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Bangladesh University of Professionals (BUP)



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## **Chief Patron**

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## **Message from Chief Patron**

Humanity has always been in the quest for truth through a journey of knowledge that governs the ways of the world. Without the scientific search for knowledge, the ever-changing human civilization could not have progressed. I believe that the publication of BUP Journal, Volume-10, Issue-2 will contribute to the expansion of newer thoughts and innovation with its multidisciplinary research findings.

BUP Journal is a good forum for sharing knowledge on various fields through pragmatic research papers written by academicians, professionals, industry experts, and researchers producing scientific and strictly peer-reviewed articles conforming to international editorial standards. The journal is committed to publishing research papers that receive high-priority recommendations from reviewers. I am glad to find that this issue contains articles from multiple disciplines. There are articles from Sociology, Environmental Science, Economics, and Education.

I sincerely thank and appreciate the BUP Journal editorial board and Centre for Higher Studies and Research (CHSR) for their painstaking efforts to make the publication of the issue a success. I thank all experts and esteemed reviewers for providing crucial peer reviews and ensuring the academic standard of the research articles with correction, revision, and appropriate comments. I also convey my heartfelt thanks to the contributors who have joined the venture of producing research works that undoubtedly enjoy a place of eminence in all our efforts for national and international understanding and collaborative research for the creation of a better tomorrow for our coming generations.

I hope and believe that the present issue of BUP Journal will enhance readers' and researchers' interests in conducting and publishing research, contributing to the dissemination of knowledge, and fostering innovation.

**Major General Md Mahbub-ul Alam, BSP, ndc, afwc, psc, MPhil, PhD**  
Chief Patron, BUP Journal &  
Vice Chancellor, Bangladesh University of Professionals

## **Message from Chief Editor**

It is a great pleasure that BUP Journal, Volume-10, Issue-2, has been published. On behalf of the editorial team, I welcome the issue's readership. I offer heartfelt thanks to the authors and reviewers and express profound regard to the editorial board and all who helped make this issue of the BUP Journal a significant publication.

The BUP Journal attempts to promote research at the academic level by encouraging researchers' inquisitiveness to find out the truth through scientific approaches to investigation and cultivation of true knowledge. The journal, therefore, inspires researchers to produce scholarly write-ups that are befittingly methodical, having contents meticulously analyzed and useful in drawing inferences realistically. The BUP Journal is registered with E-ISSN and generally receives a good number of research papers, all of which are sent to expert reviewers who conduct blind peer reviews. After a rigorous selection process, the expert reviewers finalize the articles for publication. For this 2nd Issue of Volume 10, the research papers and the finally selected articles had to undergo a stringent evaluation process for publication. I convey special thanks to the learned members of the Editorial Board who paid significant efforts to improve and finetune the articles up to the optimum level. The BUP Journal is dedicated to propagating knowledge through high-quality research papers.

I would like to express my indebtedness to the journal's Chief Patron and the esteemed Vice Chancellor of Bangladesh University of Professionals, Major General Md Mahbub-ul Alam, BSP, ndc, afwc, psc, MPhil, PhD for his enormous support, interest, and guidance throughout the process of publishing the BUP Journal, Volume-10, Issue-2.

Authors and reviewers are always welcome. We also welcome remarks and ideas to improve the journal's progress and quality. I hope you will contribute and find the BUP Journal even more enlightening and useful in the future.

**Brigadier General Mohammad Shahiduzzaman Khan, ndc, afwc, psc**  
Chief Editor, BUP Journal &  
Dean, Centre for Higher Studies and Research  
Bangladesh University of Professionals

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## Innovation and Economic Growth: An Inquiry into Bangladesh

