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Challenges of Legal Instruments for Biodiversity Conservation along with National Parks

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Abstract Biodiversity is the core outline when global environmental issues are discussed which responds to national environmental issues and interlinks with policy instruments. Environmental policy instruments are tools used by the state government to implement these conservation mechanisms through political commitments. The study aimed to assess the environmental policy instruments including legal for conserving of biodiversity through primary and secondary data analysis at Lawachara National Park (LNP) in Moulvibazar of Bangladesh. Key conservation legal instruments provided at the LNP and its challenges with gaps in policies for national parks management are highlighted. The study shows that the biodiversity related rules and regulations amended was highest in Bangladesh within the period of 2010 to 2020 while policy weight scoring is about 96% of LNP. The growth of national parks maximized within the same period. The study assessed that the existing legal conservation instruments are inadequate for national park biodiversity protection in Bangladesh.

Keywords Conservation, Policy Instruments, National Park, Co-management, Bangladesh

1. Introduction

Policy instruments have a key role in improving the status of our environment. Environmental Policy Instrument is the process of placing environmental considerations at the heart of government decision-making on environmental issues among others includes loss of biodiversity, climate change and decrease ecosystem services. Biodiversity is the central agenda when global environmental issues discussed (CBD, 2010) with responds to national environmental issues and interlinks with policy instruments. Environmental policy instruments are tools used by state government to implement these environmental policies through national, regional and global commitments for national park biodiversity conservation. Bangladesh is a ratified state party of the Convention on Biological Diversity (CBD), which stated that by 2015, each state party should develop the National Biodiversity Strategy and Action Plan (NBSAP) as a conservation policy instrument according to Aichi Biodiversity Target 17 (CBD, 1992). Thus, Bangladesh developed the revised NBSAP towards national park biodiversity conservation for the long-term period (DoE, 2016). Moreover, the NBSAP is also the major mechanism for existing biodiversity protection to be made into national policies for each State Party to show how countries have responded to the UN agenda on sustainability (Ismail, 2012). The study distinguishes four basic types of policy instruments for biodiversity conservation: (a) Legal Instruments, (b) In-situ Instruments, (c), Informational Instruments, and (d) Ex-situ Instruments. The research relates to law and national park, so the choice of policy instruments is the first two in number instruments, which are legal and in-situ instruments. The study considers policy instruments through examining NBSAP to determine whether and how the NBSAP contributes to mainstreaming biodiversity across policy sectors using Clearing House Mechanism (CHM) in Bangladesh to halt biodiversity loss. Conservation of biodiversity within national parks requires rapid access to data such as the spatial and temporal distribution of species and their habitats within environmental context (Murray *et al*., 1997).

Biodiversity is in the core field of environmental issues. The problem of loss of biodiversity has been raised as a very important global issue for several years due to the lack of dynamic policies, technological application, institutional support and stakeholder engagement (Miah *et al*, 2017). This study aimed to assess the environmental policy instruments including legal, in-situ and informational instruments for conserving of biodiversity through primary and secondary

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data analysis at Lawachara National Park (LNP) in Bangladesh, as a test site. The major consideration of this study is on the Lawachara National Park aspect including environmental, legal, policy and institutional frameworks for the conservation of biodiversity that are used by the co-management team in the National Parks of Bangladesh. In the context of the LNP, there are various challenges confronting biodiversity conservation and management policy initiatives and important including present status of existing policies (NFP, 1994), development of national park, rain water harvesting provisions, ecotourism management, removal of invasive alien species, stakeholders' engagement and the application of conservation technology in the management of existing park.

Conservation of biodiversity and its use in sustainable development have been impeded by many obstacles. The need to mainstream the conservation and sustainable use of biological resources across all sectors of the national economy, the society and the policy-making framework is a complex challenge at the heart of the Convention on Biological Diversity (Bashar, 2010). Various instruments are merged occasionally in a policy mix to tackle an assured environmental problem. These Environmental problems generally occur through overexploiting natural resources and mode of consumption of services and systematic products (Mickwitz, 2003). Rapid loss of biodiversity tends to be at the foremost of conservational issues as they potentially disturb the bio-systematic functions (Sachs *et al*., 2009; Kaeslin *et al*., 2012; Alamgir *et al*., 2014; Sohel *et al*., 2014). This loss of biodiversity is one of the most thoughtful global environmental apprehensions (dos Santos *et al*., 2015), which have been raised during various planetary precincts (Steffen *et al*., 2015) as a domineering worldwide issue for several years. Everyone exploits biodiversity but none can conserve it due to lack of dynamic policies, institutional supports, stakeholders' engagement, and ecotourism services, control measure of invasive alien species and application of conservation technologies. Thus, appropriate and specific policies are required to curb rapid losses of biodiversity.

National Parks (NPs) are often targeted on lands with the least political resistance to their establishment, and thus typically face the least anthropogenic threat. Due to lack of sound assessments can cause significance for the understanding of biodiversity related update rules and regulations for development of indicators and indices, which permit changes and trends to be observed and transformed over time. To date, there is no up-to-date comprehensive model developed incorporating the diverse pertinent political, environmental, socio-cultural, technological, economic, institutional and legal processes for National Park Biodiversity Management. The study highlights on stimulating sustainable use of ecosystem to incorporate most of these components including involvement of stakeholders, institutional participations, update policy integrations, and conservation technologies. This research illustrates to conservation of biodiversity for LNP management with indispensable tools for studying changes of conservation systems and their impacts in order to provide justifiable policy options. These study objectives are to assess the implementation of environmental policy instruments, namely legal, in-situ and informational instruments for conservation of biodiversity in Bangladesh.

2. General Context on Legal Instruments

Legal instrument directly controls or confines ecologically detrimental actions by authorising the reduction or restraint (Hahn *et al*., 1991) of damaging activities. Legal instruments aim at modification of the set of options open to agents. The use of this instrument has been the most common public intervention approach in the environmental policies of ratified CBD State Parties. This approach is often called "Command-and Control" with varying degrees of justification (OECD, 1994). The main legal instruments are well known and include law, policy and strategic plan as well as some government orders, schedules and directives (Ackerman *et al*., 1985). While it often lacks the tractability and efficacies related with direct conservation-based tactics, it offers an effective means of unpromising the intractable (UNEP, 1992), the inept, or the uncompromising, who may demonstrate insensitive (Skelton *et al*., 1995) distribution to educational, motivational, property right, informational, intentional, and price-based instruments. The legal systems in the conservation instruments may also be requisite to reserve the possibility of other relevant instruments (Bardach and Kagan, 1982). Moreover, regulatory instruments may be discriminatory, and are difficult to revise as new information becomes obtainable. However, some positive legal management enhance necessary to protect biodiversity from undomesticated animals and other threats. According to Article 18A of the National Constitution of Bangladesh, the objective is to the Government of Bangladesh (GoB) encourage safeguarding and recovering the environment and to protect as well as to secure the natural assets, biological diversity, forests flora and fauna and other relevant areas for the current and upcoming nations (TCPRB, 2012). Therefore, the GoB produced the Wildlife Conservation and Security Act 2012 including legal instruments and protection systems, but no legal instruments for the protection of undergrowth species effectively, although these species is a part of national park biodiversity.

2.1. Aichi Biodiversity Targets and National Conservation

Aichi Biodiversity Targets (ABT) included 20 targets for conservation of national biodiversity (UNEP-WCMC, 2015) within stipulated time 2020. The Article 17 of ABT indicated that every state government of CBD should improve and to approve a strategic policy instrument for effective conservation action plan within 2015 (ABT, 2010a), which was shared to this government in 2010 through at Nagoya supplementary program (Leadley *et al*., 2014; CBD, 2010).

Aichi Biodiversity Targets–ABT (2011-2020) are enhancing indicators for national biodiversity conservation (CBD 2016a), which indicates to the global networks. Aichi Biodiversity Targets contains five strategic goals including existing targets in connection with sustainable development goals (CBD-SDG, 2016; United Nations, 2015). The specific objectives of these targets are mentioned as sequentially, such as: (a) to achieve and utilize the all flora and fauna sustainably, legitimately, and implementing ecological-based (Rice, 2016) policies (CBD, 2010a), (b) to recognise species invasions for regulatory or eliminating as a prioritised basis of national park biodiversity conservation within stipulated time (CBD, 2010b), (c) to conserve 17% of landscapes and 10% of seascapes areas' biodiversity (CBD, 2014) associated with operative reserved area-based protection, (d) to progress and implement national conservation strategic plan of each state government within the period of 2015, (e) to develop and implement the science and technology management connecting to national park biodiversity status and its consequences through transferring, feedback sharing and recovery measures.

2.2. Biodiversity Strategic Plan- Evidence based Policy

National Biological diversity policy plan is an evidence-based policy instrument. There is relation between evidence base and policy coherence (Segan *et al*., 2011) for incorporating values into NBSAP (Chenery *et al*., 2015)., such as (a) Incorporating values into NBSAP (CBD Secretariat, 2010), (b) Integrated NBSAP's rationale, objectives and insights on values of nature, (c) Internalise and integrate biodiversity values and concerns, (d) Mainstream biodiversity, and (e) Behavioral changes (Schneider and Ingram, 1990), which demonstrate the value of revised NBSAP for national outcomes, improved human wellbeing and halt biodiversity loss (Adams and Sandbrook, 2013). Lack of effective and target-oriented strategic plan, conservation of national park biodiversity tends to losses profoundly. Because, national biodiversity strategy and action plan connect with goals, targets and actions for effective conservation.

2.3. National Forest Policy and Conservation of Biodiversity in Bangladesh

The adoption of authorised laws and regulations through national park management tends to State rules for conserving of biodiversity and its protection (Alam, 2009) towards national parks. According to State Forest rules, the Government accelerated approximately 20% of forest cover through afforestation program within 2015 for maintaining ecological balance. This attempts represented with flora and fauna in the core areas of national parks, particularly in Sylhet division for increasing massive ecotourism, raising awareness on environmental conservation and mitigation of climate change (Bose and Muller-Ferch, 2008). However, the Bangladesh Forest Department could not fulfil the targets within the stipulated time. For this reasons, the Government of the People's Republic of Bangladesh takes initiative for update National Forest Policy (draft) 2016. This new policy will open the door for biodiversity conservation towards national parks to fulfil the Aichi Biodiversity Targets 2020 of CBD.

2.4. National Forest Act and Biodiversity Conservation

Government of Bangladesh amended the Forest Act 2000. It is the major legal instrument in national forestry sector. The Forest Act was modified in accord through the straightforward provisions of misuse and security, and took little reflection towards participating features of national park biodiversity protection. Overall, the amended forest law takes reticent several of the scarce Articles of the innovative law and administration. It silently affords area for the implementation of the traditional managing attitudes through the Forest Department (Muzaffar *et al*., 2011). These legal instruments have influenced towards national and international policy frameworks with diverse contexts of participatory forestry practices, particularly biodiversity conservation at national parks, wildlife sanctuaries, and special conservation areas in Bangladesh. The existing engagements in the announcement of national parks and the outlines of collaborative administration in the reserve forest are closely connected to the primer and extension of shared forest options (MoEF, 2005).

