chittagong	++	44	Sherpur	Mymensingh	0
13	Feni	Chittagong	0	45	Bogra	Rajshahi	0
14	Khagrachhari	Chittagong	0	46	Joypurhat	Rajshahi	0
15	Lakshmipur	Chittagong	0	47	Naogaon	Rajshahi	+
16	Noakhali	Chittagong	+	48	Natore	Rajshahi	0
17	Rangamati	Chittagong	+	49	Chapainawabganj	Rajshahi	0
18	Dhaka	Dhaka	0	50	Pabna	Rajshahi	0
19	Faridpur	Dhaka	0	51	Rajshahi	Rajshahi	0
20	Gazipur	Dhaka	+	52	Sirajgonj	Rajshahi	0
21	Gopalganj	Dhaka	0	53	Dinajpur	Rangpur	++++
22	Kishoreganj	Dhaka	0	54	Gaibandha	Rangpur	0
23	Madaripur	Dhaka	0	55	Kurigram	Rangpur	0
24	Manikganj	Dhaka	0	56	Lalmonirhat	Rangpur	0
25	Munshiganj	Dhaka	0	57	Nilphamari	Rangpur	0
26	Narayanganj	Dhaka	0	58	Panchagarh	Rangpur	0
27	Narshingdi	Dhaka	0	59	Rangpur	Rangpur	0
28	Rajbari	Dhaka	0	60	Thakurgaon	Rangpur	0
29	Shariatpur	Dhaka	0	61	Habiganj	Sylhet	+
30	Tangail	Dhaka	+	62	Moulvibazar	Sylhet	+
31	Bagerhat	Khulna	0	63	Sunamganj	Sylhet	0
32	Chuadanga	Khulna	0	64	Sylhet	Sylhet	+
Total National Parks in Bangladesh			8				9

* +=Present of National Parks, and 0= Absent of National Park at Administrative Districts of the Existing Administrative Divisions in Bangladesh, showing the coloured and white boxes with district locations and empty respectively.

About 65% of protected areas in the WDPA have an IUCN Management Category, and 88% have a governance type [3]. The Programme of Work on NPs of the Convention on Biological Diversity (CBD) states that NPs are essential components in national and global biodiversity conservation strategies [27].

The 10% target for NPs has become deeply entrenched in the thinking of many conservationists and incorporated into the national legislation of many countries for establishing NPs. It has often been generalized to apply to individual countries and to the entire planet, despite its major shortcomings [28], with CBD policy and technological arena which is shown in **Table 3**. The CBD, UNEP-WCMC and IUCN developed World Database on Protected Areas (WDPA) for all CBD Parties. This WDPA is a good information dataset to know easily the present status of protected areas of the CBD members. All national parks, wildlife sanctuaries and other types of protected areas consists of WDPA ID which are shown in the Table 3 regarding national parks in Bangladesh.

3.2. Constitutional Obligation and Growth of National Parks in Bangladesh

In particular, the Convention on Biological Diversity (CBD) Aichi Target 11 stated, " *By 2020, at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes* [29]. According to Article 18A of the Constitution of the Government of the People's Republic of Bangladesh, "*The State shall endeavour to protect and improve the environment and to preserve and safeguard the natural*

resources, biodiversity, wetlands, forests and wild life for the present and future citizens" [30]. The national constitution is the supreme Act in Bangladesh. Before 2010, the Article 18A was not available in the Constitution. The present Government of People's Republic of Bangladesh amended it for biodiversity conservation for the present and future citizens. Meanwhile, the number of protected areas, relevant laws and policies, strategic plans, Co-management Schedule, Ecologically Critical Areas Schedule, NBSAP and related others policies developed within the period of 2010 to 2016. From the statement of the national constitution, it can be assumed that the bio-environmental policy is essential for the upcoming generations. It also mentioned the Citizens Contribution on Environmental Conservation in the Article 102 of the National Constitution. From the above article, the number of NPs had grown from 1980 to 2014 which is shown in the **Figure 3**. The mentioned figure showed in the way of 5 years interval for declaration and gazette notification which is analyzed successively. In the year 1980-1984, there are 3 national parks declared but in 1990-1994, there is no a single notification for protected areas establishment. On the other hand, 7 national parks declared within 2010-2014. Because, within this period, the relevant laws and policies are updated in Bangladesh, like article 18A in the National Constitution and Wildlife Conservation and Security Act 2012, the Bangladesh Biodiversity Act 2017 and Protected Area Management Schedule 2018.

Table 3. List of National Parks with World Database on Protected Areas (WDPA), Administrative Districts with date of Gazette Declaration in Bangladesh

Sl. No.	Name of National Parks	WDPA ID	District	Gazette Date
i.	Altadighi National Park	555576099	Naogaon	24-12-2011
ii.	Baroiyadhala National Park	555543042	Chittagong	06-04-2010
iii.	Bhawal National Park	4479	Gazipur	11-5-1982
iv.	Birganj National Park	555576100	Dinajpur	24-12-2011
v.	Himchari National Park	4480	Cox's Bazar	15-2-1980
vi.	Kadigarh National Park	555576101	Mymensingh	24-10-2010
vii.	Kaptai National Park	4474	Rangamati	9-9-1999
viii.	Khadimnagar National Park	555543260	Sylhet	13-04-2006
ix.	Kuakata National Park	555576102	Patuakhali	24-10-2010
x.	Lawachara National Park	142993	Moulvibazar	7-7-1996
xi.	Madhupur National Park	4481	Tangail -Mymensingh	24-2-1982
xii.	Medhakachhapia National Park	555543261	Cox's Bazar	8-8-2008
xiii.	Nababgonj National Park	555576103	Dinajpur	24-10-2010
xiv.	Nijhum Dweep National Park	317318	Noakhali	8-4-2001
xv.	Ramsagar National Park	7972	Dinajpur	30-4-2001
xvi.	Satchari National Park	555543040	Habigonj	15-10-2005
xvii.	Singra National Park	555576108	Dinajpur	24-10-2010