Tabassum Zaman<sup>1</sup>  
Soma Bhattacharjee<sup>2</sup>

### Abstract

*This study unfolds the impression of innovation on the economic growth of Bangladesh. Innovation has turned to be an important factor for business and thus a crucial factor of sustainable economic growth. Though the contribution of innovation in economic development and wellbeing in many countries is explored, it is still an unexplored issue for the context of Bangladesh. To explore the association between innovation and economic growth, this study applied quantitative approach, using the macroeconomic data of Bangladesh for the period of 1987 to 2019. The World Bank database's secondary sources were used to get the data. The research explored that the advancement in Bangladesh in technology and innovation does not donate to GDP growth. Though the government is very positive about the implementation of digital Bangladesh, patent applications for both residents and non-residents have no significant impacts on economic progress of the nation. Thus, it is suggested to focus more on innovation through not only promoting patents but also by producing efficient manpower.*

**Keywords:** Innovation; economic growth; FDI, trade openness, Bangladesh, ARDL

### 1. Introduction

Economic growth can be warranted by a plethora of factors such as savings, investment, trade and technological change etc. Among many cultivated variables innovation is the latest one. Innovation is a very crucial components to shift the gross domestic production curve upward of an economy in the face of a competitive world. It creates economic value by presenting new products, restructuring production processes, or reconfiguring organizational applies in the firms, industries and even in the countries (Cetin, 2013). According to OECD

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(2003; 2005a), an environment patronizing innovation and its application may support economic growth in the long run.

Technologies can be braced through not only generating innovation but assuring adoption of new technologies to continue a higher economic growth rate. The implementation of Vision-2041 in Bangladesh requires innovations, leveraging opportunities, advanced technology, planning based on data analytics and public-private partnership. The motive of the current government of Bangladesh is to produce a knowledge-based economy which is smart and innovative. Bangladesh has further started a digital era to ensure the LDC graduation by 2026, and the success of Sustainable Development Goals (SDGs) by 2030. However, in this attempt the pursued of innovation is very scanty and unattractive. The information of Global Innovation Index 2018 identified Switzerland as the most innovative country in the world while Bangladesh was identified as the 116<sup>th</sup> and the lowest in South Asia. Unexpectedly, the reality is government has not yet adequately invested in Research and Development (R&D) since 1971. Hypothetically, innovation-driven growth recommends a favourable association between innovation and economic performance. Accordingly, R&D and intellectual property rights, education expenditures play significant roles in innovation, rising efficiency and thus fast-tracking economic progress.

The status of innovation in Bangladesh is the main topic of this empirical estimation from 1987 to 2019, where it explores how innovation can play a role on economic performance. It may open windows for the contemporary countries that are chasing their economic growth to hit some global targets.

The authors applied ARDL model to identify both the short run (SR) and long run (LR) relationship between innovation and economic growth in Bangladesh where innovation is proxied with the interest variables as patent of residents and patent of non-residents, economic growth by gross domestic product (GDP) as the dependent variable and Foreign Direct Investment (FDI) and Trade openness (TO) as the control variables.

## **2. Literature Review**

From the very onset of innovation research, the works of Smith, Marx and Young established the association amid innovation and economic advancement in the history. Smith in 1776 delineated how market extension was responsible for division of labour and thus specialization and efficiency. Thus, the aftermath of specialization was steadfast learnings and innovation. In reality, Smith offered

the platform from where innovation in the name of technological advancement started to work as an endogenous process (Antonelli, 2009).

In the following decades, Marx (1867) revealed the heterogeneity of technological progress across time and space and its connection with the evolution of institutions based on capitalistic philosophy. The most important contribution of Marx was the role of an economic system which is supported by an unremitting technology driven change instead of a stationary mode (Conte, 2006). Additionally, Young (1928) interpreted economic arrangements as a combination of dynamic and complicated organizations which are simultaneously autonomous, interrelated and interdependent units familiarizing with transformation across time (Antonelli, 2009).

The revolutionary works of Solow (1956), Swan (1956) driven by neo-classical philosophy, accentuated the need for capital accumulation in economic growth. They were emphatic about labour augmenting technology. Technological progress exogenously determined in these models unable to explain economic growth. In contrast, assuming learning by doing, Arrow (1962) endogenized technological change. He elaborates that technical progress follows a constant growth rate and population is responsible for the long-run economic growth.