Some major problems were identified by different sources at Lawachara National Park (LNP) in Moulvibazar district of Bangladesh (IPAC, 2012). These are: (i) Lack of demarcation for national park boundary, (ii) Lack of national parks integrated online database, Biodiversity Clearing House Mechanism (BCHM) and digital conservation apps, (iii) Lack of sectoral integration effectively, (iv) Illegal logging, forest land encroachment and political nepotism in co-management team (v) Less involvement of local and indigenous communities towards ecotourism activities, (vi) Lack of awareness on environmental education, (vii) Lack of wildlife security and misuse modern technology (Kays *et al*., 2011) (viii) Excessive invasions of alien species at LNP. (ix) Associated food shortage for wildlife (Deshwara and Eagle, 2017; Bdnews24, 2016). (x) Animal is susceptible to traffic accidents in Lawachara National Park (Deshwara and Eagle, 2017). Lack of determined policies, national park biodiversity estimated to decline by a supplementary 10% of internationally within the period of 2050 (OECD, 2012). Previous research failed to reveal the strong points and faults evidently lingering to complications (Kaomuangnoi, 2014) on environmental policy instruments including National Biodiversity Strategy and Action Plan (NBSAP) evaluation towards national parks implementing policy domains with monitoring, formulation and analysis. Biodiversity technological research becomes more challenging due to lack of proper applications of information systems for digital conservation in Bangladesh. Developing state party lacks proper information and evaluation related to biodiversity conservation systems (Heywood, 1997) on national park.

3. Methodology

Bangladesh is a developing country in the north-eastern part of south-east Asia with augmented biodiversity earlier (DoE, 2016) and lies in the earth largest deltaic area between the coordinates of 20°34' and 26°38' north latitude; and 88°01' and 92°41' east longitude (DoE, 2016). The study was undertaken at Lawachara National Park (LNP) at Kamalganj sub-district in Moulvibazar of Sylhet division, Bangladesh coordinates with 24°32′12″N 91°47′03″E (NSP, 2005) as the forest conservation case study site. The LNP is situated in the Union and sub-district Kamalganj (Figure 1) in Moulvibazar district of Bangladesh (MP, 2006) with indicated parameters as shown in Table 1.

Besides, Lawachara National Park is uniqueness in Bangladesh for its scenic beauty, visitors attraction and other relevant parameters, which are illustrated in details as follows. (i) Important Events in Lawachara National Park (ii) Infrastructure Facilities. (iii) Administration (iv) Legal Status (v) Biodiversity (vi) Human Settlement (vii) Soil and Topography, and (viii) Climate.

Table 1. Some basic parameters of Lawachara National Park

Sl. No.	Parameters	Characteristics
i.	WDPA ID	142993 (WDPA, 2017)
ii.	IUCN Category	II (National Park category) (PAB, 2016)
iii.	Forest type of Park	Evergreen and semi-evergreen forests (IPAC, 2012)
iv.	Existing Law	The Wildlife Conservation and Security Act 2012
v.	Policy Management	Co-management System Active (CWS, 2012)
vi	Physiography	Northern and Eastem Hills (IPAC, 2012)
vii.	Bio-ecological Zone	Sylhet Hills (IPAC, 2012)
viii.	Forest Range	Moulvibazar Wildlife Range, Srimangal (IPAC, 2012)
ix.	Forest Beat	Lawachara Beat (IPAC, 2012)

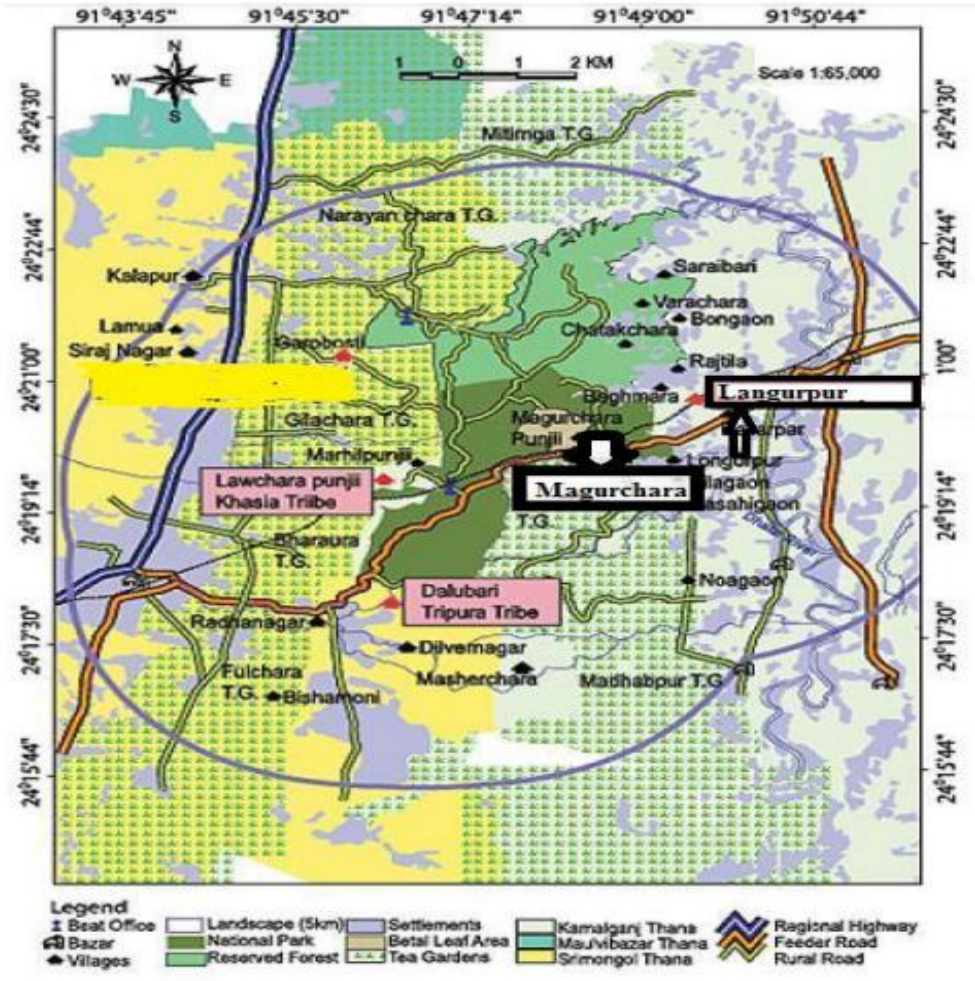

Figure 1. Lawachara National Park at Kamalaganj in Moulvibazar, Bangladesh (Source: Ferdous, 2015; NSP, 2007; MP, 2006)

3.1. Legal Status

Lawachara National Park (LNP) was established through the President Order under the Bangladesh Forest Act 1927 (Amendment 2000). In 1996, the LNP was declared as a National Park under the provision of Article 23 (3) of the Wildlife (Preservation) (Amendment) 1974 (Hossain, 2007; NACOM, 2003). It was declared as a National Park in 1996 with 1,250 hectares (Gazette Notification-PBM (S-3)7/96/367 on 07 July 1996) (Halim et al., 2008) with highly diverse hilly evergreen forest under the conservation status of the Wildlife Preservation Act-1974 (this Act revealed). The current Wildlife Conservation and Security Act, 2012 is effective under the Article 18A of the National Constitution of Bangladesh.

3.2. Biodiversity Status

The LNP is one of three national parks in Sylhet region in the north eastern part of Bangladesh (RIMS, 2015). It is semi-evergreen and mixed deciduous forest. Total 460 species consist of floral 167 and 293 faunal species including amphibian 4, reptiles 6, birds 246, mammals 20, insect 17 (IPAC, 2012; Jalil, 2009). Major plant species are Chapalish, Gorjon, Jarul, Rokton, Segun and major wildlife species are Macaque, Barking deer, Capped Langur (NSP, 2006). The Lawachara is the most suitable to tourists to watch the stunning Hoolock Gibbon (Bunipithecus hoolock / Hylobates hoolock)), Capped Langur (Trachypithecus pileatus), Phayre's Langur (Trachypithecus phayrei), Pigtailed Macaque (Macaca nemestrina), Orange-bellied Himalayan Squirrel (Dremomis lokriah), Barking Deer (Muntiacus muntjac), Masked Civet (Paguma larvata) and rare Cobra and Python species (NACOM, 2003; Hossain, 2007). The LNP is an attractive ecotourism destination due to its aesthetic scenary and dense forest diversity (NSP, 2006). The Park was also a hotspot for biodiversity to find several species of a new and regional record for biodiversity conservation of Bangladesh (Hossain, 2007; Rufford, 2014).

3.3. Legislation Scoring Method

Legislation scoring was calculated for development of update law, policy, order and related schedule for biodiversity protection effectively with the certain period in Bangladesh.

$$\text{Legislation Scoring, } P_i = \sum_{i=1}^{n=23} W_i S_i \quad (1)$$

Where, n= number of legislations, Pi= weighted average score of national park, Wi= weight for policy i, and Si= Score Assigned for policy I (Rahman and Barua, 2016).

3.4. Data Collection and Handling

At first, all the general information regarding the occurrence of biodiversity and informatics including biodiversity conservation systems in the Lawachara National Park and their diversity, status, and distribution are collected and tabulated in an organized manner. After the data had been collected, they were checked properly for accuracy, by using the crosschecking method for data compilation.

3.5. Data Analysis, Presentation and Interpretation

All general information regarding the occurrence of biodiversity and national parks including legal systems in the protected area and their diversity, status and distribution were checked for accuracy from the different sources and sources of information were also verified. Information regarding the initiatives of the authority towards the conservation of biodiversity was collected through relevant secondary information and field survey. Then the information were included in the preparation of data master sheet and incorporated into convenient forms used in the result and discussion section. The data were compiled and analyzed for presentation and interpretation using standard data analysis software like MS Office Suite 2013, and R programming version 3.4.

4. Results

Environmental Conservation Policy research findings are about developed models to evaluate the contribution of environmental policy instruments along with information systems for biodiversity conservation towards National Parks in Bangladesh. The management of biodiversity by security representative and well-connected habitat network in managed national parks. The park requires a wise combination of protection, maintenance, and restoration of plants, animals and habitat at sustaining goals (Angelstam *et al*., 2003). The ultimate goal of this research is to evaluate the existing laws, policies, assessment of biodiversity information systems with clearing house mechanism and stakeholders' engagement, control measures of invasive alien species and conservation strategies, which illustrates in different section of this chapter successively.