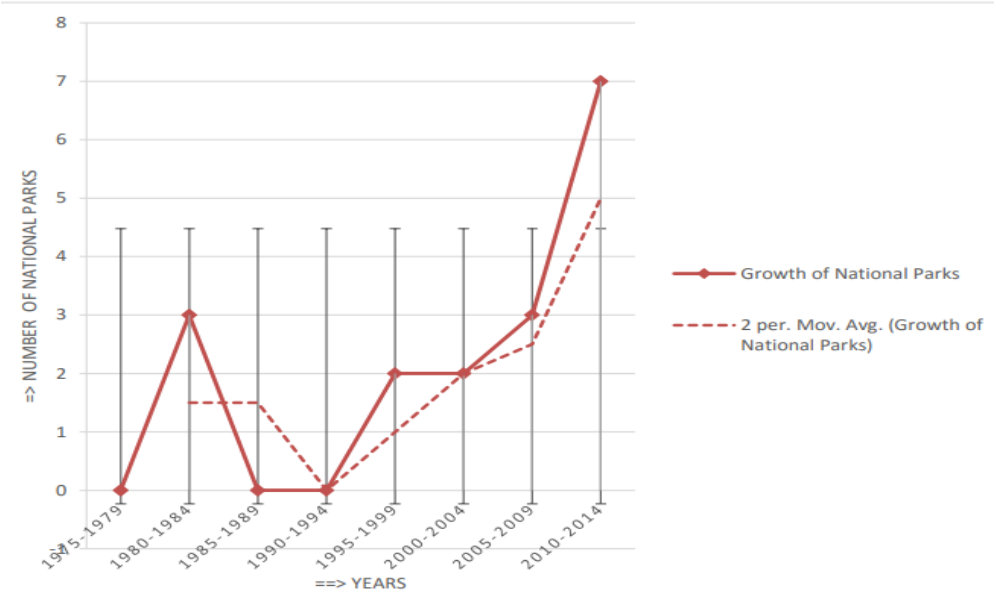


Figure 3. Year-wise Growth of National Parks in Bangladesh

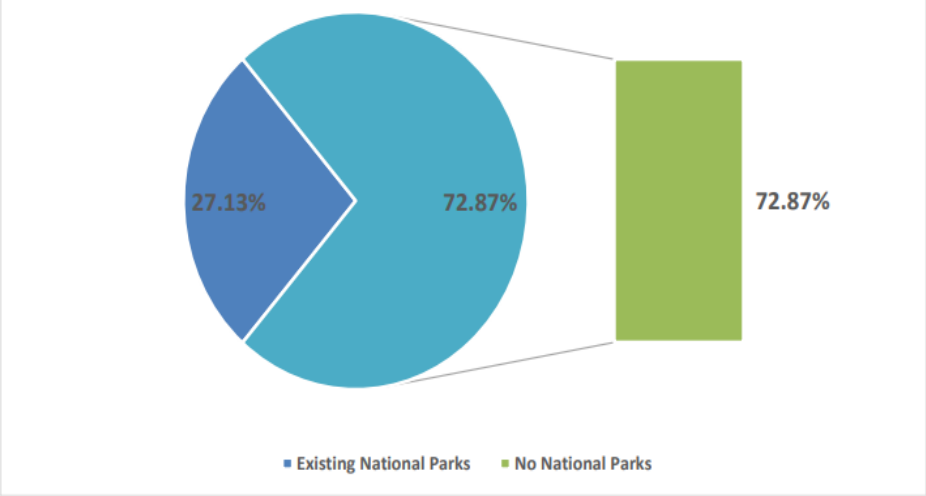


Figure 4. Showing the information on status of national parks distributed and non-distributed at different administrative districts in Bangladesh

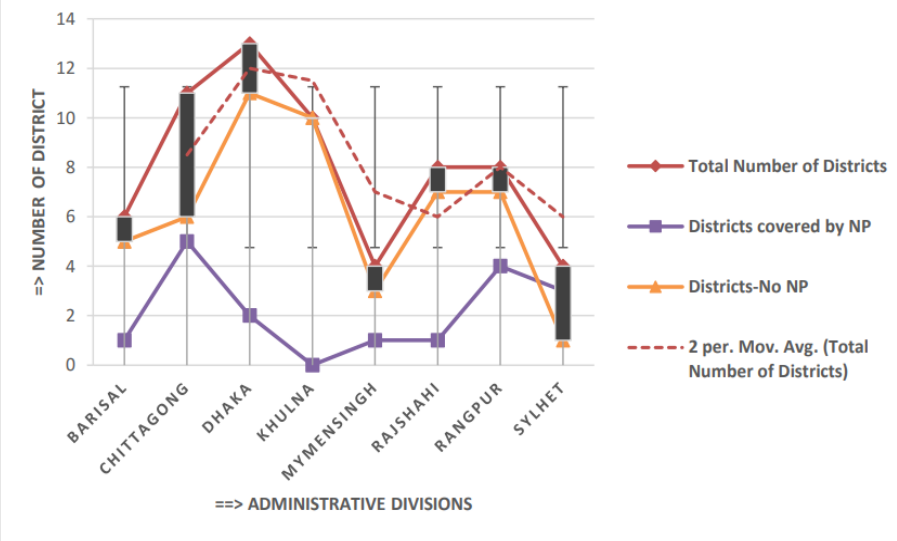


Figure 5. Information on status of national parks distributed and non-distributed at different administrative districts with division in Bangladesh

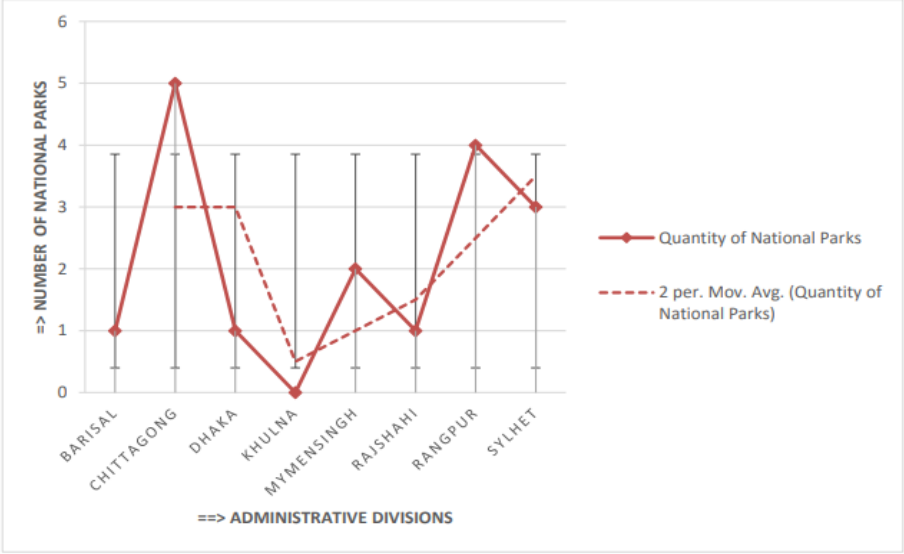


Figure 6. Showing the information on number of national parks distributed at different administrative divisions in Bangladesh

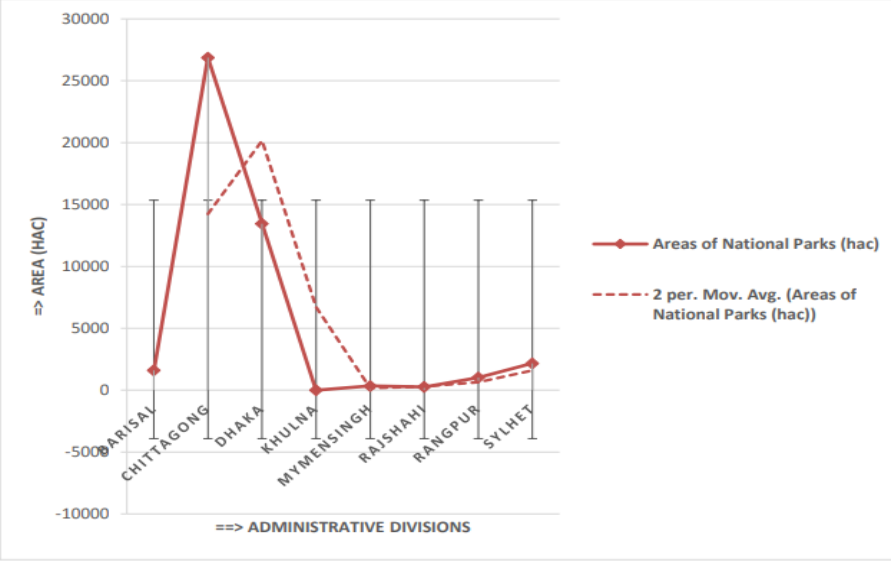


Figure 7. National parks distributed at different administrative divisions in Bangladesh

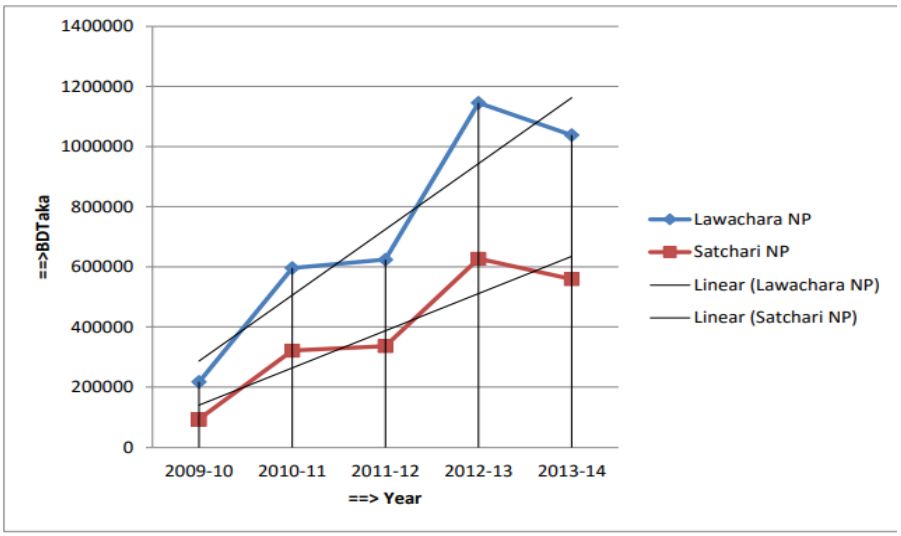


Figure 8. Lawachara National Park through Grant Financing in Sylhet division of Bangladesh [32]

In Bangladesh, there are 64 districts with only 27.13% covered by national parks (**Figure 4**). Thus 72.87% the districts are without national parks, which is considered alarming in future for these areas in terms of conservation. The study suggests declaring new national parks in connection with Aichi Biodiversity Targets 2020, particularly Vatiary Hill Forest Areas in Chittagong, Inani Forest Area in Cox's Bazar, Bichhana Kandi and Alutol in Sylhet will be declared as for National Parks.