The theoretical basis for innovation and economic performance was rigorously identified by Schumpeter (1937; 1942). He utilized the concept of product and/or process innovation in economic growth. His growth model incorporated technological progress as an upshot of endogenously determined product or process of innovation (Dinopoulos & Şener, 2007). Later the world economy dynamism insisted others mainly Romer (1986; 1990) to re-establish the Schumpeterian growth theory. Romer was followed by Grossman and Helpman (1991), Aghion and Howitt (1999) in the pursuit of Schumpeter's model. Romer (1990)'s model was based on three proposals. Firstly, technological transformation results growth. Secondly, reply to market inducements and the following intentional actions cause technological change. Lastly, proposals for new products are nonrival. The model includes three sectors: R&D, intermediate goods and final output. The R&D generated innovation process human capital and knowledge stock. The R&D driven products are applied in the process of final goods and thus output growth surges enduringly.

The Grossman-Helpman (1991) model, assumes that the successful innovators may enjoy monopoly profits for a time period due to their innovative product superiority. The prevalence of many goods in this economy has been seen by the model as 'patent races'.

Aghion-Howitt (1992) developed endogenous growth model where R&D orientation leads to innovations. Due to the protection of patent law firms can practice monopolistic behaviour and can market new products. Monopoly profits inspire them to make original and improved products. Thus, a firm involving in innovation can reduce barriers to entry and replace the incumbent monopolist. Innovation speed is the key element of economic evolution in this vein.

Innovation and economic growth are cultivated by a huge domain of empirical literature. Though the formal definition of innovation is extensive, it is usually defined by the variables like R&D, patent by residents, patent by non-residents etc. Most of them established a robust positive association between innovation and economic performances.

Focusing on the world's industrial power, Mansfield (1972) established a constructive connection among R&D expenditures and output growth in various industries of USA as well as Japan. Similarly, Griliches (1992) holds the R&D expenses responsible for the widely held fluctuations in the Solow residual in the Western World.

Applying cross-country regressions, Birdsall and Rhee (1993) investigated the perspectives of both OECD and developing countries in this aspect. They unfolded an optimistic association between expenditure on R&D and economic progress for the OECD nations. In contrast, it was vivid in their study that there was no substantial affiliation between the variables in case of developing countries. Accordingly, their study reflects that, expenditure on R&D is worthwhile only when a country realizes a threshold level of economic success.

Wang and Xu (2021) evidenced from China that the government's fiscal expenditure on science and technology innovation boost up economic growth. This demonstrates that a country's economic growth requires the promotion of technology and the strong support of the government.

Maradan et, al. (2017) cultivated innovation in 19 European countries for the time period of 1989–2014. The innovation indicators of the study include patents-residents, patents-non-residents, R&D expenditure and researchers, technological exports, and articles from scientific and technical journal. The cointegration technique of the study evidenced a LR link between innovation and per capita economic growth in majority of the cases, especially for the case of applied variables. The study identified the existence of both unidirectional and bidirectional causality among innovation and per capita economic growth applying the causality test by Granger.

Yi and Mah (2016) hypothesized that R&D expenditure bears a favourable effect on the economic growth adding some control variables in their analysis for Korea from the time period of 1963 to 2011. The growth equation in this study applied Generalized Method of Moments (GMM) in addition to Ordinary Least Squares (OLS). Results obtained that after including the proportion of investment to GDP, the proportion of FDI to GDP, the ratio of government spending to GDP, inflation and the percentage of trade openness to GDP as control variables, R&D expenditure shows an optimistic and substantial impact on the economic performance.

The perspective of developing countries was explored by Samimi and Alerasoul (2009). The study investigated 30 emerging countries for the time period of 2000-2006. Contrary to others they used the R & D proxies as government expenditures, researchers per million of population and nations' scientific output. The regression of the panel data in their study implied that, no noteworthy connection between technological novelty and economic progress in the countries under consideration were evident.

Using Least Square Method in Nigeria a paper investigated the impacts of R&D and innovation, labour and capital on economic growth (Akinwale, et.al, 2012). Reviewing for thirty-one years, (1977-2007) the result showed that the gross expenditure on R&D significantly impacted on economic growth. The negative coefficient of R&D in this vein implies that, increasing spending on R&D and innovation is not sufficient when weak institutions, high corruption practices, low collaboration between the academia and the industry, poorly constructed industrial clusters etc., are prevalent in the economy.