4.1. Conservation Awareness among Stakeholders

Socio-economic features enhance to identify the different parameters of stakeholders for cooperation and management of National Park biodiversity, as shown in Figure 2. The graph represents different types of stakeholders who responded in the research activities.

Most of stakeholders (110) are responded as local people, visitors (96) and minimum (1) respondent is national policy-maker. From the study, it found that the educationist and researcher are statistically significant. These stakeholders are aware on biodiversity conservation at Lawachara National Park, which as shown in Figure 3.

The study found that NGOs and development organizers are more aware (52%) but local villagers (20%) are less motivated than others. It depends upon the participation of all the stakeholders for proposing activities of administration, private sector, Non-governmental Organizations, local and indigenous community leaders. Nature is diminishing at

rates unparalleled in human history- and the rate of species extinctions is quickening with grave influences on stakeholders around the world now likely, warns a milestone (IPBES, 2019). This study creates awareness among these stakeholders.

4.2. Impact of Settlements on Lawachara National Park

Settlement has been one of the main footprints of humanity on earth's terrestrial ecosystems (Massada *et al*., 2014). Lawachara National Park (LNP) surrounded by 18 villages, tea-estate, agricultural land and barren land. In this LNP, there are numerous interactions between human and natural resources as a bio-ecologically region in Bangladesh. Lawachara National Park is the park area in which human settlements adjoin or intermix of local and indigenous communities with bio-ecosystems. These human settlements affect neighbouring ecosystems through biotic processes including introduction of exotic species, wildlife subsidization, land encroachment, disease transfer, land cover conversion, fragmentation, and habitat losses. The effects of LNP settlements on biodiversity conservation are two tiered– starting with national park modification and fragmentation by railway route and vehicle road, and progressing on different processes in which direct and indirect effects of anthropogenic activities spread into neighbouring ecosystems at varying fluctuate scales. The people of these villages are dependence on LNP including major, moderate and minor primary stakeholders according to involvement and distance, which as shown in Figure 4. The study identified the following outputs:

(a) Major dependency villages: Bagmara, Magurchera, Lawachera, Baligaon, Dolubari and Biranpur. These villages are situated within 1 km surrounding LNP.
(b) Moderate dependency villages: Rashtila, Botertol Slum, Saraibari, Veenachera, Radhanagar and Garobosti;
(c) Minor dependency villages: Langurpur, Ballarpur, Noagaon, Tilagaon, Bhashaniganj and Bongaon.

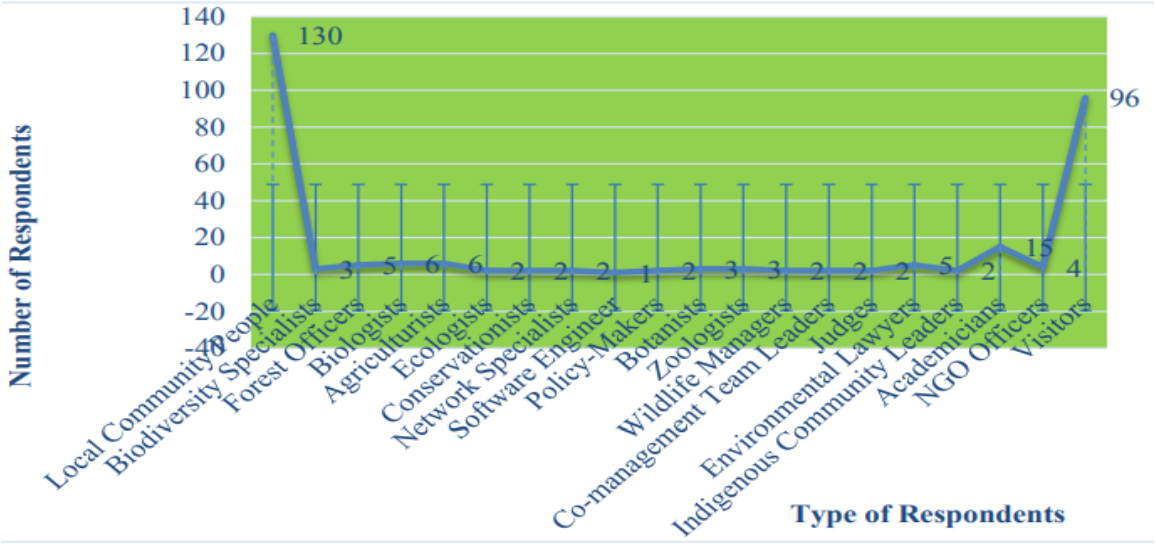

Figure 2. Quantity of Stakeholders Respondents

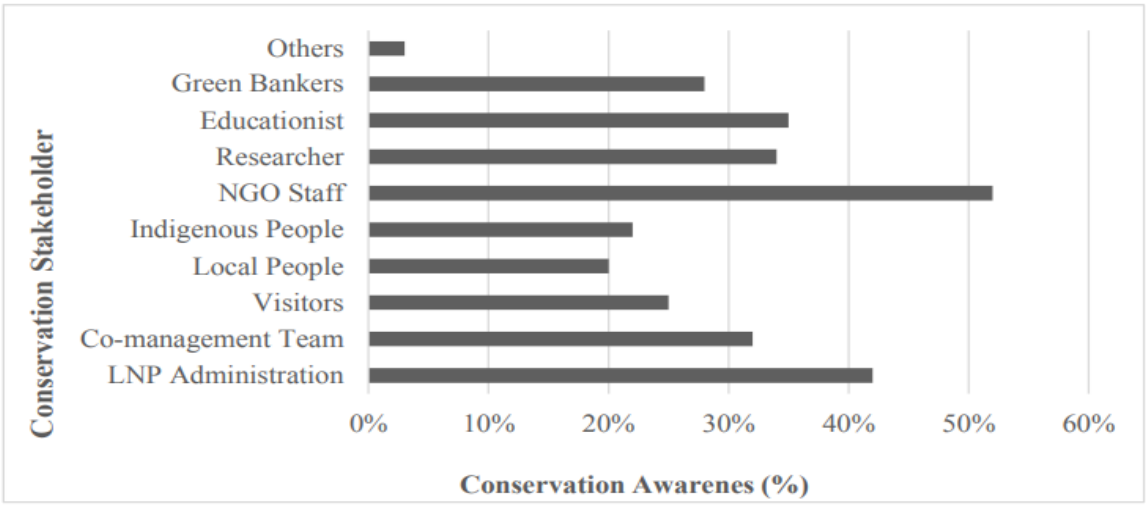

Figure 3. Conservation Awareness of Diverse Stakeholders

Inhabitants of Lawachera, Magurchera, Dolubari and Biranpur are involved in fuel wood collection from Lawachara National Park, while the people of Bagmara, Radhanagar, Rashtila, Baligaon, Verachera and Chatakchera villages are involved in illicit tree felling at the park. Out of six Tea-estates, Noorjahan and Bharaura are neighbouring tea-estate and the rest of tea-estates are country bordering. The employed tea-estate workers and their families are involved in illegal logging (NSP, 2006) from within LNP. The study suggested that need environmental education programmes for awareness building among the communities of two inside and four outside villages. New scientific management and conservation policy tools needed in order to better consciousness the LNP as a unique social-ecological zone and to mitigate negative consequences of its sustainable management.

Stakeholders' opinion on causes of biodiversity loss, these opinions of the villagers, visitors and others on different causes of loss of biodiversity are shown in Table 2. The conservation policy affected the following indicators, such as: (i) poverty/low income, (ii) over inhabitants, (iii) illegal logging/illicit-felling, (iv) hunting and capturing, (v) political reasons, (vi) lack of legal action, (vii) natural calamities, (viii) ecological disturbance, (ix) land conversion, (x) invasive alien species.

Stakeholders' Perception enhances on Environmental Policy Instruments for Conserving Biodiversity and threats to Biodiversity. Family and farm represent a unity that continuously co-evolves, fulfilling economic, environmental, social and cultural functions within its national park areas (FAO, 2019). For example, stakeholders' average opinion on habitat fragmentation and loss is 90%, where maximum between villagers (94%) and minimum in visitors (85%). The study suggested for afforestation /reforestation programme with engagement of stakeholders.

Table 2. Stakeholders' Perception for threatening to Biodiversity

Different parameters regarding loss of biodiversity	Stakeholders' Opinion			
	Villagers	Visitors	Others*	Average
Habitat Fragmentation and Loss	94%	85%	91%	90%
Unsustainable Use/Overexploitation	90%	88%	92%	90%
Negative Impact of Invasive Alien Species	87%	94%	95%	92%
Climate Change driving Biodiversity Loss	88%	93%	95%	92%
Pollution/Nitrogen Posing threat to biodiversity	75%	87%	93%	85%
Limited Capacity including Financial for human and Technical Issues for Biodiversity Loss	88%	82%	94%	88%
Complications in Retrieving Systematic Evidence	86%	94%	96%	92%
Inadequate Consciousness on Conserving of Biodiversity Issue	64%	86%	90%	80%
Constrained National Park's Biodiversity Mainstreaming	68%	85%	72%	75%
Scrappy Decision-making	62%	76%	90%	76%
Imperfect communications among various department/divisions	54%	88%	92%	78%

* Others are LNP Manager, Co-management Team Leader, Tea-Estate Manager, Ecoguide, Academicians, Researchers, Bio-network specialist, Conservation Educationists, Policy-maker, Environmental Lawyers and Judges.

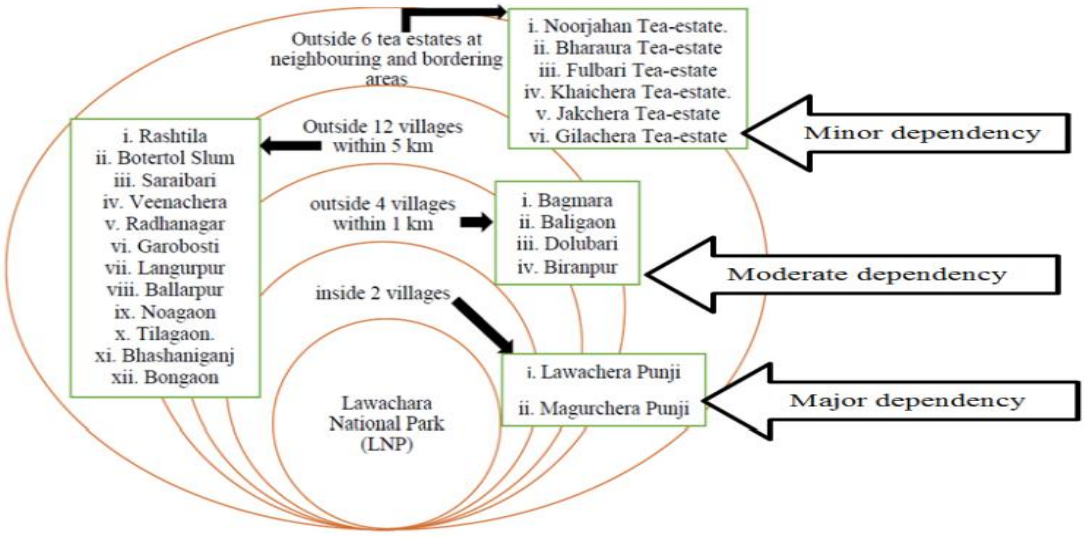

Figure 4. Settlement villages covered Lawachara National Park's inside and adjacent Area

4.3. Awareness on Co-Management Approach

Co-management approach is the new system for National Park biodiversity management through community involvement, as shown in Figure 5, with trend lines graphs. Awareness on co-management approach at studied national park area of Bangladesh in the scheduled period can be estimated using the equation developed through regression analysis. Here, the study expressed the approach through the following equation,

$$y = 3.9818x \quad (2)$$

And R2 =-0.324 Where, y is awareness (%) and x is the satisfaction approach with suitable, good, biasness and so on.

