

Scientific Environmental Governance to Accelerate Sustainable Biodiversity Management

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Abstract Governance is an essential tool for environmental management. Biodiversity is a crucial area of environmental governance. Yet environmental authorities are continuously challenged with biodiversity loss as a very important global problem for several years due to the misuse of advanced wireless sensor technology. The study seeks to rethink the vital governance tools that underpin biodiversity management policies within and around the National Park Survey of Moulvibazar District. The study found that amendments to biodiversity-related laws in Bangladesh were highest from 2010 to 2020. Growth in policy instruments has been highest but, at the same time, less in environmental governance services. The study found that existing environmental policy instruments are insufficient and slow for effective conservation, compared to other governance tools, and that various performance is still below par. Governance knowledge is crucial for biodiversity management, but such knowledge is less recognized. These findings reflect the importance of effective governance for transparency that the state provides. Thus, a dynamic and adaptive framework can be applied to collective governance relevant to policy integration, participation, and enforcement to enhance the sustainability of environmental conservation.

Keywords Governance, Environmental Management, Biodiversity, Advanced Technology

1. Introduction

Failure to govern biodiversity conservation and prevent loss of biodiversity can have profound negative effects on long-term sustainable development and human rights, including the right to access to information, access to review, accountability, and participation [1]. It can also lead to the denial of social, legal, economic, and technological protection for vulnerable groups and local indigenous communities living in poverty surrounding the natural resource area. Environmental governance is the means in society to regulate the priority basis acts and goals for the management of natural resources, which govern human behavior through decision-making processes [2]. Further dynamic governance and public policy reforms are consequently desired to ensure that the management of

national park biodiversity conservation provides poverty reduction and equitable sustainable development [3]. Exclusive of collaborative peace, stability, human rights, and dynamic governance based on the rule of law, it cannot hope for sustainable biodiversity development [4]. Collaborative approaches to governance are being applied to address some of the most complicated environmental conservation issues across the world, but there is inadequate focus on the challenges of national park biodiversity management [5]. The challenges of collaboration in environmental governance bring together leading scientists, researchers, and biodiversity specialists from the northeastern part of Bangladesh and neighboring countries with an extensive array of disciplinary surroundings. These are included planning, designing, public policy, public administration, protected area management, political sciences, biodiversity management, legal status, conflict resolution, and related arena – to directly deal with the challenge and restrictions of co-governance in practices [6]. With national park environmental issues having political, managerial, behavioral, and technological dimensions, environmental

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governance is receiving increasing attention as an overarching means to deal with various environmental difficulties [7].

The study aims to explore the vital governance tools that strengthen policies toward conserving biodiversity within and around the Lawachara National Park (LNP) at Kamalganj in the Moulvibazar district of Bangladesh. Yet, the study argues that there is still a relative paucity of comprehensive and pragmatic guidance that can be used to outline the assessment, plan, and inquiry of conservation systems for environmental governance at LNP.

2. General Context of Environmental Conservation Governance

Governance implies the actions of social, political, and governmental mechanisms that can be appreciated as decisive determinations to guide, steer, control, cooperate, participate, and manage societies [8]. It provides a means of governing the dynamics of society, and the perception has mostly suitably to conserve biodiversity for its concern with societal, cost-effective, cultural, and environmental magnitudes [9]. Governance is a network [10], which as a choice, is a determined and structured set of non-profitable firms involved in generating services grounded on implicit and organized contracts to acclimatize to environmental conservation possibilities to harmonize and protection exchanges [11].

According to the World Bank Report [12], the term Governance is defined as: “the manner in which the power is exercised in the management of a country’s economic and social resources for development”. Here, no doubt that Lawachara National Park is a public economic resource. So, good governance is a vital parameter for biodiversity protection. There are some parameters, such as Attitude, Participation, Transparency, Accountability, Access to Information, Flexibility, Responsibility, and Dynamism. On the other hand, environmental governance is the ability of a state to govern its resources as prescribed in forms of legal instruments and enhanced by policy, project, program, and institutional interventions on the priority of environmental conservation. This conservation governance is to assess how various approaches have attempted to address some of the most pressing environmental challenges to our period, which are the loss of national parks’ biodiversity, ecosystem services degradation, environmental issues, global climate change, and relevant perspectives [13]. The environmental conservation researchers find that a major part of this study has inclined to accentuate a particular agent of environmental governance as being the most dynamic, particularly policymakers, market actors, state actors, and civil society-based actors such as collaborative management committees, non-governmental organizations, and local communities.

A mixture of environmental conservation governance strategies is being practiced for national parks’ biodiversity

conservation in connection with the national biodiversity strategic action plan (NBSAP), state and civil society-based governance strategies depend on their support for the fulfillment of social domains and interactions [14]. The study also observes the significance of spatial and organizational parameters to environmental conservation governance, focusing on collaborative management [15] as well as co-governance, which is grounded on the partnership, participation, and notions of individual attitudes and relevant parameters [16,17]. These parameters in environmental conservation governance can be prolonged to involve various types of environmental issues and challenges. The assessment highlights emerging integration manners of related governance that the state provides including co-management, public-private-partnerships, and social-private-partnerships [18]. This includes the rules, both formal and informal that govern human behavior, attitude, opinion, and application of robust policy and modern technology for the decision-making process under an appropriate legal framework. The review implies the rule of law and protection of national parks biodiversity at Lawachara National Park, Moulvibazar in Bangladesh. These fields include in Table 1:

Table 1. Different governance parameters for protection of biodiversity

No.	Governance Parameters	Perspectives
i.	No one above the law	All community members respect the law
ii.	Law must be clear	All people concern the effective law
iii.	Procedural fairness	Develop the law to accept all
iv.	Accessibility of law	People aware the law
v.	Law must be adequate protection of human rights	Ensure at least fundamental rights
vi.	The state must comply with its obligations of international law	Legislative rapport building for governance

However, these elements enhanced the legal instrument, which is the major component in Bangladesh’s environmental conservation governance in the terrestrial, swamp, and marine environment. Besides, there are some agreements signed for national, regional, and global rapport building including Multilateral Environmental Agreements, Political agreements, non-binding agreements, programs, projects, and national laws, which exist at various levels in Bangladesh for declaration of new national parks and access to information through digital conservation on the update priority of international bindings.

Conservation governance lies within a legal core in which the essential source of environmental governance is to be given the right to govern natural resources. For this reason, sustainable environmental governance is essential due (a) to reduce the loss of biodiversity, (b) to enact and update national policy on biodiversity, (c) to strengthen the dynamic collaborative management between stakeholders and policy maker, (d) to improve departmental policy integration, (e)

to make some watchdog institutions for conservation of biodiversity, (f) to ensure a transparent economic mechanism.