Bangladesh consists of 8 administrative divisions. These are Dhaka (Capital of Bangladesh), Khulna, Sylhet, Barisal, Rangpur, Mymensingh, Rajshahi and Chittagong.

Most national parks are covered by 4 districts in Chittagong and Rangpur division with the least in Barisal and Rajshahi divisions as shown in the Figure 5. The increase in surrounding population, the fragmented habitats and aggressive agriculture extension had adversely impacted these national parks areas. Besides, these national parks are less proper management due to lack of updated information for policy formulation. **Figure 5** shows the number of national parks in Bangladesh with all administrative divisions. On the other hand, these national parks distributed among 7 administrative divisions out of 8 in the whole country. No national park in Khulna division. On the other hand, maximum national parks 5 in Chittagong division. Others are Rangpur 4, Sylhet 3, Dhaka 2 (1 national park situated between Dhaka and Mymensingh division), although another 1 national park in Mymensingh division, and Barisal and Rajshahi- each division contains 1 national park which are shown in the **Figure 6**. The study suggests establishing National Park in Khulna division either through Forest Department or Public-Private-Partnership ways.

3.3. Area Wise Distribution of National Parks in Bangladesh

According to area wise, maximum area, 26874.76 hac

National Parks (NP) distributed in Chittagong division where minimum 264.12 hac in Rajshahi division of Bangladesh (BD). Other NPs are distributed with 344.13 hac in Mymensingh, 1019.61 hac in Rangpur, 1613 hac in Barisal, 2171.71 hac in Sylhet and 13458 hac in Dhaka divisions of BD. Previously, it is mentioned that not a single area of NP till to date in Khulna division which are shown in the **Figure 7**. The study suggests establishing more national parks in the northern part of Bangladesh through either Forest Department or Public-Private-partnership ways. Because, this area is flood prone and climate changing zone.

3.4. Case Study on Lawachara National Park

Lawachara National Park has the maximum Grant financing system, the amount of BDT 3620500 than that of the other national parks namely Satchari National Park and Rema-Kalanga Wildlife Sanctuary from the period of 2009 to 2014 which is shown in the **Figure 8**. International Standards Organization 14000 is also another global initiative which is a series of voluntary compliance standards for environmental practices [31]. It is influenced due to co-management policy applied at Lawachara National Park and other some national parks also. The environmental, economic and social dimensions interconnect with biodiversity adaptive management cycle with the satisfaction of community needs for material welfare, which supports employment and livelihoods. The environmental dimension illustrates the need to protect biodiversity and to reduce the pressure on physical environment [82]. From Focus Group Discussion Survey, in Lawachara National Park, biodiversity protection is still in its ambiguity. Park inside running railway route, illegal forest harvest, road passing through the park, uncontrolled tourism, mining for gas, land encroacher, land conversion, fragmentation and political nepotism in co-management team are the main threats for biodiversity. Generally, Bangladesh Forest Department manages all national parks including Lawachara national park with certain limitations. The LNP biodiversity has been seriously threatened by direct and indirect impacts due to land uses of various groups [84]. Bangladesh is one of the natural disaster-prone country in the world as well as environmental risk– loss of biodiversity and ecosystem collapse country in south-east Asia [36]. The 50 percent revenue allocated budget utilises the conservation of biodiversity at Lawachara national park, which produced by national park co-management according to the section 21 of the Wildlife Conservation and Security Act, 2012 [75] and Protected Area Management Schedule 2018. The suggests to utilize the grant financing money for reforestation, afforestation and development programs in connection with green Banking activities.

3.5 Forest Area Changes and Effect on Biodiversity Conservation

The Target 11 of Aichi Biodiversity Target (ABT)-2020 is a worldwide target for protected areas and it may be used by all State Parties as a reference to set targets at a national level. According to ABT 11 of Convention on Biological Diversity (CBD) [33]:

By 2020, at least 17% of terrestrial and inland water areas and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measure, and

In Bangladesh, decrease forest area and increase loss of biodiversity due different parameters which is mentioned earlier. From the **Figure 9**, we observed that the percentage of forest area changes is 11.5% in 1990, and 11.0% in 2015 in Bangladesh. This change reflects on the national green economy as well as alarming on environmental issues.

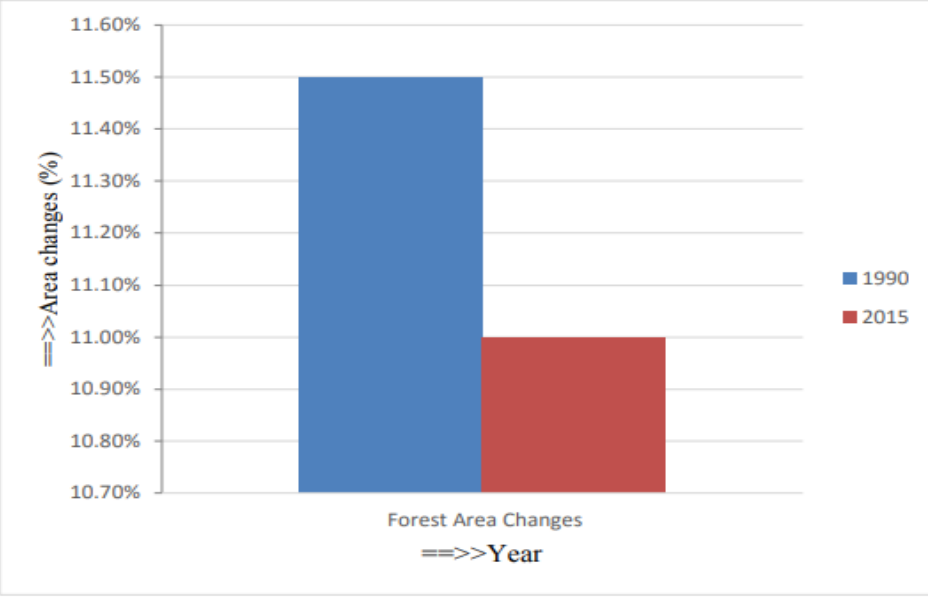


Figure 9. Forest Area Changes from 1990 to 2015 in Bangladesh

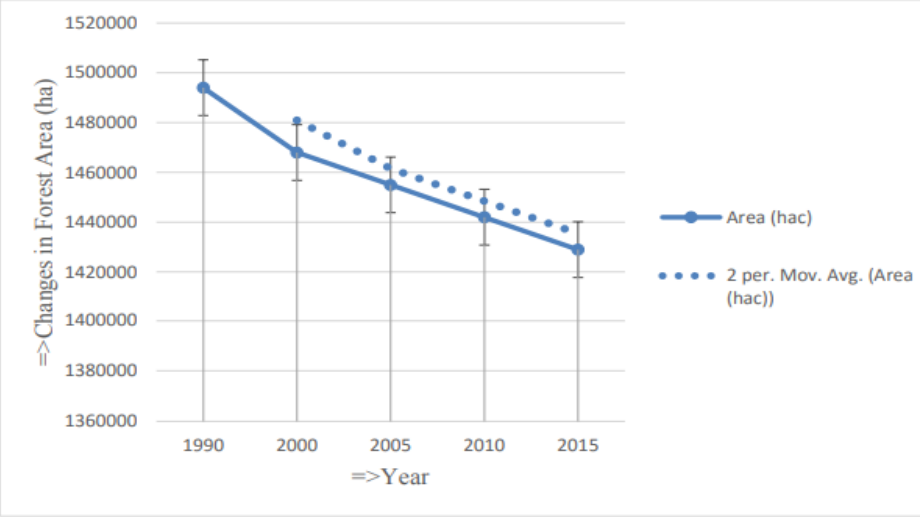


Figure 10. Changes in Forest Area in Bangladesh [35]