Equation (2) has an adjusted R2 (co-efficient of multiple determination of 0.0.324 with a standard error of estimate on observed mean. The value of R2 is below 0.5, which indicated downward portion and neglected. So, the stated equation is rejected. The developed equation was then employed to simulate human consciousness changes in LNP area for comanagement system, if the R2 value is within 0.5 to 1.0. Differences in changes through co-management approaches between observed and simulated values are estimated effects on LNP in Bangladesh. For this reason, the stated linear equation is rejected. The existing co-management approach will be accepted, if the value of "suitable" options must be reached on 40 or above for more awareness criteria adopted in the listed approaches. However, the policy on co-management is needed update.

4.4. Wildlife Critical Condition of Lawachara National Park

From the field observation, sheltered wildlife status of Lawachara National Park (LNP) is captured by threats. These Threats to wildlife and their habitations are multifarious and pervasive in the Lawachara National Park. According to IUCN (2017) these are 39 mammalian wildlife consisted in LNP, out of them, almost 23% of the known species are threatened, 18% are vulnerable as well as 5% endangered, which as shown in Figure 6. The study showed the status of vulnerable and endangered of wildlife conservation in the LNP with risk assessment. Some wildlife of LNP were killed by Railway and vehicles during movement the road / route (SOD, 2016).

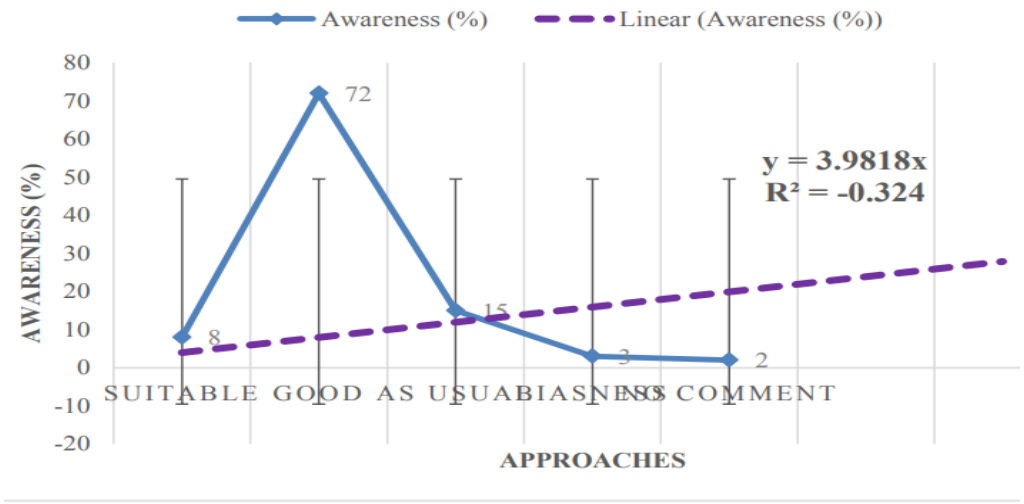

Figure 5. Awareness on Co-management Approach

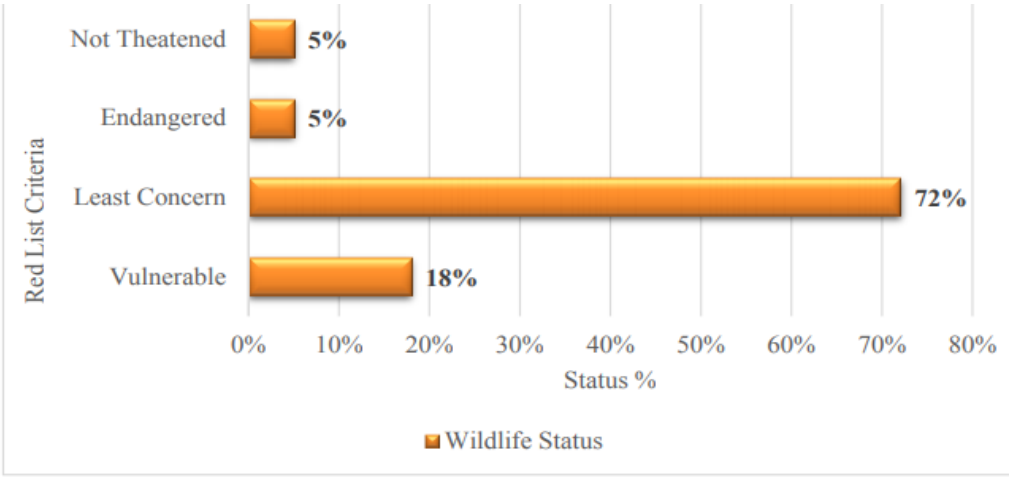

Figure 6. Wildlife Criteria of Lawachara National Park

These death wild animals are: Fox, Fishing cat, wild cat, monkey, deer, frog and snakes. These are often run over and killed by vehicles on the road. The study suggested for update wildlife conservation policy formulation in connection with national and global stakeholders' opinions on the priority of Aichi Targets. Lawachara National Park (LNP) Service Management is challenged to stability tourists and researchers' access with the environmental, social and ecosystem service consequences of motor vehicle use and running railway. Wildlife populations in LNP are in danger to road and route collision. The study of the survey identifies the existing circumstances and wildlife-vehicles conflicts. The accessible transportation systems at LNP were professed to be beyond capacity, with passageway volumes presently high or very high traffic anticipated escalating in the majority means of entrance. LNP unit used some form of mitigation method to reduce the impacts on wildlife. Approximately 55% of the respondents indicated the impacts would merely exacerbate in the next ten years (Table 3).

From the Field observation and opinions of Focus Group Discussion, different wildlifes of Lawachara National Park were killed by railway and vehicles, which as shown in Figure 7. The study suggested that the existing route and road need to shift from inside of LNP.

This loss of biodiversity at national park disturbs livelihoods, water supply, and food security and lessens resilience to life-threatening events, particularly for community living in /adjacent park areas who are often the poorest (World Bank, 2019).

4.5. Biodiversity-Related National Legislation Scoring

The legislation scoring categories and their grading definitions constructed based on discussions with biodiversity and legal experts including both professionals and academicians in Bangladesh context, as shown in Figure 8. The graph observed maximum weight (%) in Lawachara National Park (LNP) and minimum in Khadimnagar National Park (KNP), where compare with linear, and polynomial trend line for dissemination of present status on legislation scoring. The score of National Park increased gradually. The findings suggest that the Government of Bangladesh targets of fully implementing the biodiversity related policies/laws/ legislations till to date remains substantially unattained. From the study, biodiversity related law, policy, and administrative order etc. produced more or less in several years, but no legislation produced from the period of 1980 to 1989 in Bangladesh.

The result suggests that the existing legislations need to modify for sustainable development of national biodiversity in connection with regional and global perspectives, particularly CBD' requirements.

Table 3. Severity of road and route impacts on wildlife at LNP

Parameters	More Severe	Severe	Less severe	No comment
Road and Route Mortality	55%	37%	5%	3%
Habitat loss	45%	35%	15%	5%
Habitat disturbance	30%	33%	22%	15%
Habitat fragmentation	42%	35%	21%	2%

Figure 7. Snake and Monkey attacked by vehicles at Lawachara National Park road (Babu, 2013)

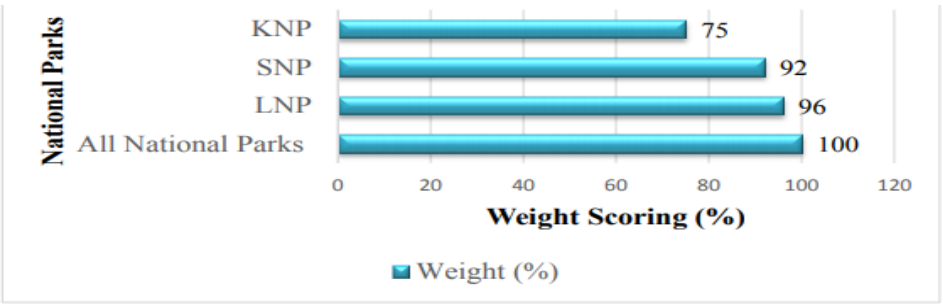

Figure 8. Biodiversity Conservation related existing national legislation scoring

Table 4. Policy related characteristics of State Party's National Parks

Parameters	Characteristics	CBD
In-situ	National Park system for special measures need.	Article 8 of the Convention
Strategic Plan	National strategic plans and programmes for conservation.	Article 6 (a)
National policy	Development and implementation of national policies for promoting.	Article 18
Technology	State Parties technologies enhance access for transfer and sustainable use of biodiversity.	Article 16 of the Convention
Exchange of Information	The exchange of information facilitated to the conservation.	Article 17
Control Alien Species	Preventing measure of Invasive Alien Species. which threaten to ecosystems.	Article 8 (h)
Resources utilisation	Regulating natural assets confirm their protection and justifiable practice.	Article 8 of the Convention
Traditional knowledge	National legislations enhance the traditional knowledge for biodiversity conservation.	Article 8 (j) of the Convention
Monitoring	Monitoring with sampling techniques enhance biodiversity protection.	Article 7 (b) of the Convention
Incentives	Biodiversity conservation measures incentives with economically and socially sound.	Article 11
Research and Training	Technical education and training established biodiversity conservation.	Article 12 of the Convention
Education and Awareness	Global education and public awareness programmes for collaboration and conservation.	Article 13 of the Convention

Table 5. Laws and Policies to protect Biodiversity towards National Park Areas in Bangladesh