Access to information be used for national park biodiversity conservation and relevant tasks [19] including (i) Digital conservation, (ii) Environmental Court Information, (iii) Environmental Informatics, (iv) Environmental legal research and Case law reports, (v) Legal database, (vi) Legal online dictionaries, (vii) Legal online library information, (viii) Legal citation, (ix) Legal treaties, convention and agreements, (x) Global legal information network, (xi) Online Legal periodicals, (xii) Information of BAR Association, (xiii) JurisPedia, (xiv) Institute of Advanced Legal Studies, (xv) International Law Associations, (xvi) Legal Online Conference, (xvii) Legal Information Retrieval, (xviii) Legal tools and media toolkits, (xix) Legal informatics, (xx) Legal Environmental Informatics, (xxi) Online Mock Trial Video Conferencing, (xxii) Online Court Session and Declaration, (xxiii) Legal System connection with Global Navigation Satellite System, (xxiv) National Court Interlinked with Space Research Remote Sensing Organization (SPARRSO), and (xxv) Environmental Court

sharing with Supreme Court and District Branch Court for biodiversity governance.

3. Materials and Methods

3.1. Study Site

Bangladesh is a developing country in the north-eastern part of south-east Asia with augmented biodiversity earlier [20] and lies in the earth's largest deltaic area between the coordinates of 20°34' and 26°38' north latitude; and 88°01' and 92°41' east longitude [21]. It includes 17 National Parks, 21 wildlife sanctuaries and 12 other conservation sites [22]. 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 [23] as the forest conservation case study site (Figure 1). Lawachara National Park is unique in Bangladesh for its scenic beauty and other relevant parameters. The study site was purposefully selected based on a set of conditions like location, suitability, flag species, and stakeholders' attractions to permit the analysis of cases [1].

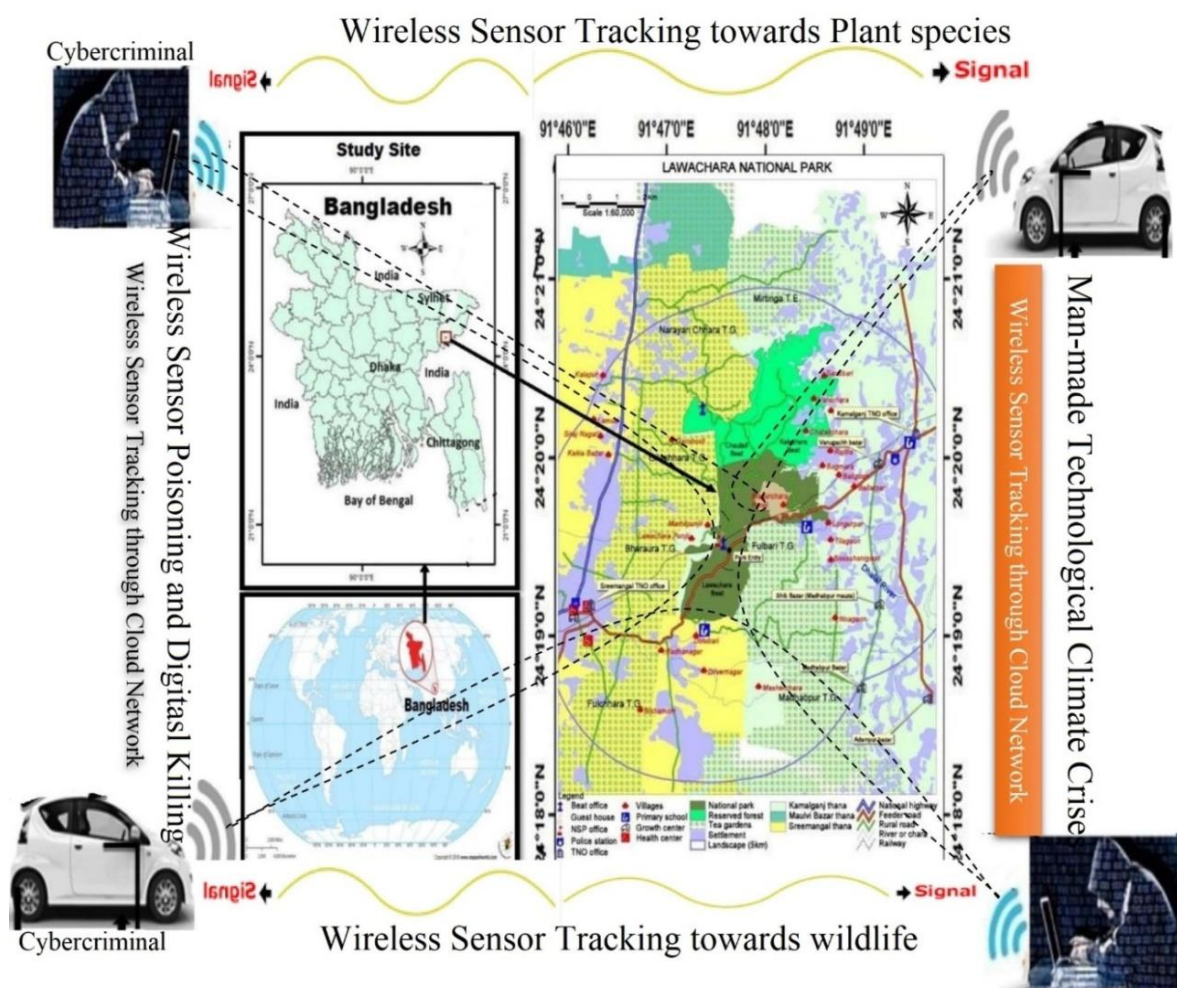


Figure 1. Map of Lawachara National Park in Moulvibazar, Bangladesh [40]

3.2. Legal Status and Biodiversity

Lawachara National Park (LNP) was declared as a National Park in 1996 with 1,250 hectares (Gazette Notification-PBM (S-3)7/96/367 on 07 July 1996) [24] 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 (WCS) Act, 2012 is effective under Article 18A of the National Constitution of Bangladesh. Section 21 of this WCS Act mentions collaborative management for national park biodiversity protection. The LNP is one of three national parks in the Sylhet region in the northeastern part of Bangladesh [25]. It is a semi-evergreen and mixed deciduous forest. Total of 460 species consist of floral 167 and 293 faunal species including amphibians 4, reptiles 6, birds 246, mammals 20, and insects 17 [26,27]. The current Wildlife Conservation and Security Act, 2012 is effective under Article 18A of the National Constitution of Bangladesh.

3.3. Data Collection and Procedure

Information on environmental governance was collected from field observations and survey questionnaires and secondary information was obtained from various sources. The eight-governance data collected were processed according to global standards for biodiversity management for analysis, namely: (i) attitudes, (ii) participation, (iii) responsibility, (iv) accountability, (v) collaboration, (vi) access information, (vii) transparency and (viii) partnership.

Individual species are collected to stay at a specific GPS location to be tracked using wireless sensor devices to know the health status of individuals at longitude, latitude and altitude location.