Using macroeconomic data for the time period of 2000-2017 in Jordan, the innovation-growth link was explored by a quantitative study (Alheet & Hamdan, 2020). It was observed by this experiment that, technology and innovation does not contribute to GDP growth. Internet penetration resulted a persistent decline in GDP. Nevertheless, patent applications (non-residents) significantly contribute to the reduction in unemployment in the country.

Mohammed (2018) investigated Ethiopia by examining innovation using proxies like Patent, R&D and imported capital goods from 1996 to 2017. The pairwise Granger causality test and the ARDL multiple regression method both worked in the investigation. It explored that patent bears an unfavourable significant impact on both SR and LR demonstrating widespread imitation. Additionally, the unidirectional causality approves the essential role of economic development for robust intellectual regime. As opposed to R&D for both LR and SR showed a positive significant impression on economic performance. Finally, imported

capital goods demonstrated a positive but insignificant connection with economic growth where the unidirectional causality established from imported capital goods to economic progress unlike the previous variables.

Research outputs are accordingly brimming with various inconsistent implications of innovation on economic advancement. Consequently, this study opted to explore the potentiality of innovation in Bangladesh considering it as an unfolded aspect of research yet.

### 3. Econometric Methodology

#### 3.1 Data and Variables

The candidate variables' yearly data from 1987 to 2019 are used in this research. The World Development Indicators (WDI) of the World Bank served as the source of the information (WID 2023). The variables are details in table 1.

**Table-1: Name and Definitions of the variables**

Abbreviation	Variable name	Unit
GRGDP	Growth rate of real GDP	Yearly %
FDI	Net inflows of foreign direct investment	% of GDP
PANR	Patent applications, non-residents	Number
PAR	Patent applications, residents	Number
TO	Trade openness	% of GDP

#### 3.2 The Test of Unit Root

The majority of macroeconomic time series, according to Nelson and Plosser (1982), are non-stationary. In order to proceed with the final modelling, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test have been applied to determine if the time series are stationary.

#### 3.3 Econometric Model

This study has looked at the LR and SR co-integration among GRGDP and other variables (FDI, PANR, PAR, TO) using the ARDL model. The ARDL model's ability to be used with a combination of I (0) and I (1) variables is one of its benefits (Pesaran, Shin & Smith, 2001). The value of F-statistics is used to determine whether co-integration between the variables exists.

For bounds test, the null ( $H_0$ ) and alternative ( $H_1$ ) hypotheses are:  $H_0$ : Variables are not cointegrated ( $H_0 = \sigma_1 = \sigma_2 = \sigma_3 = \sigma_4 = \sigma_5 = 0$ ) and ( $H_1$ ): Variables are co-integrated ( $H_1 \text{ G } \sigma_1 \text{ G } \sigma_2 \text{ G } \sigma_3 \text{ G } \sigma_4 \text{ G } \sigma_5 \text{ G } 0$ ). From this, one can

derive three probable outcomes. If the estimated F-statistics is less than the lower bound critical value,  $H_0$  cannot be rejected; but, if the estimated F-statistics is greater than the critical value, the  $H_0$  will be rejected. Also, the subsequent math is ambiguous if the F-statistics lies in the range between the upper and lower boundaries (Pesaran et al, 2001). The following is the ARDL framework for this research:

$$\Delta GRGDP_t = \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta FDI_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta PANR_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta PAR_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta TO_{t-i} + \sum_{i=1}^n \alpha_{5i} \Delta GRGDP_{t-i} + \sigma_1 FDI_{t-1} + \sigma_2 PANR_{t-1} + \sigma_3 PAR_{t-1} + \sigma_4 TO_{t-1} + \sigma_5 GRGDP_{t-1} + e_{1t} \quad (1)$$

Where -

$\Delta$  = difference operator,

$\alpha_0$  = constant,

$\alpha_{i1} - \alpha_{i5}$  and  $\sigma_{i1} - \sigma_{i5}$  = coefficients and

$e_{1t}$  = error term.