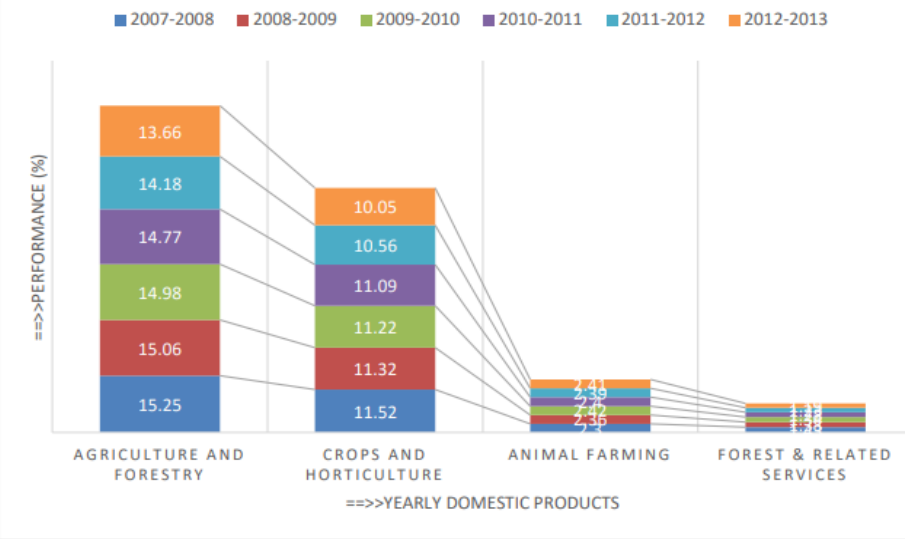
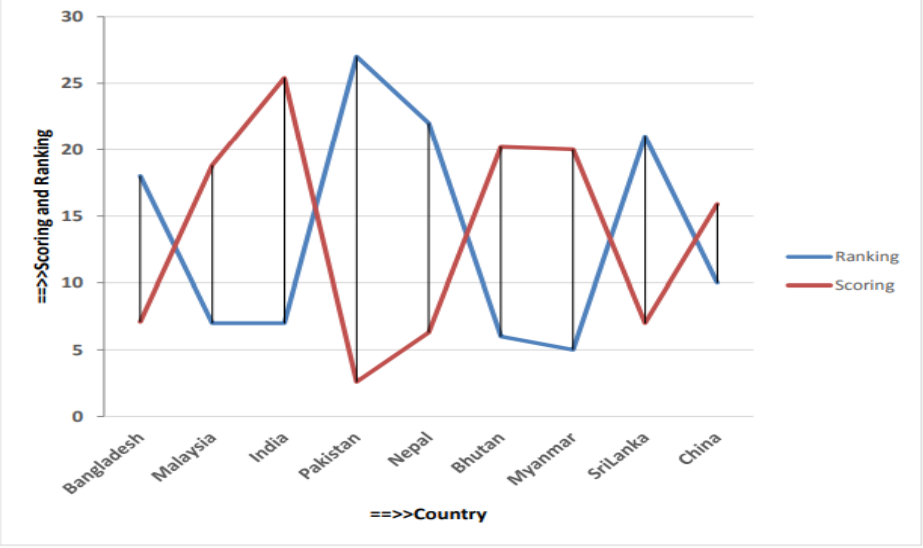


Figure 11. Sectoral GDP Performance in the following year



Feure 12. The ranking and scoring of loss of biodiversity and ecosystem collapse among different countries in south-east Asia [36]

Food and Agriculture (FAO)-2015 reported a gradual decline in forest area over the period 1990 to 2015 in Bangladesh. In 1990, the total forest area was 1494,000 ha and in 2015 it became 1429000 ha (**Figure 10**). From the FAO report, we calculated that every year 2600 ha forest area changes. In 2000, the total forest area 1468000, in 2005 and 2010, it was 1455000 ha and 1442000 ha respectively. It was changes tremendously in 2015 as 1429000 ha [34]. Meanwhile, the continuation of this change, Bangladesh will lose natural forest within 71 years. The study suggests developing a systematic and strategic roadmap long term plan for 2090 with target-oriented milestone national park services.

Forest area changes affects on biodiversity conservation, meanwhile relfects on national green economy. Because, it connects with natural ornamentation, ecotourism research, and local, national and foreiner visitors' satisfaction, local people involvement for livelihood services, and plant and wildlife habitat conservation. Lawachara National Park is in Sylhet division, which is a renowned tourist place in Bangladesh, particularly Srimanagal, Kamalganj, Kulaura, Sunamganj, Sylhet and Habiganj areas are tourists place attachment. So, forest area changes create reflection on national green economy and social dimensions. According to Global Forest Watch report, Lawachara loses 34 ha in the period 2001-2014 and gain 0.18 ha area on the period 2001-2012 [83].

There are several government sectors perform as a national economic review indicator on gross domestic products for conservation connection of biodiversity.

Agriculture and forestry sector perform maximum valuation than the other sectors [86] to enhance national green economy as well as sustained livelihoods, which showed in **Figure 11**, indicating standard deviations of individuals. The study can assume the loss of biodiversity and ecosystem collapse spontaneously in south-east Asia. Loss of biodiversity and ecosystem collapse increase day by day tremendously in Bangladesh (BD). From the **Figure 12**, we observed the ranking 7 on favour of scoring 18.8 of Malaysia, whereas Bangladesh ranking 18 tends to scoring 7.1 [36], which influence negative impact in future on biodiversity and ecosystem services to the upcoming generations of Bangladesh. The study suggests for continuing afforestation and reforestation program in connection with National Biodiversity Strategy Action Plan.

3.6. Policy Relating to Biodiversity Information Knowledge

Policy is a continuum of formulation, implementation, evaluation and adjustment of measures, it is of paramount importance that the policy assistance process follows a strategic design and consider human factors (communication, participation, ownership, timing and capacity building) with national context of critical dimensions [37]. Biological diversity is the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems [38]. Biodiversity is defined as genetic and species diversity of all species or sub-species of flora and fauna living in aquatic, terrestrial and marine ecosystems or diversity of their ecosystems [39]. It is used to describe the number, variety and variability of living organisms in a given assemblage [40]. However, biodiversity conservation has become international concern to protect it from illegally exploitation. At national and regional levels, biodiversity policy plays a key role to maintain its conservation, which is effectively enforced for implementation. The **Figure 13** showed regarding reflection of informants on biodiversity policy research factors at the adjacent villages of Lawachara National Park where maximum reflections 52 informants on forestry policy and minimum 2 on environmental education.

Figure 13. Reflection of Informants regarding Biodiversity Policy Research Factors

Table 4. Policy related Characteristics outlined from National Forest Policy 1994 [44]

Sl.	Forest Policy related Characteristics for Biodiversity Conservation	Remarks
a.	About 20% of the country's land under the afforestation programs of the government and private sector by year 2035 by accelerating the pace of the program through the coordinated efforts of the government and NGOs and active participation of the people in order to achieve self-reliance in forest products and maintenance of ecological balance.	Need effective integrated afforestation program among different stakeholders.
b.	Attempts will be made to increase the amount of protected areas by 10% of the reserved forestland by the year 2035. The priority protection areas are the habitats, which encompass representative samples of flora and fauna in the core area of National Parks, Wildlife Sanctuaries and Game Reserves.	Need intensive monitoring including the regional and sub-regional biodiversity strategies and action plans.
c.	Inaccessible areas such as slopes of the hills, fragile watersheds, swamps etc. will be identified and kept as protected forests.	Need different Sectors and departments integration.
d.	The lands in Sylhet, which were allocated to different persons and institutions for developing the tea gardens and still remain unutilized and uncultivated will be identified and used for tree plantation and afforestation.	Need cooperation among government, private and co-management team.
e.	There will be massive Ecotourism campaign through the government and non-government media for raising consciousness among the people regarding afforestation and conservation, and use of forest resources.	Need media exposure for afforestation and reforestation programs.
f.	Strengthening educational, training and research organizations will support the implementation on National Forest Policy. This will contribute to forestry sector development.	Need financial supports including international Donors/ Agencies involvement.
g.	Laws, rules and regulations relating to the forestry sector will be amended and if necessary, new laws and rules will be promulgated in consonance with goals and objectives of National Forestry Policy.	Need update all legislations related to biodiversity conservation and protection. Forest Policy (2016) drafted.