3.4. Data Analysis and Interpretation

The research method related to different parameters to enhance data collection, compilation, and interpretation. Quantitative and qualitative related environmental governance data were obtained through field observation, interviews, field surveys, focus group discussions, and informal discussion while secondary data were obtained from diverse sources with the environmental governance assessment method. The data were compiled and analyzed for presentation and interpretation using standard data analysis software like MS Office Suite 2021 and SPSS ver.27.

4. Result and Discussion

The result and discussion included with different parameters of environmental governance, which are listed as following.

4.1. Positive Attitude

The main findings from field descriptions showed that inhabitants of four villages, such as (i) Lawachera punji,

(ii) Magurchera punji, (iii) Dolubari, and (iv) Langurpur. They were highly dependent on the natural resources of Lawachara National Park (LNP). An average of 63% of respondents opined their positive attitude toward environmental conservation governance, which is shown in Figure 2. The trend line equation stated that the value of R^2 is below 0.5, which indicates extra effort from inhabitants of four villages in connection with environmental governance for biodiversity management towards Lawachara National Park.

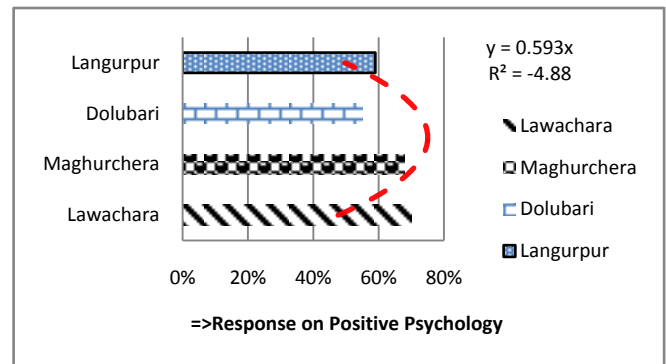


Figure 2. Positive Attitude towards biodiversity conservation

4.2. Participation and Awareness

These stakeholders are aware of biodiversity conservation at Lawachara National Park through participation, 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, and local indigenous community leaders.

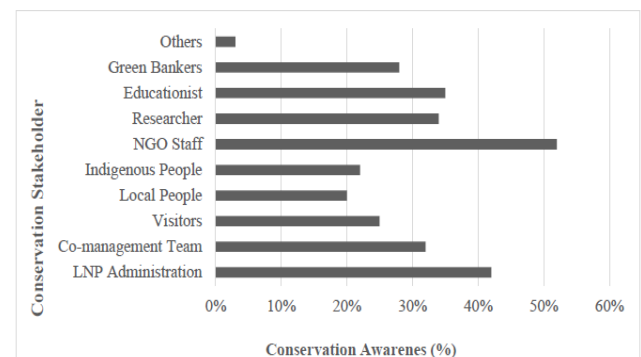


Figure 3. Stakeholders participation for conservation awareness [40]

The stakeholders' average opinion on habitat fragmentation and loss of biodiversity is 90%, with where maximum between villagers (94%) and minimum of visitors (85%), as shown in Table 2. The study suggested for afforestation /reafforestation program with the engagement of stakeholders.

New legislation's relevance to biodiversity conservation initiatives requires 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 3).

From Table 3, the study identified 8 environmental governance tools for biodiversity conservation in national

parks. These are (i) Attitude, (ii) Participation, (iii) Transparency, (iv) Accountability, (v) Access to Information, (vi) Flexibility, (vii) Responsibility, and (viii) Dynamism.

Table 2. Stakeholders involvement regarding opinion on loss of 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, 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%

Table 3. Laws and policies to protect biodiversity towards National Park areas in Bangladesh

Enacted Law	Section/Article	Remarks
The Constitution of the People's Republic of Bangladesh	18A, 102, 152	Conserving national biodiversity and environmental governance
The Bangladesh Biodiversity Act, 2017	3,4,6,8 and 9	National biodiversity conservation and resource dynamism
The Wildlife (Conservation and Security) Act, 2012	2, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, 27, 28, 29, 30, 34, and 42	Biodiversity conservation and collaborative governance
Bangladesh Environmental Conservation (Amendment) Act 2010.	5, 6, 7, 12, and 15	Environmental conservation and transparency
Bangladesh Forest (Amendment) Act 2000	28, 29, 30, 32, 33, 41, 42, 43, 52, 53, 54, 55, 56, 63, 64, 65, 66, 67, 68	Forest biodiversity protection and accountability
Environmental Court Act 2010	4, 9, 11, 14, 15, 18, 19, 20, 21, and 22	Environmental rights, rule of law and responsibility
National Biodiversity Strategic Action Plan 2016	1, 2, 3, 4, 5, 6, 7, 8	Long term planning and community participation for national biodiversity conservation
Brick Prepared and Kiln Establishment (Control) Act 2013	5, 6, and 8	National biodiversity protection and public attitude and flexibility
ICT Act 2013	54, 55, 56, 57	Biodiversity conservation through access to information
Protected Area Management Rules 2017	2, 4, 15, 18, 19, 20, 21, 24, 29	National Park management with involvement of community.
The Bangladesh Public Private Partnership Act 2015	2, 4, 5, 6	Biodiversity conservation through partnership.

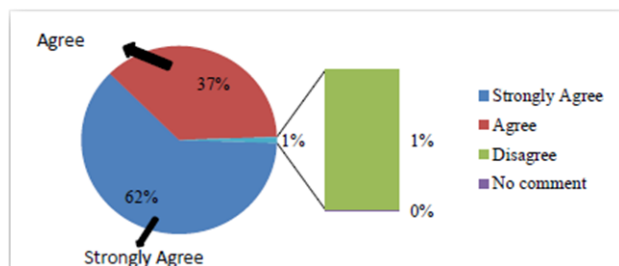


Figure 4. Stakeholders' opinion on Policy Adoption for Biodiversity [59]

About 62% of Stakeholders opined the opinion for policy adoption on national park biodiversity conservation in Bangladesh as shown in Figure 4. Legislation has been enacted to promote the biodiversity of national parks.

Biodiversity-related national legislation produced maximum within the period of 2010-2018, as shown in Figure 5. The study found that most of the legislation related to biodiversity conservation formed after COP-10, in this period, CBD provided circulations to the state parties to update the national legislation for conserving biological diversity. The Government of Bangladesh produced the Biodiversity Conservation and Security Act 2012 within this

period. The trend line equation stated that the value of R^2 is above 0.5, which indicates the growth of legislation development is indeed a good sign in connection with environmental governance for biodiversity management towards Lawachara National Park. The study suggested that the government takes initiatives for separate laws and policies for national biodiversity conservation towards national parks in Bangladesh.