Law/Policy	Year	Perspectives
The National Constitution	2011	Article 18A, 102, 152
The Bangladesh Biodiversity Act, 2017	2017	Chapter 3, 4, 6, 8 and 9.
The Wildlife (Conservation and Security Act	2012	Section 2 (15, 43), 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, 27, 28, 29, 30, 34, and 42.
Bangladesh Environmental Conservation Act 2010 (amendment)	2010	Section 5, 6, 7, 12, and 15
Bangladesh Forest Act (amended)	2000	Section 28, 29, 30, 32, 33. 41, 42, 43, 52, 53, 54, 55, 56, 63, 64, 65, 66, 67, 68
Environmental Policy	1992	Section 5
National Forest Policy	1994	Section 1.1 (a, b, c. and d)
Environmental Court Act	2010	Section 4, 9, 11, 14, 15, 18, 19, 20, 21, and 22
National Biodiversity Strategic Action Plan	2016	Chapter 1, 2. 3, 4, 5, 6, 7, 8.
Compensation Policy for Casualties caused by Wildlife	2010	Section 5, 6, and 7.
Saw-Mill (License) Rule	2012	Section 7, 8, and 9
Forest Products Transit (Control) Rule	2011	Section 3, 4, and 5
Social Forestry Rule (amendment)	2011	Section 4, 5, and 6
Brick Prepared and Kiln Establishment (Control) Act	2013	Section 5, 6, and 8.
The Prime Minister Award Giving Rules 2013 on Plantation	2013	Section A. B. C and D
ICT Act 2013	2013	Section 54, 55, 56, 57
ICT Policy	2009	Section D (9), E (4, 9)
Ecologically Crical Areas Rules	2016	Section 3, 18, 19, 20, 22, 26, 27, 28.
Tea Act 2016	2016	Section 7, 17, 29
National education Policy 2010	2010	Chapter 11, 12, 14, and 15
Water Act 2013	2013	Section 3, 4, 8, 15, 17, 18, and 29.
Protected Area Management Rules 2017	2017	Section 2, 4, 15, 18, 19, 20, 21, 24, 29
Plant Quarantine Act 2011	2011	Section 6, 7, 26, 31
The Bangladesh Public Private Partnership Act 2015	2015	Chapter 2, 4, 5, 6

4.6. Existing Law and Policies Related to Biodiversity Conservation

Existing legislations related to biodiversity conservation, as shown in Table 4, with relevant parameters. The study relates to biodiversity conservation with different articles at the Constitution of Convention on Biological Diversity, such as in-situ, national policy, strategic plan and relevant technology. Every state party develops National Park, national biodiversity related policy and strategic plan through national biodiversity database and clearing house mechanism according to CBD requirements. These requirements enhanced to legislation analysis for conservation of biodiversity towards National Parks in Bangladesh on the priority of regulation, control alien species, regular monitoring through effective research and training, environmental education awareness and sustainable use.

The conserving parameters of biodiversity laws and policies indicates on the following, such as: (i) In-situ, (ii) Strategic Plan, (iii) National policy, (iv) Technology for Clearing House Mechanism, (v) Exchange of Information, (vi) Control measures of Invasive Alien Species, (vii) Resources utilisation, (viii) Traditional knowledge, (ix) Monitoring, (x) Incentives, (xi) Research and training, and (xii) Education and awareness.

4.7. Legislation Relevance to Biodiversity conservation in Bangladesh

New legislation relevance to biodiversity conservation initiatives require human resources, institutional capacity, and funding for successful development and implementation to identify the people and organization with the interest and expertise to ensure progress on new legislation development related to biodiversity in Bangladesh (Table 5).

From Table 5, the study identified 26 tools for biodiversity conservation on national parks. These are: (i) Constitutional Rights, (ii) Forest, Wildlife and Biodiversity, (iii) Agroforestry, (iv) Industrial ecology, (v) Forest health and environment, (vi) Food energy, (vii) Water development and harvesting, (viii) Forest land, (ix) Fisheries and Livelihood, (x) Associated for wildlife, (xi) Terrestrial Environment, (xii) Transport and communication, (xiii) Green Banking, (xiv) Settlement and community, (xv) Sectoral policy intregration, (xvi) Bio-culture and religious, (xvii) Population/ stakeholder, (xviii) Collaborative Management, (xix) Removal of Invasive Alien Species (IAS), (xx) Education and public awareness, (xxi) Dynamic administration, (xxii) Science and Technology, (xxiii) Research and innovation, (xxiv) National, regional and global commitment/agreement, (xxv) Public-private partnership, and (xxvi) Protected Areas Management rules (PAMR, 2017), for example- Lawachara National Park Management Rules. From the study, National Constitution, Wildlife Conservation and Security Act, Forest Act and Policy, Environmental Conservation Act and Policy, ICT Act and related policies, Biological diversity Strategic Conservation Plan, Compensation Policy on behalf of Causulties caused by Wildlife, Environmental Court Act, and Brick Burning (Control) Act are the major instruments for conservation of biodiversity at National Parks.

These laws and policies enhanced for update for National Park biodiversity management and protection as well as taking initiative for alternative choice (Figure 9). The study suggested that the existing conservation policy needs improvement including alternative choices on the priority of constitutional rights as well as it will be stakeholders' participation without nepotism and procrastination.

4.8. Produced Quantity of National Legislations

National legislation develops for enhancement of national biodiversity towards National Parks. Biodiversity related national legislation produced maximum within the period of 2010-2018, as shown in Figure 10. The study found that most of legislations related to biodiversity conservation formed after COP-10, in this period, CBD provided circulations to the state parties for update the national legislation for conserving of biological diversity. The Government of Bangladesh produced the Wildlife Conservation and Security Act 2012 within this period. The study suggested that the government takes initiatives for separate law and policy for national biodiversity conservation towards national parks in Bangladesh.

4.9. Analysis of Wildlife Conservation Act and Order

National biodiversity conservation opens the door through the Wildlife Conservation and Security (WCS) Act 2012. This Act updates in Bangladesh for biodiversity conservation and protection, particularly wildlife protection. The WCS compares with previous Preservation Order 1973, as shown in Table 6. The main parameters highlight on National Constitutional Status, Legal Integration, and National Park declaration, Co-management System, Penalties, Biodiversity Advisory Board and Scientific Committee. But no Section of relevant Law and policy mentions for digital conservation through National Park database and clearing house mechanism. From the respondent's opinion on WCS Act 2012 at FGD is as 11% 'adequate', 33% 'good', 56% 'inadequate' and 2% 'no comment'. The findings suggest for modification with new Sections related on digital conservation, particularly biodiversity information systems and clearing house mechanism for the purpose of global network connection and digital conservation. The study also represented the legal status of co-management system in Section 21 of the Wildlife Conservation and Security Act 2012 creating new opportunities for national park biodiversity conservation in connection with national and global perspectives.

Table 6. Comparison between Wildlife Conservation Act and Order

Parameters	Wildlife Conservation and Security (WCS) Act, 2012	The Bangladesh Wildlife (Preservation) Order, 1973
Constitutional Status	The provision behalf of the conserving and safety of biodiversity including wildlife by the state has been inserted Article 18A of the National Constitution. And indirectly Article 102.	In enactment of the Fourth Schedule to the National Constitution, the President is satisfied to create this Order.
Providing Status	This Act is to offer for conserving and safety of national biodiversity.	The Order is convenient to offer for the protection safeguarding and managing of national wildlife.
Act/Order No.	Act No. XXX of 2012, 10 July, 2012/26 Ashar, 1419.	President's0rder No.23 dated March 28, 1973.
Chapters and Sections	10 Chapters and 54 Sections	No chapter and 48 Sections
Schedules	Contains I, II, III and IV Schedules.	Contains I, II, III Schedules.
Highlights	Advisory Board. Scientific Committee and Authorized Officers	The Bangladesh Wild Life Advisory Board. Officers and Honorary Officers
Legal Integration	(i) Code of Criminal Procedure (CrPC) 1898, (ii) Brick-Burning (control) Act 2013, (iii) ICT Act 2006. (iv) Penal Code (PC). (v) Environmental Conservation Act, (vi) Environmental Court Act 2010. (vii) Forest Act (FA).	(i) Code of Criminal Procedure (CrPC) 1898, (ii) Arms Act (AA) 1878, (iii) Penal Code (PC), (iv) Forest Act (FA)
Global Participation	CBD, CITES, IUCN, UNCLOS and other related organizations	This order included the CITES as the global partnership
Co-management	Section 21: Introduction of Co- management Systems	No Section on co-management
Special Declaration	Section 22: Declaration on special biodiversity conservation area	No Section for special declaration
Community	Declaration of community conservation	No Section for Community

Conservation Area	Area in the section 18	Conservation Area
Declaration of Parks and breeding centre	Declaration of safari park, ecopark botanical garden and wild animal breeding center.	No declaration of safari park. eco-park, botanical garden and breeding centre.
Offences	(a) Cognizibility and non-cognizibility. (b) bailability, non-bailability, and (c) compoundability of offences	Offence identified by not classify.
Minimum Penalties	Minimum custody l year with BDT fiity thousand or with both.	Minimum custody $^{1}/_{2}$ year with BDT two hundred fifty or with both.
Maximum Penalties	Maximum custody 12 years with BDT fifteen Lac (1.5 million) or with both.	Maximum custody 2 years with BDT two thousand or with both.
Application of Technology	No proper legal section but indirect linking with ICT Act 2006.	No section on this Act.
Miscellaneous	Annual Reports, Scientific Research. Prohibition relating to airgun, Powers to amend schedules and making rules Publication of translation, Repeal & savings.	Powers to amend schedules and making rules. Publication of translation, Repeal & savings.