The short-run coefficients are evaluated using the Model of Error Correction (ECM) established by Engle and Granger in 1987. As it determines the LR association among variables, the sign of the EC term is crucial. ECM can be written as:

$$\Delta GRGDP_t = \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta FDI_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta PANR_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta PAR_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta TO_{t-i} + \sum_{i=1}^n \alpha_{5i} \Delta GRGDP_{t-i} + \epsilon_1 ECM_{t-1} + e_t \quad (2)$$

The EC term for a single period lag is represented by  $ECM_{t-1}$ . The adjustment speed toward equilibrium following a shock in each period is used to calculate the  $ECM_{t-1}$  coefficient, which is displayed as  $\epsilon$ . The parameter's negative and significant value indicates the presence of a co-integration connection.

Finally, normality, serial correlation, heteroscedasticity, and stability tests should be carried out to see whether the model has the appropriate attributes and is stable.

## 4. Results and Discussion

### 4.1 The Test of Unit Root

In this study, the existence of a unit root in a set of data is checked using the ADF and PP tests. The series might not have a unit root, which is an alternative hypothesis.

**Table-2: ADF and PP Tests**

Variable	ADF		PP	
	Levels	1 <sup>st</sup> differences	Levels	1 <sup>st</sup> differences
<b>GRGDP</b>	-0.9227***	-	-0.9227***	-
<b>FDI</b>	-0.3770	-1.2167***	-0.3770	-1.2167***
<b>PANR</b>	-1.1367***	-	-0.2591	-1.1021***
<b>PAR</b>	-1.0533***	-	-1.0533***	-
<b>TO</b>	-2.5276**	-	-0.1306	-0.9351***

Note: \*\*\*, \*\*, and \* represents at 1%, 5%, and 10% significant respectively.

Table 2 shows that for both test the variables are integrated of both I(0) and I(1). The ARDL is the subsequent step to determine whether there is a co-integrating relationship between the variables

### 4.2 The Bounds Test

The equation (1) is used to find out the LR co-integrating association among GRGDP, FDI, PANR, PAR and TOR. The  $H_0$  here is no co-integration and the  $H_1$  is existence of co-integration between the variables. The ARDL bounds tests results are shown in Table 3.

**Table-3: Bound Test**

Lag length		F-stat.	
ARDL (1, 0, 0, 0, 1)		5.465296	
Significance Level	k and n	Critical Values	
	k = 4, n = 1000	Lower bound	Upper bound
10%		3.03	4.06
5%		3.47	4.57
10%	k = 4, n = 35		
		3.374	4.512



5%		4.036	5.304
	k = 4, n = 30		
10%		3.43	4.624
5%		4.154	5.45

Note: *k* is the number of independent variable in equation (1) and *n* is sample size. Here *n* = 32.

Table 3 demonstrates that for both asymptotic (n=1000) and finite sample (n=35 or n=30), the estimated F-stat. is bigger than the upper bound value at the 5% and 10% significance level. The findings show that there is a significant co-integrating relationship among the variables and that the null hypothesis is rejected. The results specifically show that there is a LR association among GRGDP, FDI, PANR, PAR, and TO over the course of the study period.

### 4.3 LR Estimation

The ARDL model stated in equation (1) is used to investigate the LR association among the variables. The ideal number of lags for each variable are displayed by the ARDL (1, 0, 0, 0, 1) model. According to the Table 4, the LR can be explained by FDI, PANR, PAR, and TO. The statistical significance of the model is strongly supported by the F-statistics value (9.453620) with zero probability.

**Table-4: LR Coefficient for the ARDL Estimations**

ARDL (1, 0, 0, 0, 1) selected based on AIC					
Dependent variable: GRGDP					
Constant	Trend	FDI	PANR	PAR	TO
3.309709 (2.866145)* **	0.127276 (2.703162)***	0.068774 (0.101717)	-0.001097 (-0.271659)	0.007698 (0.664953)	-0.024117 (-0.541796)
R <sup>2</sup> = 0.733852					
Adjusted R <sup>2</sup> = 0.656225					
F-statistic = 9.453620***					

Note: The t-ratio value is represented by the parenthesis

1%, 5%, and 10% level of significance is represented by \*\*\*, \*\* and \* respectively.