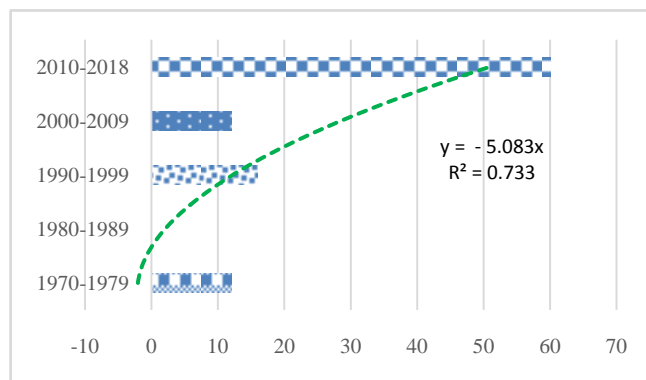


Figure 5. Produced number of biodiversity related legislation in Bangladesh

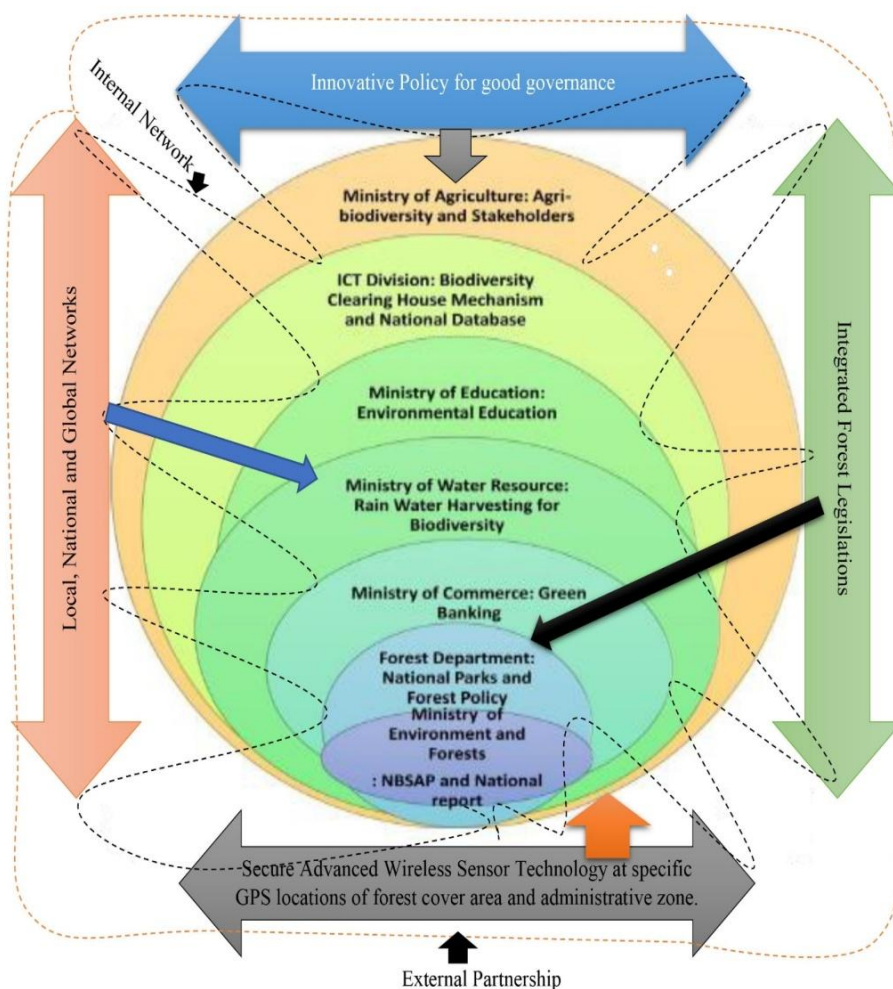


Figure 6. Innovative Policy Integration for Environmental Governance [1]

Bangladesh is a developing country with different sectors and departments, like Bangladesh Forest Department, Department of Environment, Department of Agriculture, and so on. Each sector has an individual policy, viz. forest policy, agriculture policy, environmental policy, and land policy, etc. as shown in Figure 6.

The study observed that only 36% ‘In general’ and 64% ‘Not mention’. Therefore, the existing law needs to improve. 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. From the field survey, 56% of the respondents opined their opinions as ‘inadequate’. Besides, Section 14 (f) of the WCS Act 2012 stated that ‘no person shall disturb or threaten any wildlife, which may destroy its habitat. Section 21 of the WCS Act 2012 stated the introduction of a co-management

system for proper utilization, conservation, and management of natural resources of the national park involving the forest department, minor ethnic community, and local community on a participatory basis to ensure active participation of the parties therein. Nevertheless, Section 21 did not mention the connection of the co-management Committee between the Village Conservation Forum, Community Patrol Group, and People’s Forum—that is stated in the Protected Areas Management Rules 2017. Overall, the existing law needs to improve on the priority of Aichi Biodiversity Targets 2020. Bangladesh Islamic Foundation under the Ministry of Religion can develop policy instruments on bio-religious conservation integrity for all National Parks of Bangladesh. Moreover, the involvement of religious people can be performed for biodiversity conservation in different ways including involvement, recruitment, inclusion, legislation, multiplication, incorporation, and conservation consciousness of cultural exchange for biodiversity protection with Lawachara National Park vegetational conditions.

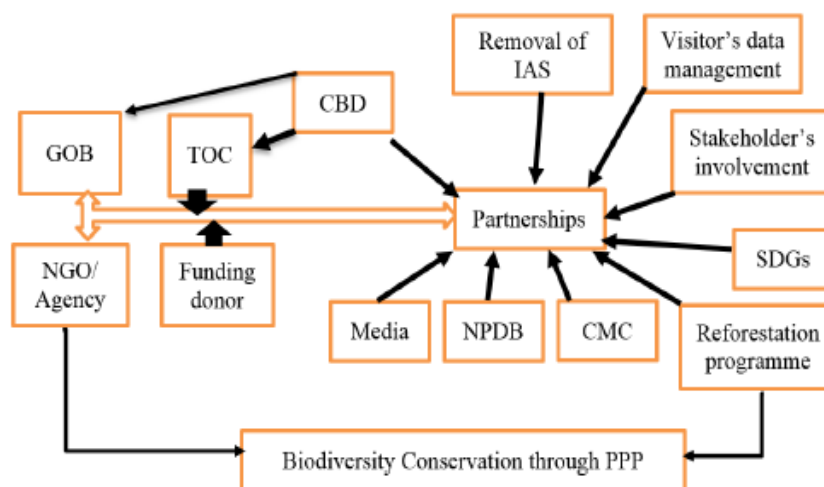


Figure 7. Partnership for biodiversity governance [1]