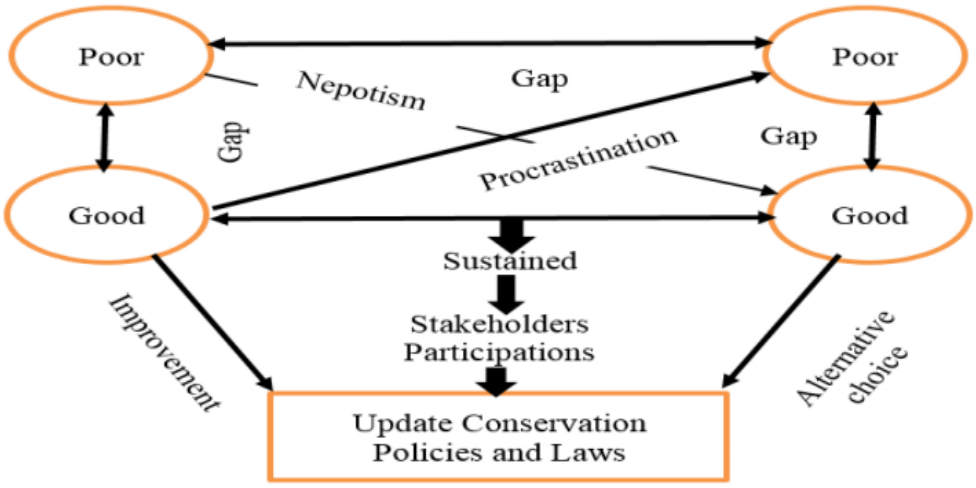

Figure 9. Criteria on Conservation Policy Improvement

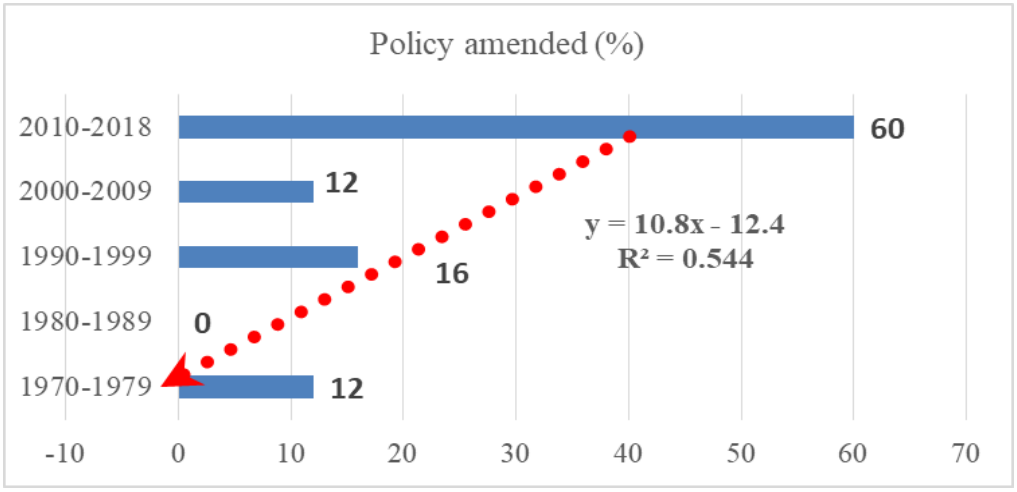

Figure 10. Produced Number of Biodiversity related Legislation in Bangladesh

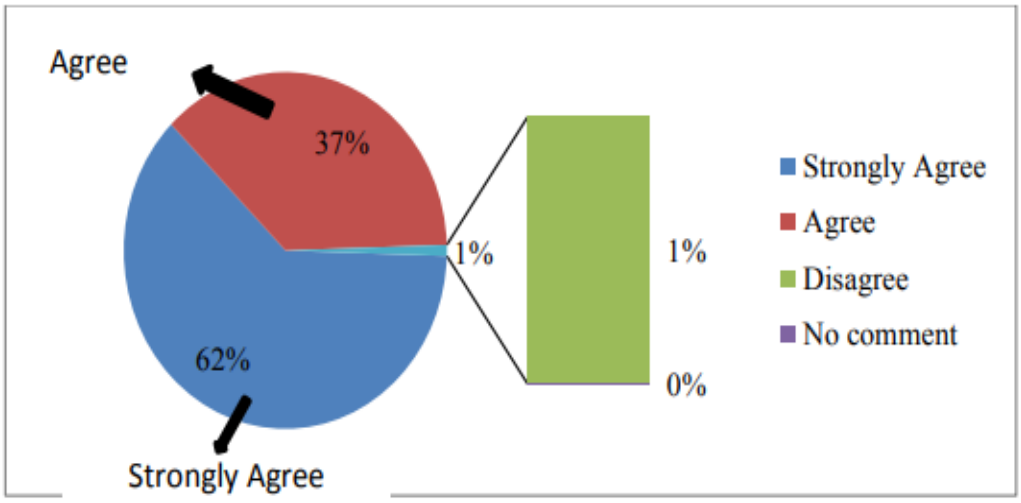

Figure 11. Stakeholders' opinion on essential laws and policy adoption for national park

4.10. Essential Law and Policy Adoptions for National Park

National Park is an essential In-situ instrumentsns for biodiversity conservation. Every State Party committed to CBD to increase the National Parks with the stipulated times. For this purpose, each State Party tries to adopt relevant law and policy. Most (62%) respondents 'strongly agreed' for essential law and policy adoption for National Park management, on the priority of Aichi Biodiversity Targets 2020, as shown in Figure 11. The findings suggest that Government should adopt the priority of stakeholders' opinions for development of new essential law and policy for National Park management.

4.11. Conservation-Related Policy and Gap Analysis

Biodiversity and nature's contributions to people are common heritage and humanity's most important life-supporting 'safety net' (Sandra Diaz, 2019). This safety net connects with conservation policies. Conservation related policies contain some gaps on biodiversity protection, effective management, cooperation, coordination and integration among various sectors/departments. The MoEFCC in Bangladesh leads the position for integration and development of NBSAP, CHM and National Park management and forestation programmes, as shown in Table 7, successively including relevant policy, ministry or department and conservation related gaps. As a State Party, Bangladesh has little research on biodiversity policy and technology, where there are a lot of research gaps. In this regard, gaps are observed between update policy and application of biodiversity technology. The research finds suitable methods on the priority of observing gaps. The study suggests enhancing the revised edition of NBSAP towards National Park's biodiversity conservation. Nature conservation related policy and gap analysis discussed in Chapter 5 in details including policy options, policy integration, policy improvement and combination of conservation policy and technology for Lawachara National Park Biodiversity Management. The study also suggests that the integration of natural and social sciences in the form of two-dimensional (horizontal and vertical) gap analysis is an efficient tool (Angelstam *et al*., 2003) for the implementation of biodiversity policy.

Table 7. Different Policies on Ministries for Conservation Gap Analysis

Policy	Conservation and Gap Analysis	Ministry/ Department
Environment Policy 1997	Biodiversity conservation is a cross-cutting issue stated in the section 3 and 4. For this purpose, it is required to connect with global communities, like CBD.	Ministry of Environment and Forests (MoEF)
Forest Policy 1994	Biodiversity policy is a sketchy manner. For this purpose it is required incorporation with policy-makers and world-wide stakeholders.	Ministry of Environment and Forests (MoEF)
National Agriculture Policy 2013	Conserving of biodiversity enhances sustainable use of natural and genetic resources, which emphasis towards integration among sectors, department and institutions.	Ministry of Agriculture (MoA)
Landuse Policy 2001	National Park biodiversity connected with land zoning and promulgation including agricultural land and wetland. For this purposes, it is required boundary demarcation with land data bank and certificate of land ownership.	Ministry of L. and (MoL)
ICT Policy 2013	National biodiversity is connected with global network for exposure of digital conservation and environmental informatics. For these reasons, it is required national park database with clearing house mechanism.	Ministry of Post and Tele-communication, and Information Communication & Technology

5. Discussion

The discussion on analysis of research findings on environmental policy instruments, along with the assessment of information systems evaluates the biodiversity conservation at Lawachara National Park in Bangladesh. Result of this study clearly demonstrates that '*In-situ'* environmental conservation policy instrument is more suitable than legal and informational instruments for biodiversity conservation. Limited comparison of legal and informational instruments suitably have been undertaken and conclusions differ. In this study, the development of produced policies declaration of National Parks and applications of biodiversity clearing house mechanism were analysed as criteria for suitable biodiversity conservation. The three mentioned environmental conservation policy instruments analysed had different effects on National Park Biodiversity Management, Policy Development and application of digital conservation of Bangladesh – as a signatory State Party of CBD's objectives requirements. The findings on the existing policy instruments are inadequate in connection with national and global perspectives, where there are some gaps, like policy formulation, sectoral integration, national park declaration, establishment of digital conservation.

5.1. Develop 7R's Policy for National Park Biodiversity Conservation

Conservation policy is the recognition of the rights of nature in the 'Rights of Mother Earth' law (Romero-Muñoz *et al.*, 2019). The 7R's Policy is essential for national park biodiversity conservation. Here includes seven parameters rule indicating first letter capital "R" as shown in Figure 12, such as: (i) Reformation integrated policy in connection with forest policy, environmental policy and relevant other policies, (ii) Restoration national parks, (iii) Replacement Invasive Alien Species (including plant invasion and wildlife invasion), (iv) Reforestation with biodiversity targets indicates on afforestation for forestation on the priority of Aichi Biodiversity Targets 2020, (v) Reintegration communities commitment (i.e. they are mainly local, indigenous and national communities as well as regional and global communities), (vi) Reuse biodiversity technology i.e. application of digital technology and biodiversity information systems, (vii) Recovery valuable resources (i.e. using resource information management systems for protection of natural resources). The 7R's policy improves the national policy reforms and enhances to development of BCHM, particularly Lawachara National Park Database linking with reformation, restoration, replacement, reintegration, digital conservation and resource recovery.

5.2. Departmental Policies Integration for conservation of National biodiversity

Bangladesh is a developing country, consists of different sectors and departments, like Bangladesh Forest department, Department of Environment, Department of Agriculture and so on. Each sector has individual policy, viz. forest policy, agriculture policy, environmental policy, and land policy etc., as shown in Table 8, with necessary examples. There is a shared important link among these sectors for sustainable development, social and economic reforms and their integrations for specific policy areas (Owens and Hope, 1989). From the point of research, biodiversity policy relates with public policy, which is related to National Biodiversity Strategy and Action Plan (NBSAP). Article 6 of the CBD requires each State Party to develop a NBSAP for implementation of the Convention's objectives, to integrate the plan's objectives into sectoral policies and to report to other Parties about related efforts, successes and failures (CBD, 1992). Government of Bangladesh adopted a NBSAP to halt the loss of biodiversity in Bangladesh and to reconcile protection with the interests of users (DoE, 2016). The National Strategy is based on the CBD's biodiversity strategy; with connect to a number of related national sectoral strategies inter alia National Conservation Strategy, the Country Perspective Plan and linking within the Sustainable Development Goals.