The results of table 4 indicate that FDI and PAR have positive insignificant effect on GRGDP whereas PANR and TO have negative insignificant effect on GRGDP. Moreover, in LR, the constant and trend are significant.

#### 4.4 SR Dynamics

Table 5 shows the estimated ECM. In SR, TO has positive significant effect on GRGDP.

**Table-5: Regression of Error Correction**

Dependent variable: D(GRGDP)	
Regressors	ARDL (1, 0, 0, 0, 1)
C	3.309709*** (5.042225)
TREND	0.127276*** (5.131259)
D(TO)	0.081599** (2.213982)
ECT(-1)	-0.905858*** (-5.646317)
R <sup>2</sup>	0.558415
Adjusted R <sup>2</sup>	0.511102
F-statistic	11.80263***

*Note: The t-ratio value is represented by the parenthesis*

1%, 5%, and 10% level of significance is represented by \*\*\*,\*\* and\* respectively.

The estimated value of the ECT in this study is -0.905858. This value shows a 0.91% speed of convergence to the equilibrium after shock and is highly statistically significant with the right sign. More particular, the ECT predicts that throughout the year, the divergence from the LR, GRGDP path is corrected by 0.91%. The R<sup>2</sup> value of 0.56 indicates that the independent variables of the model are able to account for 56% of the variation in GRGDP, which is a good fit for the ARDL model of error correction regression.

#### 4.5 Diagnostic Testing

The outcomes of several diagnostic tests are shown in Table 6. These tests have a P-value greater than 5%, demonstrating that the model is free from serial correlation and heteroscedasticity problems. In this study, the Jarque-Bera test is employed to determine normality. Furthermore, the P-value of this test is greater than 5%, demonstrating that the residual has a normal distribution.

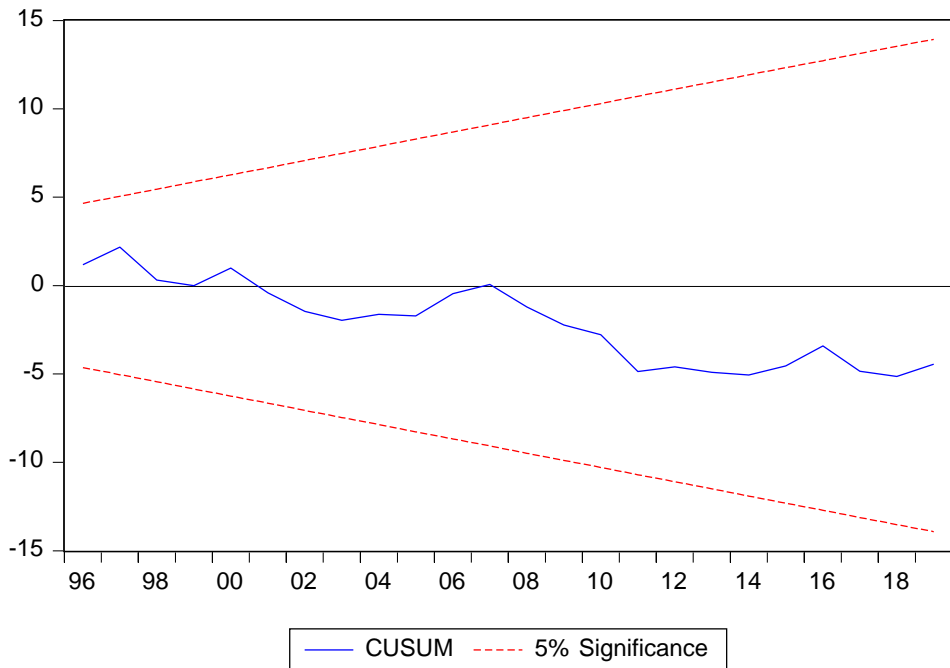
**Table-6: Results of Diagnostics Test**