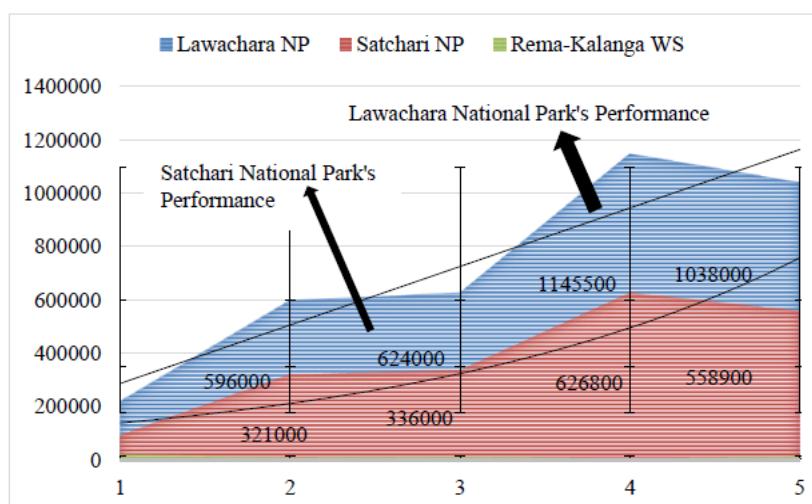


Figure 8. Financial Transparency at Lawachara National Park [1]

4.3. Role of Public-Private Partnership to Protect Biodiversity

Public and Private Partnerships (PPP) are the new collaboration for the sustainable management of National Park areas. If the Government cannot alone meet the huge investment needs to protect, conserve, manage and restore the National Parks' Biodiversity, the Government of Bangladesh can build a partnership with private agencies [28]. Public Private Partnership Central Unit collaborated to develop a PPP model focused on the management, conservation, and operation of National Park areas, located national park in Bangladesh (Figure 7).

4.4. Transparency as a Catalyst of Good Governance

Lawachara National Park has the maximum grant financing system, the amount of BDT 3620500 (1 US\$ equals BDT80) than that of the other National Parks namely Satchari National Park and Rema-Kalanga Wildlife Sanctuary from 2009 to 2014 [29], relates to transparency of environmental governance (Figure 8).

4.5. Environmental Governance Knowledge

The study revealed that about 43% of stakeholders answered positively 'yes' regarding environmental governance knowledge for access to information for biodiversity conservation, but 57% of respondents responded 'no' as shown in Figure 9. Research has revealed that

governance is crucial for environmental biodiversity management, but such knowledge is less recognized among stakeholders. The study also showed that stakeholders view secure wireless sensor technology access to information as user friendly. Studies have shown that biodiversity loss is further exacerbated by misuse of advanced wireless sensor technology towards forest cover and management at specific GPS locations. Because of the person's tracking to the amygdala, administrators and wildlife are censored, blocked, poisoned, and subjected to digital murder in CASSID (Common Acute Sensor Sudden Infection and Disorder) [41,42,43,44,45,46,49,52,53&54].

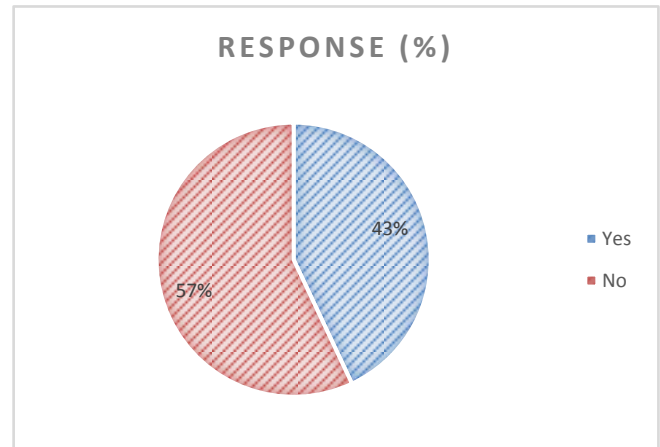


Figure 9. Respondents' Environmental Governance Knowledge

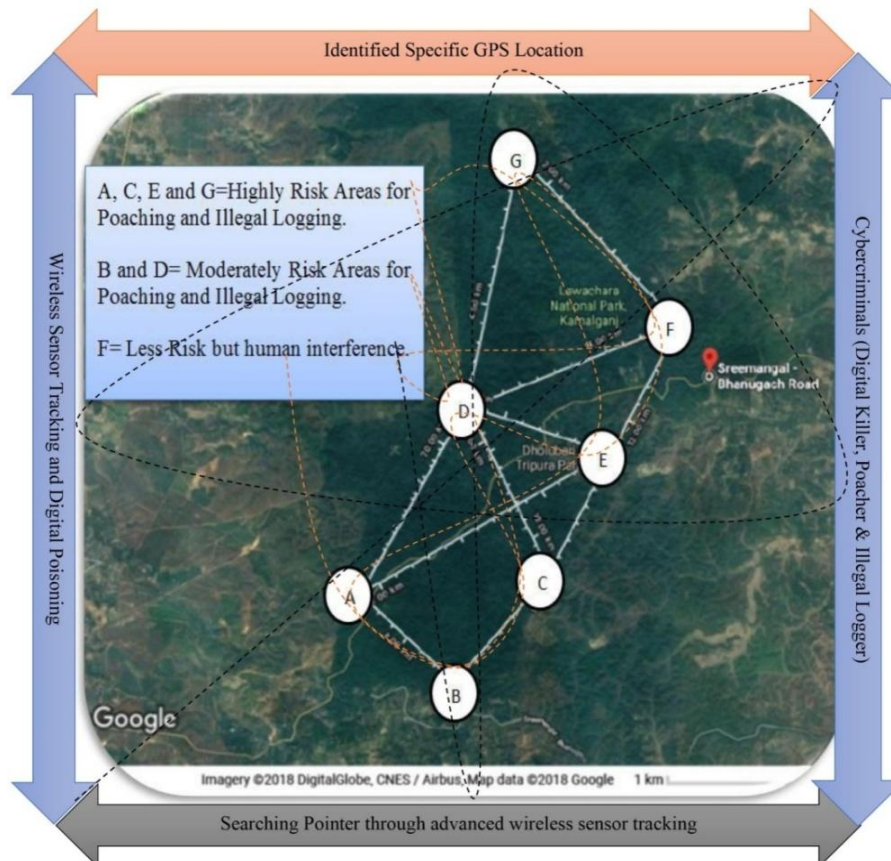


Figure 10. Risk areas in Lawachara National Park for poaching and illegal logging [40]

4.6. Access to Information and Environmental Justice

The Wildlife Conservation and Security Act 2012 has no single section for the development of a national park biodiversity database on the priority of biodiversity clearing house mechanism (BCHM) of the Convention on Biological Diversity. But access to information is essential for sustainable management of national park biodiversity concerned with information on risk, high risk [30], poaching, illicit-felling, and encroaching perspectives for setting environmental justice, which is shown in Figure 10.

From this accessibility of national park information, the study is to ease the formulation of biodiversity data

regarding global, national, regional, and local perspectives; meanwhile, it is easy to access the network governance for biodiversity management.