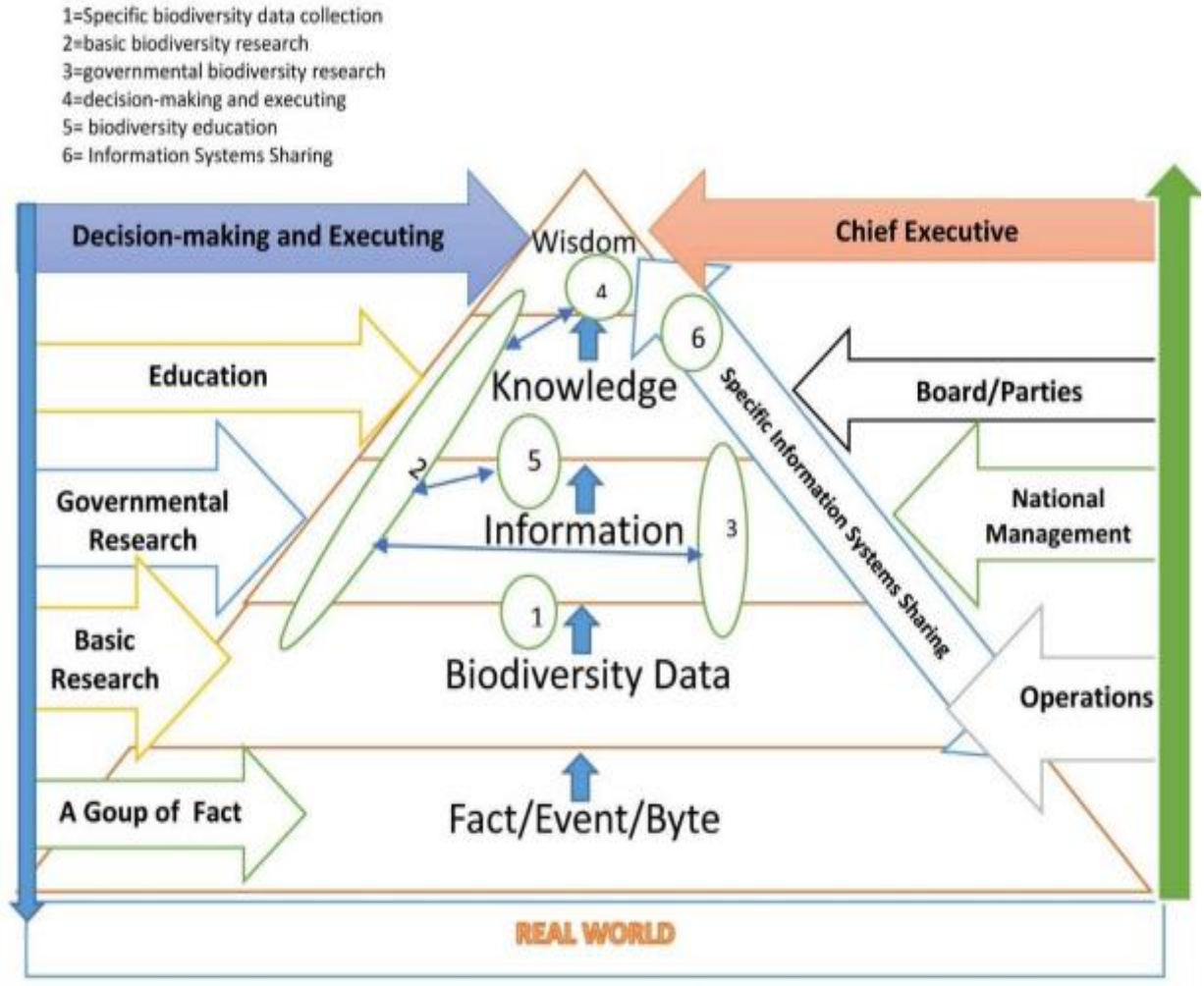


Figure 14. The Biodiversity Information Hierarchy [43]

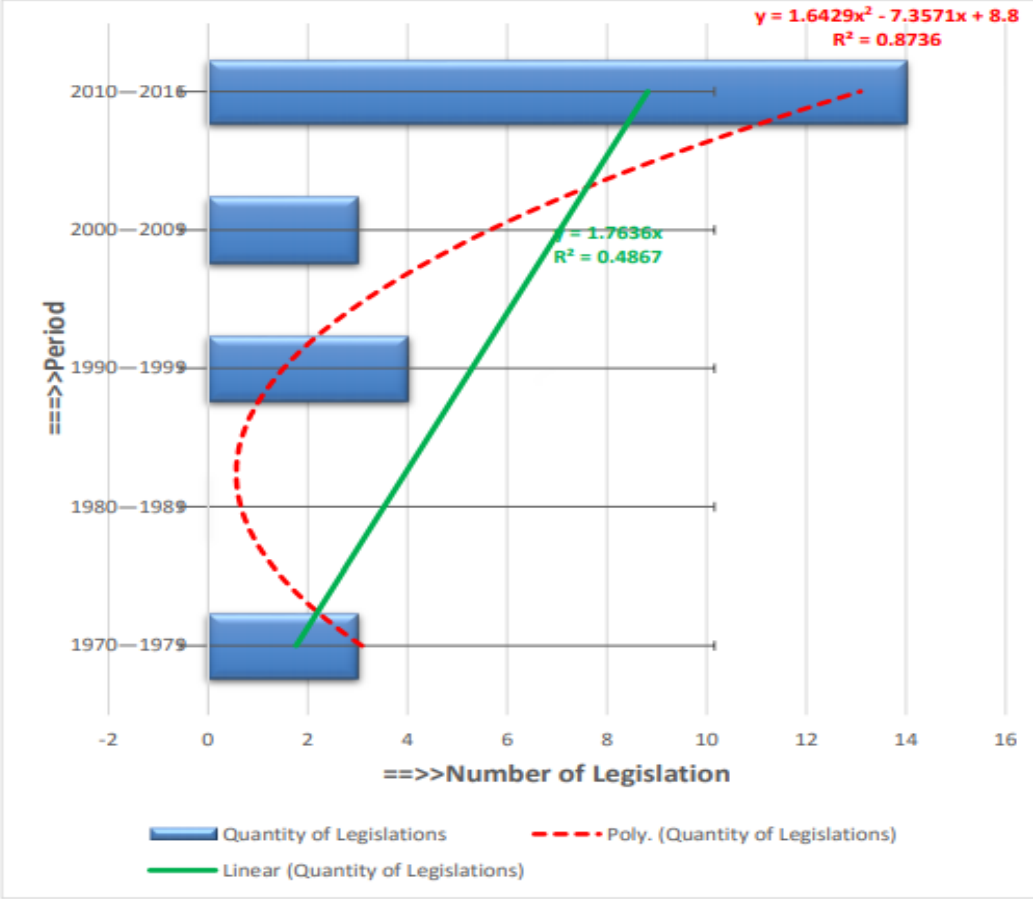


Figure 15. Produced number of biodiversity related legislation in Bangladesh

Others are land use 23, agriculture 20, environment 14, biodiversity 12, and national park 3 and others. According to Article 8(j) of the CBD [41]: *To respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity, and to promote their wider applications with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the sharing of benefits arising from the utilization of such knowledge, innovation and practices*. Knowledge management, dissemination and practices depend on specific communication channels, like bottom-up approaches. Besides, obsolete forest policy reduces the dynamic decisions of policy-makers. These phenomena create ambiguity in connection with misusing wireless sensor technology and densely populated habitat areas.

Biodiversity policy information tends to positions strata from operation level to management, then chief executive or decision-maker with information system sharing and feedback meeting, which is shown in the **Figure 14**. In general, the policy and decision-makers must be educated and equipped with techniques to cope with both increasingly complex and inter-related environmental issues [42].