	F-Statistics /Jarque-bera	Obs*R2	Probability
Heteroskedasticity	0.9400	6.8856	0.4409
Serial Correlation	0.5251	0.7142	0.3980
Normality	4.0181	-	0.1341

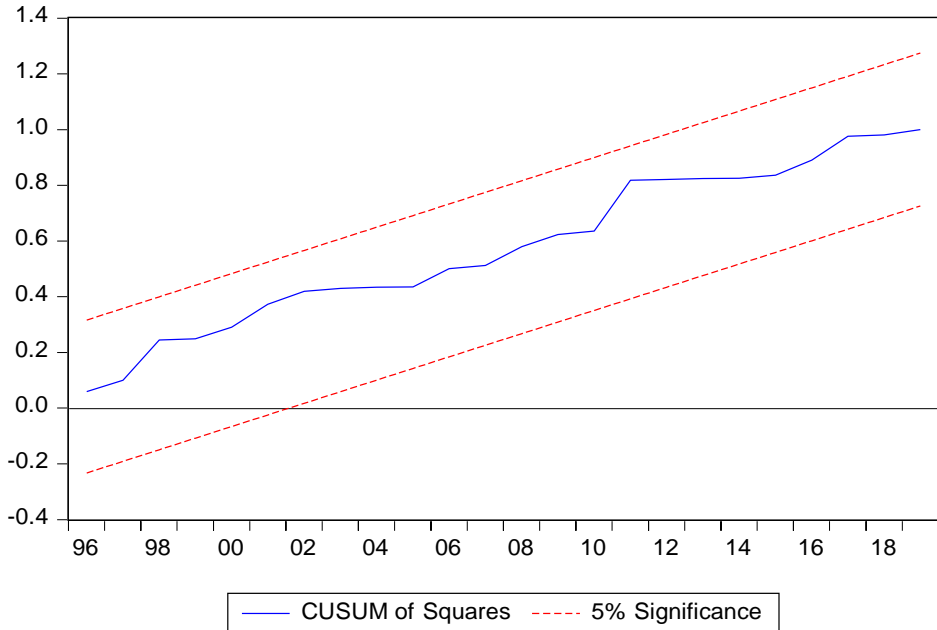
*Source: Author’s calculations.*

**4.6 Test of Stability**

To assess the model's stability, this study uses the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMQ). The test results are shown in Figures 1 and 2, respectively.



**Figure-1:** Cumulative Sum of Recursive Residuals (GRGDP)



**Figure-2:** Cumulative Sum of Squares of Recursive Residuals (GRGDP)

The stability of the parameters is assumed to be true if both the plot of the CUSUM and the CUSUM of squares remain inside the 5% critical bounds. There was no coefficient instability over the research period, as seen in Figures 2 and 3 where neither line is outside the 5% critical bounds. The models have the desired econometric properties and are structurally sound, per the findings of the aforementioned tests.

## 5. Discussions

The digital Bangladesh is a prime motive of the current government of Bangladesh and accordingly different policy initiatives are under consideration and in the implementation phase. Due to a transition phase that Bangladesh is going through, the influence of patent on its economic pursuit is very inconsistent. The LR impact of the patent of the non-residents on the economy of Bangladesh is found to be negative in the study whereas that of the residents' one is found to be positive though both are insignificant. In this vein, only trade openness as a control variable is found to be affecting the economy in the SR significantly.

This trend of patent in Bangladesh may resemble the findings of Chu, et al. (2019) in case of patent by non-residents where the researcher found that tougher patent protection eventually slows down economic performances by rising the number of products, decreasing their market sizes and by demotivating quality-improving innovations. Moreover, our study may also confirm the interpretation of Chu and others where they showed that many interventions are not patented. If unpatented innovation is taken under consideration, then it may lead to economic growth provided that the rate of return of patented (resident) and unpatented innovation are linked. It is also expected from previous studies that, Intellectual Property Right (IPR) may not essentially cause an instant take-off but only an earlier start out which may resemble the present study findings.