4.7. Responsibility to Stakeholders

Due to this high dependency on the national park resources, most of the respondents in four villages admitted undertaking illegal as well as unwanted activities inside the park (Figure 11). For example, illegal logging, poaching, hunting, illicit-felling, and encroaching. So, there is a lack of environmental governance, like effective accountability and collaborative management.

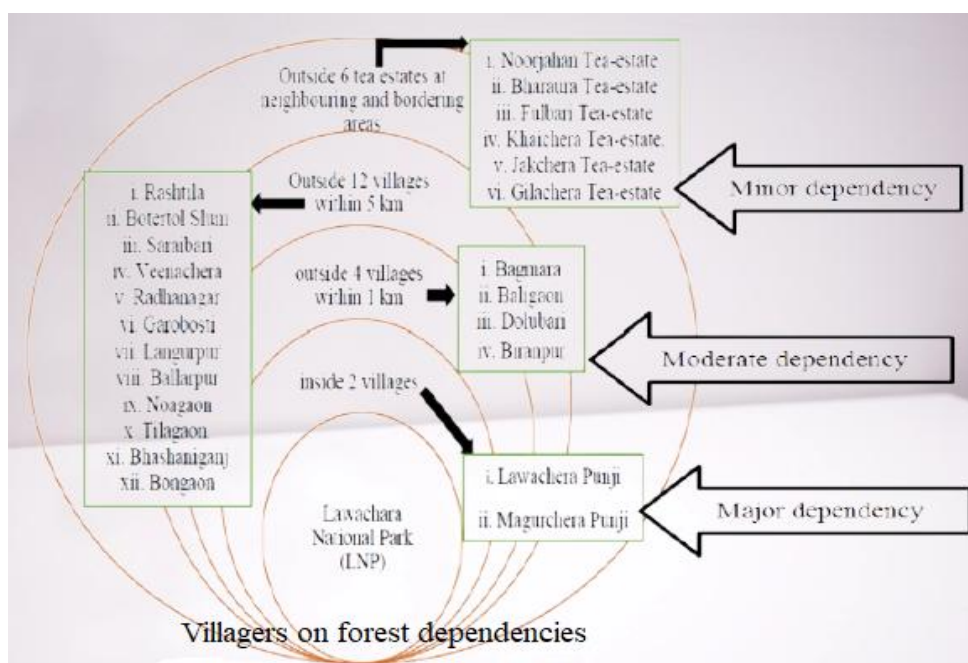


Figure 11. Responsibility of different villagers of surrounded Lawachara National Park [40,59]

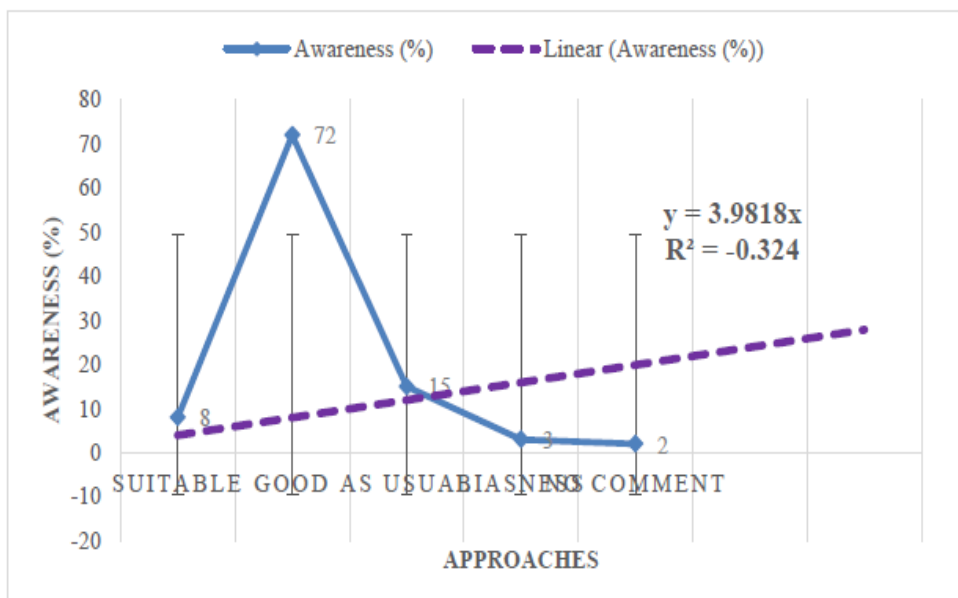


Figure 12. Collaborative approach at Lawachara National Park [59]

4.8. Collaborative Responses

The collaborative tool is related to the co-management approach to environmental governance. The value of R^2 is below 0.5, which indicated a downward portion and neglected (Figure 12).

So, the stated equation is rejected. The developed equation was then employed to simulate human consciousness changes in the LNP area for a co-management system if the R^2 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 needs an update.

4.9. Biodiversity Governance in Lawachara National Park

Top ten-biodiversity governance thinking is the new ideas of developing world for biodiversity conservation applying towards Lawachara National Park. These ideas connect each other reciprocally with the governance perspective, which is shown in Figure 13. The top ten-biodiversity governance thinking is enabled to enhance biodiversity management. These are (i) collaborative management and cooperation, (ii) Access to benefits with policy science and technology, (iii) national park stewardship, (iv) accountability on biodiversity policy precautionary principles, (v) adaptive governance on ecosystem-based biodiversity management, (vi) institutional linkage through potential sustainability and equity, (vii) good governance for conservation, (viii) transparency through polluters pay, (ix) network governance through respect to national and global laws and (x) integration for

ensuring protection and security of national park biodiversity. This thinking creates network governance for biodiversity management.

4.10. Human-Biodiversity Interactions

Today more than 75% of the terrestrial surface is impacted by humans [31]. Human-biodiversity interactions enhance to counteract possible outcomes [32]. This is the intangible outline of human—biodiversity and national park connections and possible outcomes for strength and safety [33], perception of biodiversity, connection with conservation education, and pro-biodiversity behaviour [34]. From this framework, conserving biodiversity reduced anthropocentric pressure from adjacent areas’ inhabitants, particularly the dependency of human beings on national parks. This is shown in Figure 14 that the question symbols signify less well-understood associations. The spotted lines characterize the response from results back to biodiversity or the specific object. Meanwhile, human-biodiversity reflection connects with local and indigenous people for environmental governance to manage national park biological diversity conservation, especially on health and well-being outcomes including the ratio of total landscape area, national park area, and population density.

The study suggests a conceptual framework established on quantities uncertainty and sensitivity analyses to build cost-effective environmental governance that performs the sustainable conservation of national park biodiversity.

4.11. Conceptual Framework on Environmental Governance

The conceptual framework assesses the application of the principle through four stages, associating what is observed in repetition with what would be anticipated with full executions in Table 4.