The successful policy-makers and managers of natural resources of tomorrow will need to be able to understand the language of many disciplines and integrate information across them to find feasible, efficient, socially-acceptable and alternative solutions [42]. Moreover, they must be skilled enough to facilitate the reciprocal process of learning and communication – both about the needs and expectations of stakeholders as well as educating stakeholders to be literate decision-makers [43]. The draft Forest Policy (2016) is good sign for achieving the goals of Aichi Biodiversity Targets 2020 and Sustainable Development Goals 2030.

National Parks (NPs) serve a vital role in providing *in-situ* conservation of biodiversity and the ecological processes that maintain it. A good network of NPs areas forms perhaps the pinnacle of a nation's effort to protect biodiversity [45], ensuring that the most valuable sites and representative populations of important species covers in a variety of ways [46]. In Bangladesh, PA means all wildlife sanctuaries and national parks; besides, community conservation areas, safari parks, eco-parks, botanical gardens declared by the Government under Sections 13, 17, 18 and 19 of Chapter IV and special biodiversity conservation area established under Section 22 of Chapter V and national heritage and kunjaban (small dense forest) declared under Section 23 [47]. National Park is a comparatively large area of outstanding scenic and natural beauty with the primary object of providing education, research and recreational facilities to the public and are managed for conservation of natural environment of

plants and wild animals and outstanding charming scenery. All these are declared by notification officially gazette under Section 17 of this Act [48]. Many national parks and wildlife sanctuaries have been declared primarily for their scenic, touristic and recreational value [49]. In Bangladesh, there are some laws and policies related on biodiversity conservation towards protected areas management. These are (i) Wildlife (Conservation and Security) Act, 2012, (ii) Forest Act, 1927 (amended 2000), (iii) The Bangladesh Environment Conservation Act, 1995, (iv) National Forest Policy, 1994, (v) Forestry Master Plan, (vi) Environmental Policy, 1992, (vii) Plant Quarantine Act, 2011, (viii) Environmental Court Act, 2010, (ix) The Constitution of the People's Republic of Bangladesh (Article 18A), (x) Bangladesh Water Act, 2013, (xi) Information and Communication(ICT) Act, 2013, (xii) Information and Communication (ICT) Policy 2009, (xiii) Code of Criminal Procedure, 1898, (xiv) Code of Civil Procedure, 1908, (xv) Penal Code, 1860, (xvi) National Agriculture Policy, 2018 (xvii) Land Law and National land use Policy, 2001 (xviii) National Biodiversity Strategy and Action Plan, and (xix) National Education Policy 2010, and (xx) National Tourism Policy 2010. These laws and policies are enacted with the hope to change the way how we think about the law as a system of power and control. These relate to preparation of species documents, editing, customization and the management of ecosystem services that are related to environmental law.

Very little efforts had been made to sustainably protected biodiversity due to inefficiency of prevailing conservation policies and technologies. Before any action with the potential for adverse effects can be taken, the law requires that adequate information to be developed, utilised, and clearly documented in all decisions [50]. Except for other jurisdictions, the protected area managers around the globe recognize the value of marshalling the best available information to support decision-making in the complex milieu of parks and protected spaces [51]. Attempts are made here to determine if the mentioned laws and policies can be utilised in the integrated online clearing house mechanisms in Bangladesh, and that the information flow and decision-making could enhance biodiversity conservation which can be better than traditional system. Biodiversity related national legislation produced maximum within the period of 2010-2016 and no legislation produced in the year from 1980 to 1989, which showed in **Figure 15**, with compare to polynomial and linear trend lines. The value of R^2 is accepted in different periods except the period of 1980 – 1989.

3.7. International Treaties and Agreements

Bangladesh is a signatory to some international conventions [52] which have bearing on protected areas. These conventions are:

(1) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The purpose of CITES is to protect certain endangered species from over-exploitation by means of a system of import and export control,
(2) Convention Concerning the Protection of the World Cultural and Natural Heritage. The purpose is to establish an effective system of collective protection of the cultural and natural heritage of outstanding universe value, organized on a permanent basis and in accordance with modern scientific methods,
(3) International Plant Protection Convention. The objective is to maintain and increase international cooperation in controlling pests and diseases of plants and plant products, and in preventing their introduction and spread across national boundaries,
(4) Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value,
(5) Convention on Biological Diversity (CBD) to conserve biological diversity, promote the sustainable use of its components, and encourage equitable sharing of the benefits arising out of the utilization of genetic resources (**Table 5**).

Bangladesh is a developing country in the world as well as state party with some international treaties and agreements related to biodiversity conservation. These treaties and agreements enhance to conserve terrestrial, coastal and marine biodiversity for the present and upcoming national generations through donors requirements, research and development, global networks, diplomatic connections, information exchange with biodiversity clearing house mechanisms, national and international NGOs collaborations, for example- national biodiversity strategy and action plan (NBSAP) and CBD, as well as national-global public-private-partnerships and USAID or other organizations etc. These agreements enhance the conserving of national park biodiversity.

3.8. Indicators for Biodiversity Conservation Systems

National park is a designated hub area indicator of outstanding scenic and natural beauty, particularly multi-strata diversity. This multi-stratum diversity provides education, research and recreational facilities, which indicates proper conservation systems. Biodiversity conservation systems depend on national and international indicators, which is shown in the **Figure 16**. National indicators are, (i) Afforestation and Reforestation Program, (ii) Poverty reduction, (iii) Conservation Awareness, (iv) Education, (v) Stakeholders' Engagement, and (vi) Media exposure, in the presence of (a) effective forest policy, (b) Efficient national institute and Administration, (c) National Biodiversity Strategy and Action Plan (NBSAP) [57], (d) Clearing Mechanism with spatial technology [58], (e) Political commitment, (f) Sectoral integration, Intensive

monitoring, (h) Co-management, and (i) Global networks. On the other hand, international indicators are, (i) Research Grants, (ii) State Parties Collaboration, (iii) Treaties and Agreements, (iv) Integrated Networks sharing with best practices for biodiversity conservation. For this purpose, a subgroup of collective indicators could be established at global level, perfected by more and varied indicators at national, regional and local levels to measure the quality of ecosystems and biodiversity monitoring particularly at national parks areas. Biodiversity monitoring systems should not focus on a few aspects of biodiversity but cover a wide range of natural attributes, including habitat extent and condition [59]. For better appreciation, the policy maker can develop DPSIR (Drivers, Pressures, Status, Impact and Responses) Framework as a policy indicator in order to conserve biodiversity and to manage ecosystem services effectively at protected areas [60], as there is good evidence that biodiversity losses can have substantial impacts on such services. For example, due to lack of effective policy, human beings are hunting wildlife and degrading ecosystem services to reduce economic values. For this, political and regulatory responses need stakeholder's participation.

Table 5. National and International Agreements and Treaties [53], [54], [55], [56]

Sl.	Agreement	Ratification/Signed/Accepted/Joined
i.	Ramsar Convention (Convention on Wetlands of International Importance specially as waterfowl Habitat)	20.4.1992 (Ratified)
ii.	UNESCO (Convention Concerning the Protection of the World Cultural and Natural Heritage)	03.08.1983 (Accepted), 03.11.1983 (ratified)
iii.	CBD (Convention on Biological Diversity)	05.06.1992 (signed), 20.03.1994 (ratified)
iv.	UNCCD (United Nations Conventions to Combat Desertification)	14.10.1994 (signed), 26.01.1996 (ratified)
v.	CITES Convention (Convention on International Trade in Endangered Species)	20.11.1981 (signed), 18.02.1982 (Ratified)
vii.	GTI (Global Tiger Initiative)	Established in 2008. 1st ministerial meeting at Bangkok in 2011. 2nd ministerial meeting at Thimpu in 2012.
viii.	APFNet (Asia Pacific Network for Sustainable Forest Management)	Officially launched on 25th September 2008 in Beijing. Focal point CCF, Forest Department
ix.	GTF (Global Tiger Forum)	Established in 1994. HQ New Delhi. 1st general assembly held in Dhaka in 2000.
x.	UN REDD Program (Reducing Emission from Deforestation and Forests Degradation in Developing Countries)	Started in 2008. Bangladesh joins in 2010. Focal point: DCCF Education &Training Wing, Forest Department.
xi.	UNFF (United Nations Forum on Forests)	Establish in 2000. International Year of Forest 2011. Focal point: Joint secretary (Administration), Ministry of Environment of Forests
xii.	Nagoya Protocol	Nagoya Protocol adapted in CBD, COP 10 in Japan, 2010.
xiii.	MFF (Mangrove for Future)	Bangladesh became member in 2012 in the 9th Regional steering Committee. IUCN operational Focal Point in Bangladesh. Joint programme of IUCN & UNDP. Focal point: CCF, Forest Department
xiv.	SAWEN (South Asia Wildlife Enforcement Network)	Bangladesh joined in 2013.
xv.	APAP (Asia Protected Area Partnership)	Bangladesh joined in 2014. To provide technical support for Asia's Protected Areas.