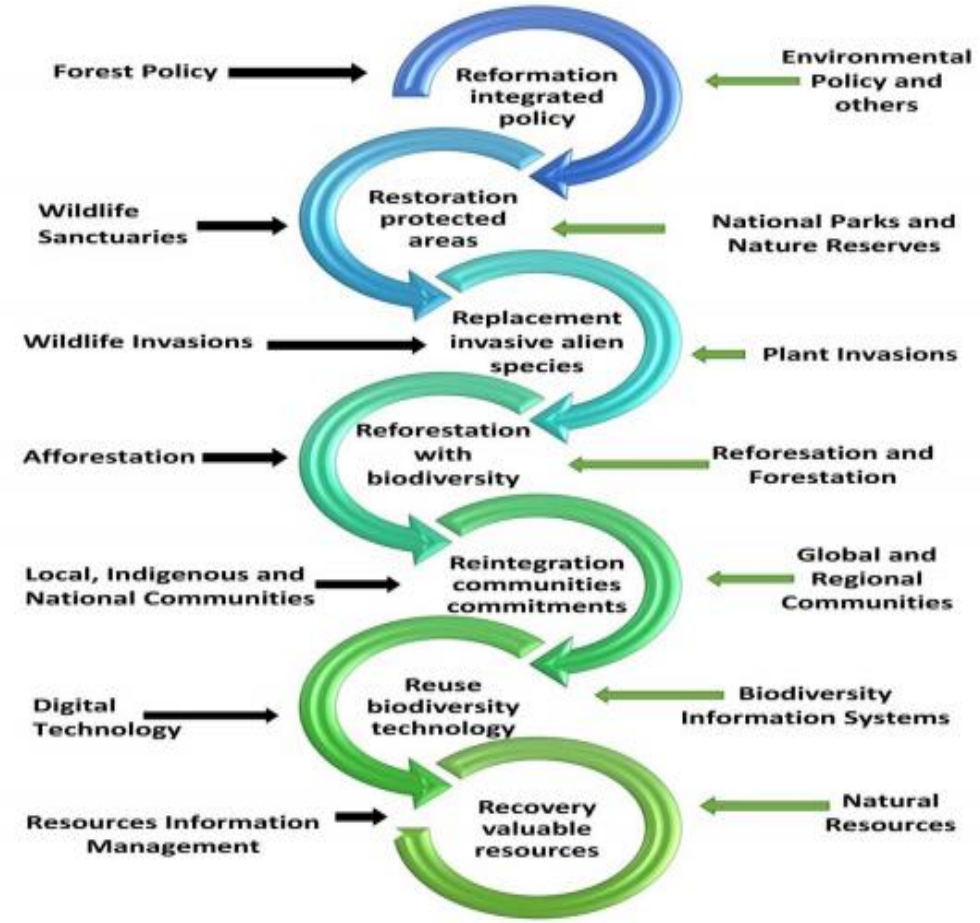

Figure 12. 7R's Policy Theme for Conserving of National Park Biodiversity

Table 8. Different Departmental Policies Integration

Sectors	Important Roles
Agriculture	Agriculture and land management perform a significant role in preserving and cultivating the environmental condition of the cultivated landscape biodiversity, site index, water quality and capacity for carbon storage. The combined agricultural policy shows a role in stimulating both basic and more improved forms of environmental conservation.
Forestry	Integrated policies directly or indirectly influence forests and forestry for example: Forestry Master Plan, National Environmental Management Plan as well as environmental legislation on nature protection, climate change and air quality. The national forest policy enhances the implementation of sustainable forest management and supporting national forest programs.
Environment	Environment remains one of the most important sectors influencing the state of environmental resources. It enhances with the natural resources to ensure a sustainable and responsible management of environmental concerns.
Others	There are several sectors, like Fisheries, Tea, Energy, Maritime Transport Trade, Communication, ICT, and International Affairs and so on. These sectors can cooperate for conservation of biodiversity and relevant programs.

So, the study tried to analyse for integration with ministries of Bangladesh through different policy options analysis, such as: (i) NBSAP and national report from Ministry of Environment and Forests, (ii) Environmental Education from the Ministry of Education, (iii) Green Banking services from the Ministry of Commerce, (iv) National Parks from Forest Department. The study also observed that there are opportunities for multi-sectoral cooperation both on macro, micro and meso levels – while ethical, good practice and assessment frameworks for self–regulation will need to be developed. The study argued that broad interdisciplinary science and academia practice partnership are central integration to a sustainable development of digital conservation (Arts *et al*., 2015) towards National Park Management.

5.3. Challenges for Dynamic Conservation Legal Instruments

The prominence of biodiversity and healthy ecosystems for the country's supportable economic and social development is largely standard, but this awareness is not yet broadly replicated in the planning, formulating and implementation of policy procedures and corporate decisions (GIZ, 2019). Bangladesh faces a number of challenges for empirical dynamic policies. Mainly, it is alarming that

matters such as federal policy can be effectively executed at the State Government and department levels in Bangladesh; it would to need sectorial/departmental policies integration. According to Global Risks Report (2016), Malaysia is more risks country on cyber-attacks, but Bangladesh is more vulnerable on natural catastrophes than that of Malaysia which as shown in Table 9. On the other hand, Malaysia developed online biodiversity clearing house mechanism (BCHM) according to CBD's requirements; till date, the BCHM is in on-going process in Bangladesh.

Table 9. Global Risks Report on Technological arena between Bangladesh and Malaysia

Parameters	Bangladesh		Malaysia	
	Ranking	Scoring	Ranking	Scoring
Cyber attacks	18	7.1	1	38.6
Natural Catastrophes	10	17.9	16	11.9
Data fraud theft	24	3.6	4	21.8
Misuse of technologies	22	5.4	2	28.7
Critical Information Infrastructure breakdown	18	7.1	19	9.9

Additional major challenge between two countries is how to interconnect research findings in an easy to recognize matter to policy-makers and CBD so as to enable them to formulate policies that are favorable to sustainable national parks management for biodiversity conservation. From environmental performance index (EPI) report stated that biodiversity scoring of Malaysia is more (93.37%) than that of Bangladesh (EPI, 2015), which as shown in Table 10.

Table 10. Environmental Performance Index

Bangladesh		**Malaysia**	
Parameters	**Scoring**	**Parameters**	**Scoring**
Ranking 169 (178)	25.6l (100)	Ranking 51 (178)	59.31 (100)
Biodiversity and habitat	39.68%	Biodiversity and habitat	93.37%
Forests	22.83%	Forests	1.68%
Agriculture	92%	Agriculture	57.68%
Water and Sanitation	22.56%	Water and Sanitation	8.64%
Air quality	13.83%	Air quality	90.54%
Health Impacts	54.87%	Health Impacts	95.38%

(Source: EPI, 2015).

However, a policy mix in the context of biodiversity conservation is an integration of policy tools that has advanced to inspiration the magnitude and worth of conservation of national park biodiversity (Ring and Schroter-Schlaack, 2011a) and growth of national parks options in government and non-governmental sectors. Therefore, several causes have been given to justify the cost effectiveness of policy integration for biodiversity conservation. The study compared with World Competitiveness Ranking 2017, which reflects on green economy in connection with sustainable biodiversity conservation towards national parks (Table 11).

Table 11. World Competitiveness Ranking within 1 to 30 countries

Country	Ranking 2017	Scoring 2017	Ranking 2016
Bangladesh	No listed within 1-30 countries		
India	45	69.701	(41)
Malaysia	24	83.53	(19)
Australia	21	85.245	(17)
China	18	87.758	(25)
Singapore	3	99.488	(4)

(Source: WCR, 2017).

5.4. Environmental Policy Instruments towards Sustainability

Environmental development is a pre-condition for green economy, which is a crucial challenge for sustainable biodiversity in Bangladesh (BER, 2016). Because, efforts are on to integrate issues pertaining to environment with mainstream development policies to ensure economic growth and environmental sustainability. Moreover, sustainability depends on 17 goals of Sustainable Development Goals (SDG), such as: poverty, food, health, education, women, water, energy, economy, infrastructure, inequality, climate, consumption, habitation, marine ecosystem, ecosystem, institution and individual's sustainability (UN, 2015; MoEF, 2016). Grant for research activities is largely dependent on donors (for example global-GEF, UNDP, USAID; national- ICT division), although national cash and in-kind contributions are significant. Although a certain level of national subsidy is likely to continue to be made accessible, international financial mechanisms to reimburse for the predetermined use of national park needs to be further settled. Such alternative funding mechanisms are under development by the national or regional research project executing agencies for bioenvironmental conservation towards national parks management. This research provides a good overview on biodiversity conservation system, growth of national parks, comparative analysis on CHM and NBSAP for the present and upcoming generations' sustainability. Payment for ecosystem services (PES) is among the advocated viable options on developing returns from sustainable economic activities, such as national park biodiversity conservation through rainwater harvesting or ecotourism development. Corporate social responsibility funds from private companies (for example- HSBC, Dutch Bangla Bank) are an increasingly important complementary sources of funding of national park biodiversity management activities in Bangladesh, where citizens' contribution in the form of volunteer tree planting are also snowballing. In the way, the research is fully embedded in permanent structure of the target groups through community level to bureaucracy levels, who are involved in planning, decision-making and

implementation of activities operational, technical, institutional and management capacities are being developed at all levels.

As a result, target groups, at all levels show full ownership of research activities including ecological, economic, social and political factors, as shown in Figure 13, indicating today–tomorrow with internal and external services and benefits for potential sustainable biodiversity conservation towards national parks. Regular reporting to CBD, which enhance the high-level profile and supports, facilitates the active engagement of national contact points of Bangladesh and Secretariat of CBD. The high-level meetings / roundtables have also agreed to advance the national park biodiversity conservation systems and to highlight its use at the head-of-state/ government level.

5.5. Improvement to the Wildlife Conservation and Security Act 2012

The Environmental Conservation Policy Instruments have become outdated on the wildlife habitat losses and in many cases, inappropriate (IPAC, 2012) on the priority of political commitment and global agreements. However, the Wildlife Conservation and Security (WCS) Act 2012 is the latest as well as pioneer revision of conservation law in Bangladesh. From the result, it was shown that the law has a comparative advantage against other conservation laws in Bangladesh and South-south-east Asian region. However, several improvements could be included in the WCS to make it effective implemented and enforced. These are mentioned as below:

(a) The WCS Act and Forest Act are the provisions for nature conservation for the present and future citizens in Bangladesh, which allow the local and indigenous communities to freely involvement for the development with specific part of forest areas. It might be better to integrate both protected areas and reserved forests into national park on the priority of Aichi Biodiversity Targets 2020. In addition, the Act should explicitly describe the functions on national park, wildlife sanctuary, botanical garden, eco-park, safari park, special conservation and community areas. This could augment the protection of biodiversity by obligatory the loyalty of forestry organizations to accomplish the national park according to the functions with access benefit sharing provided by this Act.

(b) The WCS Act 2012 has no Section for the protection of undergrowth species, which is a part of biodiversity of national park. These species contribute the enhancement of soil surface and vegetation structure with nutrient recycles. This could enhance the protection of national park biodiversity according to the requirements of Convention on Biological Diversity (CBD).