Figure 13. Top-Ten Biodiversity Governance Thinking [1]

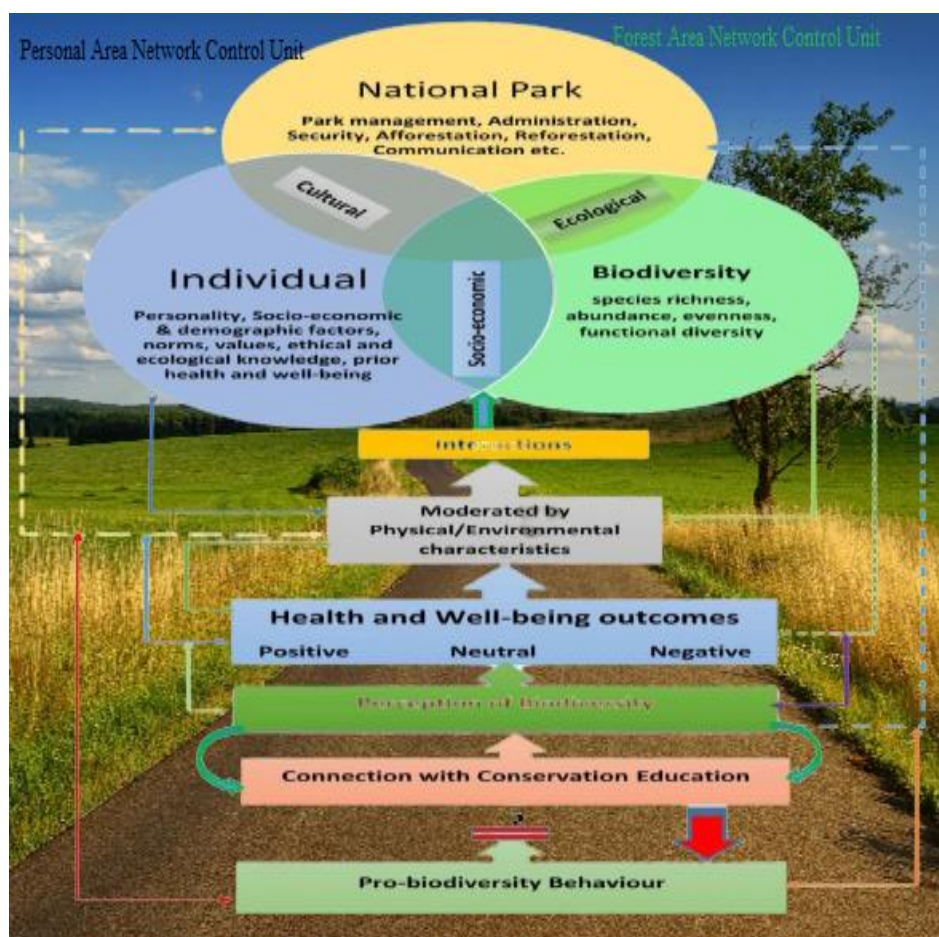


Figure 14. A Conceptual Framework on Human-Biodiversity Governance [1]

Table 4. Application of four principles for environmental governance

No.	Principles	Repetition
i.	Selecting suitable drivers by people and administrations	Collaboration with selective and executive approach
ii.	Taking objective with social and environmental magnitudes.	Social-environmental impact assessment
iii.	Interpretation of the Principle into rules of law of the State	Replication according to rules and regulations.
iv.	The formation of indispensable institutional and structural attributes.	Conception and the necessary effectiveness.
v.	Use of secure advanced wireless sensor technology including Personal Area Network Control Unit (PANCU) and Forest Area Network Control Unit (FANCU).	A safety net against digital poisoning and assassination at a specific GPS location.

The approach can be applied across the whole of Bangladesh, or administrative divisions within the country. This can be utilized to assess rules and regulations in different authorities and to stimulate critical debate about the efficiency and justice of environmental law, biodiversity law, Wildlife Conservation, and Security Act, ICT Act, and relevant rules and regulations. The dynamic significance of assessment is not a particular decision about how effective or not, is a legal procedure. On the priority, better significance

is the effectiveness of objective and attributes evaluation to facilitate positive dialogue about humanizing the outcomes of environmental governance as shown in Figure 15.

Pearranged the complication of governance processes and instruments, there are several potential entry arguments for legal assessment. The conceptual framework is based on the assessment of the effectiveness of authorized principles pertinent to environmental conservation governance. A highlight on principles can support the researcher, scientist, and park manager to elude appropriate deferred in the particulars of specific legal instruments. Legal values can be restricted from global instruments, national legislation, and state judicial decisions and customs.

The framework is occupied with taking together policymakers from different ministries, departments, institutions, and the private sector to familiarize environmental governance principles. The research is stimulating the exchange of ideas among all parties particularized and training employees in the capacity of environmental governance and national parks' biodiversity. It is supportive of people from institutions in the Sylhet region as well as Lawachara National Park in the Moulvibazar district of Bangladesh and its peripheral cities in making administrative procedures advance efficient. The framework developed for Lawachara National Park can then be replicated in other National Parks in Bangladesh.

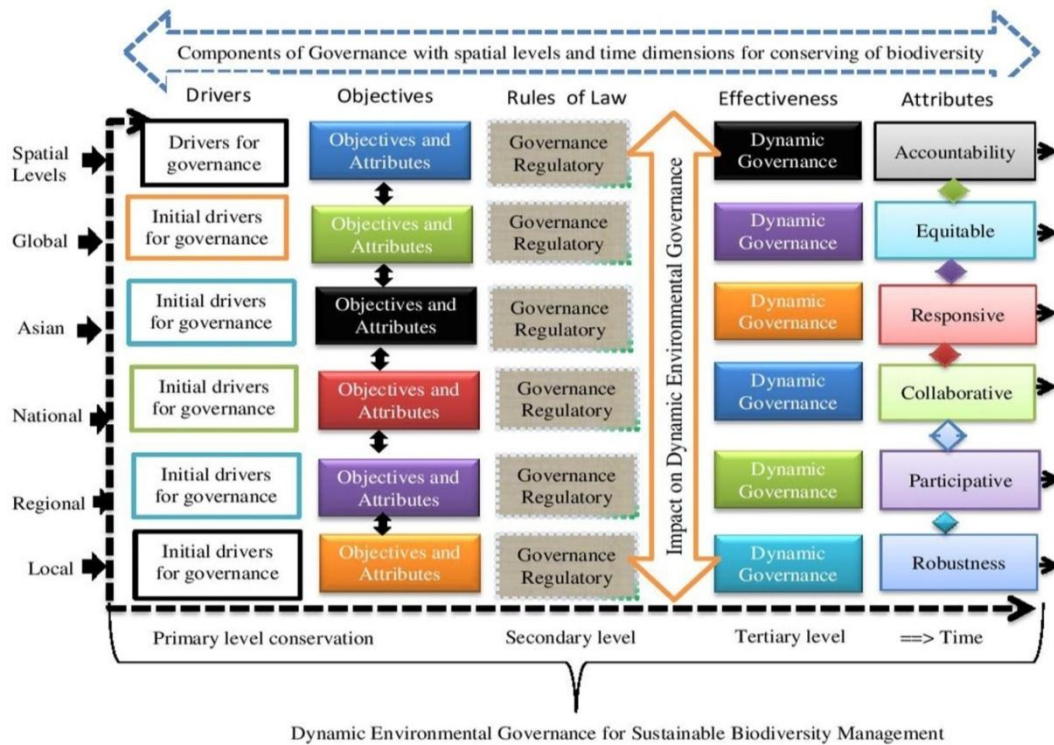


Figure 15. Dynamic and adaptable framework with collective governance for Biodiversity Management