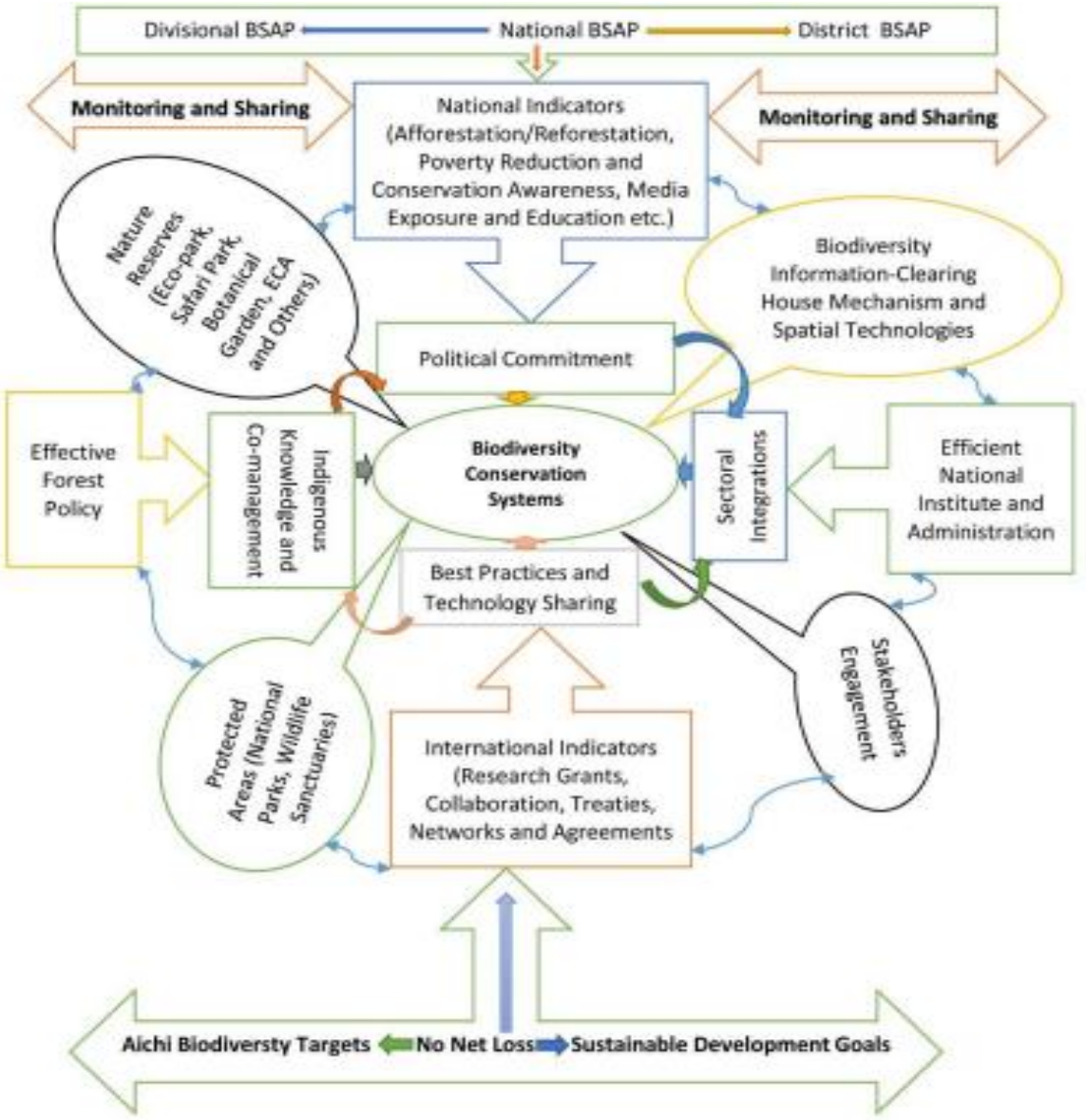


Figure 16. Policy Development Model for Conserving Biodiversity towards protected areas

3.9. Major Challenges

The major challenges are risks in biodiversity with different CASSID (Common Acute Sensor Sudden Infections and Disorders) and environmental diseases, particularly wildlife due to misuse of advanced wireless sensor networks [91], [92], [93], [94], [95], [96], [97], [98], [99], [100], [101], [102], [103]. The modern era of industrialization and globalization allocates a lot of comfort and luxurious life which lead to an alarming situation of huge environmental degradation integrated with all the disturbing activities like land conversion, fragmentation and over population. Bangladesh is one of the world's most densely populated countries experiencing intense pressure on forest areas through land use change and human disturbance [61], [62], [63], [64] towards national parks as well as over-exploiting of natural resources. For this reason, it is alarming that it is important to face a number of challenges for empirical dynamic policy instruments to protect biodiversity through continuous growth of national parks in Bangladesh. It would need different sectoral and departmental policies integration. In addition, major challenge to Bangladesh, is how to interconnect research findings in an easy to distinguish matter to policy-makers and CBD so as to enable them to formulate policies that are favourable to sustainable national parks management for conserving of biodiversity [65] and growth of national parks provision state-of-the-art in public-private-partnership or collaborative management toolbox. This incorporated toolbox represents a framework of evaluation and facilitation of biodiversity conservation in the context of forest policy processes to the benefit of facilitating policy implementation. Hence, in order to bridge the gap between national parks and biodiversity research with community and administrative processes (e.g. policy-making, implementation, monitoring and evaluation) with parks management and biodiversity

conservation on the landscape level the barriers identified accordingly. Unambiguous identification of the connectedness, complication and ideological differences of ecological and social systems is the primary step towards continuing and improving the magnitude of knowledge biodiversity in order to better serve the society with new applications [66]. Social sciences are needed and should be used as the following **Table 6**.

Table 6. Different characteristics of using natural, social and development biological sciences [67], [68]

Sl.	Natural, Social and development biological Sciences using characteristics
i.	To evaluate the needs of society in particular landscape in order to be able to develop applications of conventional forest science knowledge base.
ii.	To communicate to the society, policy-makers and decision-makers on the key issues of importance for the forest sector.
iii.	To require the assessment of the status of actual landscapes with their distinct land-use types and ownership as well as of the relevant institutions.
iv.	To disseminate the knowledge sporadically at grass-root level with update technological restriction inside national parks

4. Discussion

Bangladesh is a ratified signatory state party to the CBD (Convention on Biodiversity), out of 196 State Parties. The country has no self-adopted Biodiversity Conservation Policy. There are several President's Orders, Strategic Plans, Perspective Plan, Rules, Regulations, Policies, Laws, Acts, Ordinances and Administrative Orders relating to management and control of forests, environment, wildlife and protected areas for enforcement activities in Bangladesh. Some of which are special and some are general laws accordingly [69], [70], [71], [72], [73]. The Government of People's Republic of Bangladesh has developed National Biodiversity Strategy and Action Plan (NBSAP) as version 2 according to CBD instruction and is on-going for implementation. A sound and lasting national park service program requires careful, realistic deliberation to ensure the existence of adequate legal strategies and institutional arrangements [74]. Biodiversity issues are national, regional and global concerns.