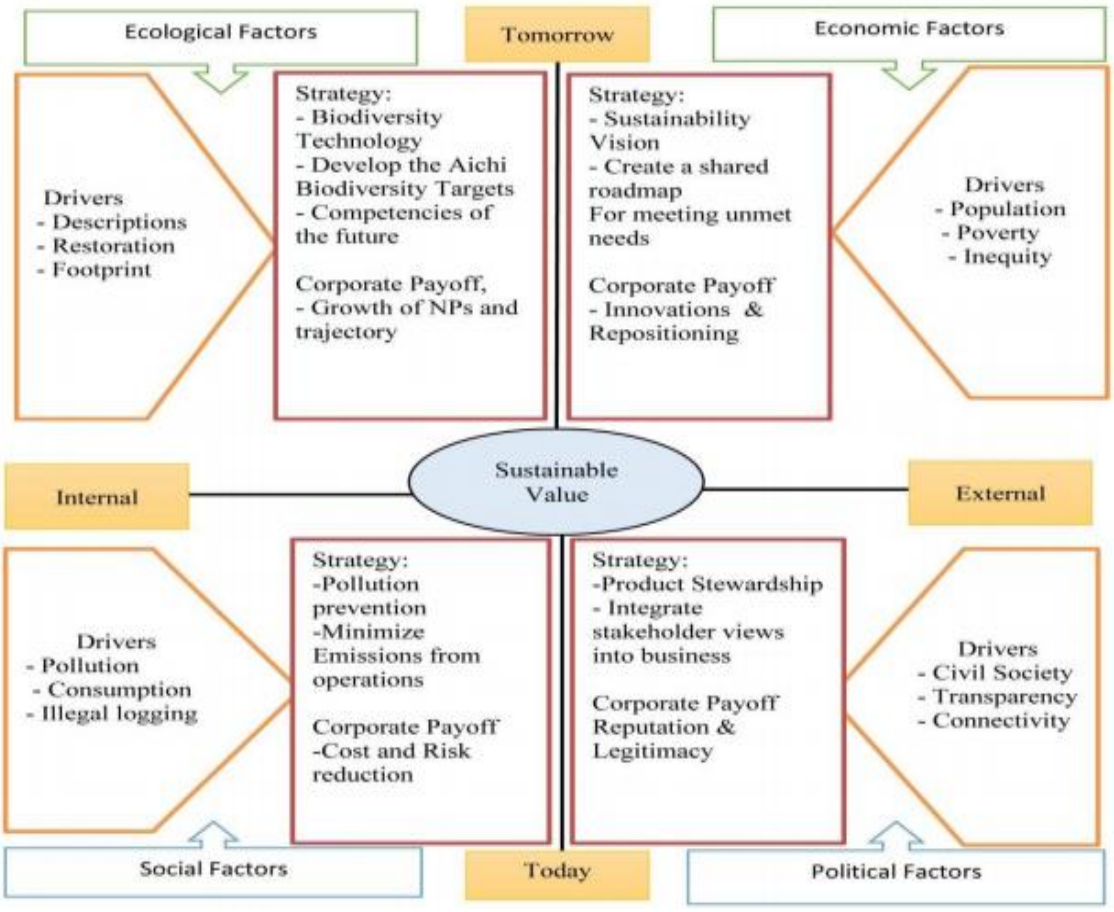

Figure 13. Potential Sustainability for Biodiversity Conservation

Table 12. Criteria and Policy Improvement Gaps

Criteria	Relevant gaps	Remark
Effectiveness	To what degree do the achieved outcomes correspond to the intended goals in connection with NBSAP?	In general
Attractiveness	Does the law attract to the civil society as for political commitment?	Not mention
Efficiency (cost effectiveness)	Does the law justify the Acees Benefit Sharing applied?	Not mention
Update	Does the law formulate recently for national conservation administration?	In general
Dynamic legitimacy	To what degree do individuals and organizations. particularly non-governmental organisations (NGOs), interest organisations and industries accept the law for dynamic conservation activities?	Not mention
Transparency	To what degree are the outputs, outcomes of the conservation policy, and processes used in the implementation observable for donors and outsiders?	Not mention
Equity	How are the outcomes and costs of national park's environmental conservation distributed?	Not mention
Predictability	Does the law make the output rather predicable in practice?	Not mention
Relevance / Separate	Does the law separate for biodiversity conservation?	Not mention
Impactness	Is it possible to identify impactness that is clearly due to the conservation policy and their implementation?	Not mention
Persistence	Are the effects persistent in such a way that the law has a lasting effect on the country of national park environment?	Not mention
Flexibility	Can the law cope with changing national park's condition?	In general
Enforcement	Docs the law enforce misuse positively to the society?	In general
Connectivity	Does the law properly match with regional and global biodiversity connectivity corridor?	In general

(Source: Modified Mickwitz, 2003)

(c) The WCS Act 2012 has no a single section for the development of national park biodiversity database on the priority of biodiversity clearing house mechanism (BCHM) of CBD. The BCHM is the system of exchange information among of all state parties according to the constitutional requirements of CBD. Till to date, Bangladesh has not effective national park biodiversity database in connection with CBD. But the Government of Bangladesh has taken initiatives for it, meanwhile she declared as "digital Bangladesh" with its vision 2020. The BCHM could enhance the biodiversity informatics of national park resources to share information of each state party as well as sending nation biodiversity reports to CBD.

(d) The WCS Act 2012 included the collaborative management system for protection of national park resources. It is good Section to involve the various stakeholders. But the Section could not mention specifically some stakeholders, such as: indigenous community leader, sawmill licensee, brick manufacturer, tea estate manager, and academic researcher, manager of green banking performed activities, rain water harvester, forest nursery manager, betel-leaf cultivator, home gardener, social forester, pesticide entrepreneur and environmental educationists. It might be better including them that could be enhancing the protection of national park biodiversity. For example, the Iban have been settled in and around the Batang Ai National Park at Sarawak in Malaysia. They have historically played a major role in orang utan conservation as they have a strict taboo against harming these animals; some group believe these animals are inhabited by the soul of departed ancestors (SF, 2016).

(e) The advancement towards national park biodiversity management and multiple use of park resources shall take leading indication. However, these phenomena are augmenting attentiveness and prerequisite for the national park to be achieved sustainably, as it is dynamic means of natural resources in preventing environmental catastrophe and climate change. Amid this, it is surprising that the WCS 2012 has not include a single Section or Article on these issues, excluding a nebulous provision for formation of rules on the obligation for national park management and restoration of NBSAP as well as means to take advantage of ecosystem services. Hence, it is imperative for the provision on sustainable management, multiple uses of parks to be incorporated in this WCS Act. At the same time, the proposed improvement Act should recognize the importance of public participation and education in order to increase the effective enforcement of this Act, and inculcate the responsibilities in protection of national park resources in the country. In addition, the improving legislation intends to harmonise national park biodiversity conservation laws and policies. The objectives of improving WCS Act 2012 are prioritised six main aspects, such as:

(i) Conserving biodiversity – Constitutional Rights (Article 18A). (ii) Enhancing productivity and functionality of the National Park Ecosystem (iii) Safeguarding variety, i.e. beauty and recreational value of National Park. (iv) Access Benefit and Sharing (ABS) in connection with CBD's objectives. (v) Application of digital conservation technology on the priority of BCHM, e.g. National Park database, Monitoring database, Tourist database. (vi) Scientific Policy for Removal of Invasive Alien Species in

connection with ABT. From Table 12, the study observed that only 36% 'In general' and 64% 'Not mention'. Therefore, the existing law needs to improve. Moreover, from the desktop observation, the existing conservation related laws and policies contain some evaluation gaps (Mickwitz, 2003) for sustainable biodiversity conservation in connection with Sustainable Development Goals 2030. In addition, Bangladesh requires a comprehensive biodiversity law in response to the UN Convention on Biological Diversity (CBD), which embraces the three objectives of the CBD, (a) conservation of biodiversity, (b) sustainable use of resources, and the fair and equitable sharing of the benefits from the utilization of genetic resources to satisfy the needs of present and upcoming generations on the priority of intra-inter-generational equity.

As a ratified country of CBD, Bangladesh Biodiversity law connects with national, regional and global laws interlinks with CBD, RAMSAR, CITES, IUCN, APAP, Green List, IPR and pertinent organizations. From the field survey, the 56% of the respondents opined their opinions as 'inadequate'. Besides, according to Section 14 (f) of the WCS Act 2012 stated that 'no person shall disturb or threat any wildlife, which may destroy its habitat. From the field observations, opinions of Focus Group Discussion and Key Informant Interviews, the existing running railway is hampered to the growth and development of Lawachara National Park's wildlife. The whistle of Train could be disturbed on genetic biodiversity, particularly leaf flashing, germinating, flowering, fruiting and breeding period. Section 21 of the WCS Act 2012 stated that the introduction of co-management system for proper utilization, conservation and management of natural resources of the national park involving forest department, minor ethnic community, local community on participatory basis to ensure active participation of the parties therein. Nevertheless, the Section 21 did not mention on the connection of Co-management Committee between Village Conservation Forum, Community Partol Group and People's Forum—that stated in the Protected Areas Management Rules 2017. Overall, the existing law needs to improve according to the Aichi Biodiversity Targets 2020 roadmap of conservation policy instruments.

6. Conclusions

The study had assessed two instruments of four types of conservational instruments of Convention on Biological Diversity. These are legal and *in-situ* instruments for Bangladesh with Lawachara National Park (LNP) – as a study site. Based on these instruments, LNP is not well managed on the priority of national park management effectiveness and political commitment for biodiversity conservation. However, this study has attempted to develop a complete scenario of the causes of less management on LNP Biodiversity Conservation in Bangladesh. The findings of this study clearly indicate that traditional forest policy, illegal logging, wildlife poaching, NTFPs collection, parkland encroachment, excessive invasive alien species and no national park database in connection with biodiversity clearing house mechanisms are important sources for loss of biodiversity at LNP. However, the predisposing conditions of this LNP also have the influential effects on local corruption and politics along with weak government policies, institutional weakening to the losses of biodiversity and this would be implemented by sustainable alternative policy approaches, which provide immediate to poor households. At the same time, National Park Biodiversity Management will need to be modernized through a long term effective national biodiversity strategy and action plan including all dynamic administration, pertinent stakeholders and update National Park Database for biodiversity clearing house mechanism in this process. The results of this study support the adoption of environmental policy instruments that create National Park Biodiversity Protection in Bangladesh. The analysis observes the Aichi Biodiversity Targets 2020 based on National Biodiversity Strategy and Action Plan. The analysis also supports using compositional targets based on natural disturbance and settlement simulations at the community level with the involvement of various stakeholders. Spatially explicit, quantitative National Park biodiversity conservation model developed for a focal set of plant and animal species describe the target levels and range of variability in national park conditions required, as a minimum to support the occupied supplement of Lawachara National Park Biodiversity. The simulated range of *in-situ* instruments helps define the legal and informational instruments that should be expected for both environmental conservation instruments and associated alternative policy options. The approach is of strategically modelling long-term patterns, but using realistic operational constraints, adds both validity and complexity to model interpretation. Overall, Appropriate policy integration and effective management are absent till date for enhancing biodiversity conservation at Lawachara National Park. Rainwater harvesting reduces water scarcity and removal illegal hunting during wildlife migrates outside at dry and winter seasons. Overall, the research stated the dynamic legal instruments at national parks with requirements policy improvement for sustainable nature conservation to the effective policy makers and relevant bodies with interconnected training and socio-technical arena, which contributes to park management at national and global perspectives.

7. Conflicts of Interests

The authors declare no potential conflict of interest in this research. The funders had no role in the design of the research, in data collection, analyses or final interpretation of data, in the writings of the manuscript, or in the decision to publish the findings.

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