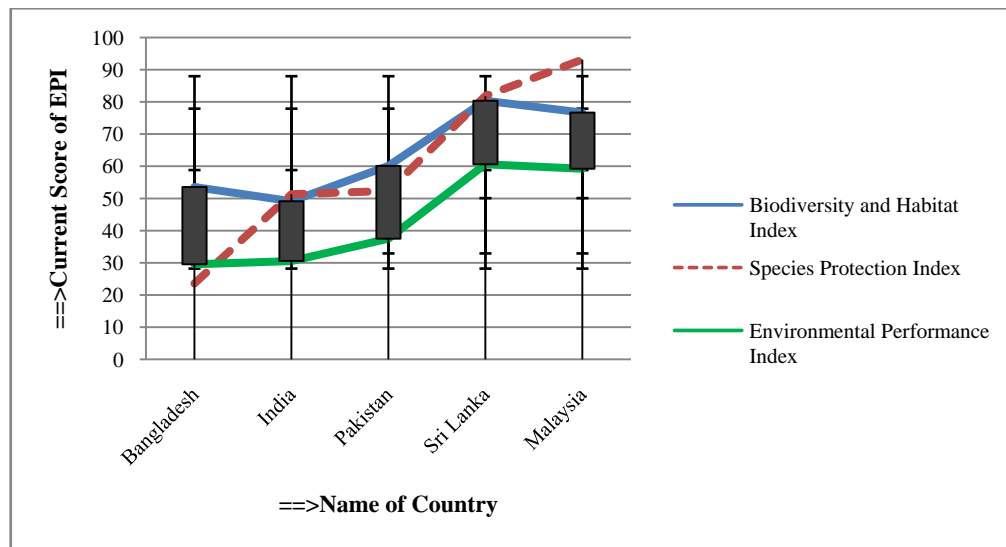


Figure 16. Environmental Performance Index of some countries in Asia

4.12. Challenges for Dynamic Environmental Governance

The era of traditional management is overdue to update Nano-technology [35]. Bangladesh faces of several challenges for empirical dynamic environmental governance. Mainly, it is alarming that matters such as Central government policy can be effectively executed at the divisional and department levels in Bangladesh except for local's opinion; it would need departmental policies integration. Such integration is gradually understood as a governance challenge [36]. Besides, Bangladesh is more

vulnerable to natural catastrophes and unwanted climate change compared to Environmental Performance Index (EPI) among different countries in Asia [37]. The general EPI of the current score is 29.56, which is the lowest in Bangladesh but the highest 60.61 in Sri Lanka among the studied countries in Asia. On the other hand, the current biodiversity score of Bangladesh is 53.58 to be compared with 80.38 in Sri Lanka, as shown in Figure 16.

On the other hand, the study has challenges of nomenclature, obtaining research aims, repeatable findings, opportunity, and the fact that some research costs are on causal assumptions about human sensitivity, which is not

entirely implicit. It is tough for the field to fit into institutional structures linking with environmental governance and conserving of national park biodiversity. These results reflect the dynamic environmental governance to challenge biodiversity management towards national parks in Bangladesh. Major challenges are the risk of wildlife, plant species and forest management against digital killing, and man-made climate crises in forest areas, including unwanted flash floods, technical cyclones, sudden tornadoes, artificial earthquakes, sensor tsunamis, frequent landslides and constant desertification at designated GPS locations [47,48,50,51,52,55,56,57,59&60].

4.13. Implications

The government of Bangladesh is no longer the greatest significant situation of decision-making in the environmental conservation field between collaborative management and park administration [40]. More consciousness of key ideas and perceptions of environmental governance can support park managers and researchers to contribute dynamics in governance processes. However, innovative means of governing in linking to environmental management have imperative implications for the repetition of conserving national park biodiversity. Understanding how the conservation of biodiversity practice is prejudiced by promising hybrid and network governance provisions is mostly essential [38]. Based on the research findings, environmental governance processes are keys in supporting conservation systems of biodiversity [39] towards Lawachara National Park (LNP). The study argued that the current environmental governance at LNP does not fully appreciate the connection between conservation and functions that neglects cross-scale dynamics, and those actors intricate in LNP management require to involve in faster dialogue.

4.14. Future Research Trajectory

The study advocates future research trajectories of a new kind of collaborative alternative approach to drive the methodological agenda and recommendations on how to further incorporate the demanding environmental conservation governance towards national parks' biodiversity management. There are some recommendations included are:

- Should expand support for media programs on well-watched television channels, radio, newspapers, and magazines that highlight positive conservation activities in Bangladesh to build awareness.
- Should establish a Nature Education Centre adjacent to the national park community area to raise awareness of the need to protect our biodiversity.
- Should need ethical and cultural knowledge dissemination through mosques, guereza, pagoda, theatre halls, and other relevant cultural and religious institutes.
- Should improve policy instruments' consistent and transparent decision-making progressions through committed issues.
- Should establish a database management system ensuring accountability and environmental justice by introducing a new section of the Wildlife Conservation and Security Act 2012.
- Should establish dynamic collaboration between the co-management team and the local community with the amendment of Section 21 of the Wildlife Conservation and Security Act 2012.
- Should improve departmental policy integration by reducing corruption.
- Should make some watchdog institutions for the conservation of biodiversity with the help of the local community.
- Should ensure a transparent economic mechanism of grant financing as a tourist zone.

5. Conclusions

The study assessed eight types of governance of the World Bank for environmental conservation. These are attitude, participation, responsibility, accountability, collaboration, access to information, transparency, and partnership for Bangladesh with Lawachara National Park (LNP) – as a study site. Based on these governance tools, LNP is not well managed on the priority of access to information and responsibility for environmental conservation. However, this study has attempted to develop a complete scenario of the causes of less governance on national park biodiversity conservation in Bangladesh. The findings of this study clearly indicate that traditional forest policy, illegal logging, wildlife poaching, parkland encroaches, and no national park database in connection with biodiversity clearing house mechanisms in connection with environmental governance. Moreover, based on our outcomes, the study has worked out theoretical insights for what seems to be suitable social network structures for environmental governance and proposed principles for conservation practices on how to nurture and sustain such structures. The study could also be effectively implemented in other national park case studies in Bangladesh.

6. Declaration

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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