Table 7. Optional Guiding Principles for biodiversity conservation at Lawachara National Park

Sl #	Parameters	Guiding principles
a.	National Park's boundary	Need specific boundary for national park with protection parameters to the land zoning and core buffer zone.
b.	Definition of Biodiversity	Need clearly definition of biodiversity with undergrowth species protections and totally protected areas management according to guidelines of Convention on Biological Diversity (CBD).
c.	National Biodiversity Strategic Action Plan (NBSAP)	Need proper implementation of NBSAP including Divisional BSAP and District BSAP according to CBD guidelines.
d.	Biodiversity Research Group (BRG)	Need mention properly the formation of BRG according to NBSAP
e.	Endangered Species Protection	Need proper perpetuation with modern technological arena and application of national ICT-Act 2013.
f.	Species Conservation	Need appropriate security with also undergrowth species management except alien and invasive species.
g.	Illegal Logging and encroachment	Need removal network of political biasness and inherent power of administration
h.	Responsible for enforcement of Legislation	Need departmental enforcement team with modern technological arena for state-of-the-art monitoring, set-up and legal action according to NBSAP
i.	Silvicultural Operations	Need community species stratifications with restrictions on massive weeding, thinning, pruning and poaching/stampeding
j.	Co-management Team and others	Need proper biodiversity conservation knowledge and scientific guidelines among co-management team members, policy bureaucrats and managers
k.	Penalty settlement	Need update of penalty settlement for enforcement to illegal activities, particularly hunting, capturing and seizing of wildlife.
l.	New policy adoption and update	For adaptive management, need policy formulation and adoption according to requirements.
m.	Conflict Management	Need conflict management between wildlife and local communities through engagement, participation and awareness.
n.	Alternative Income Generating Activities (AIGA)	Need proper management of human population through introducing AIGA for reducing illegal forest activities.

Table 8. Action necessary to improve NP Information instruments for biodiversity conservation

Root Causes	Actions Necessary for expected biodiversity conservation	Remarks
Lack of administration and Institutional Capacity.	To reinforce the institutional capacity of department of environment and department of forests including wildlife and nature conservation circle, wildlife crime control units with relevant resources, instruments, technology and training.	Training and tools
Lack of Coordination among different government and private agencies.	To reconcile the overlap between the Ministry of Land, Ministry Fisheries and Livestock, and Ministry of Environment and Forests in environmental permitting and sensitive land allocation policies.	Integration
Policy and Information related knowledge gaps	To develop a national biodiversity monitoring system and support its implementation to include collection of baseline data on status, abundance and distribution of species and regular monitoring of changes.	Intensive monitoring
Lack of effective enforcement	To increase the profile environment and natural resources crimes in all law enforcement institutions (police, forest guards, border guards, rapid action battalions etc.).	Legal Action
Lack of adequate technological system of national park areas	To restrict tourist activities and most human activities in core zones and critical biodiversity areas at LNP in Bangladesh.	Ecotourism observation system
Corruption and misappropriation	To conduct institutional and legal reforms to clearly separate the responsibilities and actions of those responsible for environmental law enforcement from those that is involved in daily management of natural resources.	Policy Reforms
Lack of environmental awareness	To support informal learning activities involving nature, like festivals, nature clubs, and school nurseries near national park area. Develop and promote "animal characters" that can help teach children about nature. Encourage responsible tourism and use of national parks.	Behavioural approach
Lack of alternative income generating activities	To expand upon programs that provides alternative sources of income for those living near national park.	Alternative options

The legal status of land designated as a national park is a critical preliminary consideration which may require different approaches in different countries. All national parks and wildlife sanctuaries declared under the Wild Life Conservation and Security Act 2012 invariably in Bangladesh. Besides, Forest Act, 1927 (amended 2000), Environmental Conservation Act 1995 (amended 2010), which must be viewed as the comprehensive legislation for control and management of biodiversity including its habitat. The Wildlife (Conservation and Security) Act-2012 denotes the genetic and species diversity of all species or sub-species of flora and fauna living in aquatic, terrestrial and marine ecosystems or diversity of their ecosystems [75]. Effective policy indicators improve the adaptive management and biodiversity conservation towards national parks. Generally, indicators enhance a manageable amount of meaningful information by summarizing, focusing and condensing on biodiversity conservation at protected areas [76], which are mentioned as policy relevant, scientifically sound, easily understood, practical, affordable and sensitive to relevant changes [77] and [78]. In general, growth of national parks with updated policies enhances proportionately to augment biodiversity. The Ministry of Environment, Forests and Climate Change (MoEFCC) and its agencies are the central apex body of the Government of Bangladesh responsible for the policy, planning and administration of all forestry and environment-related issues and development programmes [79]. National policies stress the benefits that nature provides in terms of ecological balance, ecosystem services, economic growth, anti-poverty measures (such as social protection) and disaster protection [80]. However, forest policy development, clearing house mechanism, revised Sylhet divisional biodiversity strategy and action plan, and removal policy for invasive alien species as well as engagement of stakeholders through co-management necessitates disseminating of information to and good communication with those who should be occupied [82]. Overall, the above-mentioned discussion on growth of national parks and relevant policy factors in Bangladesh, biodiversity conservation systems augments inevitably. There are some optional guiding principles for biodiversity conservation and national park management from the Wildlife Conservation and Security Act, 2012, which is shown in **Table 7**.

Besides, there are reciprocal relationships among advanced legislation including Digital Security Act-2018, Wildlife Master Plan 2015-2035, Forestry Master Plan 2017-2035 and guidelines of CITES, United Nations Conference on Environment and Development (UNCED), Trade Records Analysis of Flora and Fauna in Commerce (TRAFFIC)- Wildlife Trade Monitoring Network, International Criminal Police Organization (INTERPOL), Land Use-Land Use Change and Forestry (LULUCF) and Reduced Emission from Deforestation and Degradation Plus (REDD+).

5. Actions Necessary to Improve the National Park Information for Expected Biodiversity Conservation

There are some necessary actions to improve the National Park Information knowledge for expected biodiversity

conservation at Lawachara national park at Kamalganj sub-district in Moulvibazar district of Bangladesh, which showed in **Table 8** including root causes, actions necessary and remarks successively.

Overall, the reported trends in national park information systems require debate; policy direction and target options need national park management effectiveness evaluation to assess conservation implications [90] in connection with roadmap NBSAP and Aichi Biodiversity Targets 2020.

6. Conclusions

The research shows that national parks are essential for in-situ conservation from national and global perspectives. It focuses on the growth of national parks information and its distribution to the administrative districts and divisions on the priority of policies, regulations and legal status that must sustain the biodiversity conservation systems and ecosystem services. But proper policy incorporation and effective management are missing till to date for an attractive sustainable and healthy environment at Lawachara National Park. The co-management system continues at Lawachara National Park with park management, encroached land recovery, ecotourism support, improvement of natural scenic and cooperation with institutional dimension. Indigenous communities and local people depend on this national park for non-timber forest products collection and eco-tourist services connected with their livelihood supports and changing social dimensions. Bangladesh Forest Department (BFD) takes necessary policy formulation and other relevant initiatives for stimulating active local participation in park resources management. The administration of Lawachara national park rescued 20 acres from illegal encroachers in January 2017 [85] with the cooperation co-management team. This information enhances knowledge management and rethinking the rapport building among national, regional and global networks, particularly Convention on Biological Diversity (CBD) and State Parties. The State should endeavour to increase the valuation of forest policies instrument for conserving biodiversity at national parks areas according to Constitutional Rights. To date, Bangladesh is faced with immediate and material, social and environmental changes and its population growth is unwanted as a developing country. So, policy innovations are evolving mostly strongly from developing and emerging economies which affect sustainable park management. The growth of national park information and biodiversity conservation systems are being used in the study to identify and sustain environmental protection in the study areas for the present and rationalized generations which is essential to address both scientific and national environmental issues. Moreover, it augments proper decisions for the sustainable development of environmental resources. Overall, the research was accomplished for national parks increase with requirements for policy improvement for sustainable nature conservation to the effective policy makers and relevant bodies with interconnected training and social-technical domain, which will contribute at national and global perspectives. In conclusion, the study suggests that future research trajectories of a new kind collaborative approach to drive the methodological agenda and recommendations for further integration of national park management policy and biodiversity conservation systems with the indispensable environmental instruments in nature conservation for sustainable biodiversity protection not only at national but also globally acceptable.

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Data Availability

The data being used to support the findings of this research work are available from the corresponding author upon request.

Competing Interests

The authors declare no potential conflict of interests in this research work.

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