Park and Ginarte (1997) applied a patent index on 60 countries to investigate the link between patent rights, economic performance, and R&D expenditure. They found a favourable link between robust patent protection and R&D expenses for higher income countries as opposed to the lower income ranges. Moreover, the affiliation between patent protection and economic growth was not evident in their study. This scenario is similar to the short run outcome of the study. Being on the verge of a lower middle income country Bangladesh may show a similar pattern on innovation in the short run as well.

The present study is further validated by Park (2003) analysis on 18 manufacturing industries between 1980 to 1995 for 21 OECD countries. Though the study proved a favourable link of patents application with the efficiency of labour and R&D, for a larger sample the similar findings was not established. It implies that for many contexts innovation may not help to increase economic growth through labour productivity.

Another logic was developed by the scholars where stronger patent protection ensures attractive profit through innovation, but it lessens the demand for capital. This procedure quickens innovation but dampens capital growth, and thus impacts negatively on economic achievements through curbing capital flow (Iwaisako & Futagami, 2013).

Among the control variables, the finding related to trade openness of this study is also validated with other research findings. Chang et al., (2005) recognized that increase in trade openness on economic pursuits will be higher if it is reinforced by heavy investment on human capital, market penetration and infrastructure readiness. Lopez (2005) surveys of literature unfolded that trade liberalization can augment productivity and economic growth for the emerging countries. Correspondingly, Anderson and Babula (2008) concluded that there remains a probable positive link between global trade and economic progress though they

are anxious about the ability of the transitional countries. Therefore, the SR and LR impacts of trade openness on economic upliftment in Bangladesh found in this study can be validated by the previous studies.

## **6. Conclusion, Recommendation and Ways Forward**

The implications of innovation for economic growth are extensively analysed in plentiful studies over the last three decades, especially by the works of Romer (1986;1990) and his followers. These revolutionary theories revealed that innovation through R&D may result economic growth and thus productivity.

This study attempts to link innovation with economic growth for the context of Bangladesh. Here the authors applied patent of residents and patent of non-residents as the proxies of innovation. To test their link, ARDL multivariate regression model is applied for identifying their long run relationship for the period of 1987 to 2019. In this effort of ARDL, the ADF and PP tests were pursued to test the stationarity of the data. The mixed stationarity of the data nature rationalized the use of ARDL model for this study. The study found no significant bond between innovation and economic growth in Bangladesh. In both the SR and LR the role of innovation to economic growth in Bangladesh found to be insignificant. Though education standard as well as R&D are the prerequisites of innovation, their status in Bangladesh is not satisfactory. Recently, Bangladesh's bared an expenditure for research worth of only 0.30 percent of its GDP. Scholars prescribe that it should increase its R & D expenditure to at least 2.5 percent of GDP by 2030 (Ahmed, 2021). Top of that the quality of human capital is also questionable and thus it may also result the inertia of innovation in the country. Researchers held responsible the employee skill gaps, poor quality education system, inefficient teachers, industry-university non-collaboration, no outcome based course curriculum and corruption etc., for poor quality human capital in Bangladesh (Uddin, 2021).

The study accordingly offers some policy prescriptions to get some positive impressions of innovation on the economic performance of Bangladesh. Since sustainable economic evolution can be maintained by a stable and increasing investment in R&D, the government alone as a stakeholder is not sufficient at this moment. Bangladesh can excel in future through its competitiveness in the world economy which can be ensured by stable innovation practices. Innovation has no alternative when the world is moving towards knowledge economy. In this vein, the private sector can empower the hands of the government and can be a stable source of resources at this moment.

Investment, particularly FDI, can be a solution for Bangladesh in getting the fruits from innovation. In this context, since FDI is also not significantly playing its role in the country, it can be utilized to its utmost limit as it comes not only with capital but with knowledge and technology to the host nations. In this regard, researchers found that inward FDI flows play a facilitating role in boosting the effects of patent on economic achievements (Alexiou, et., al, 2016).

Finally, the implementation of innovation through R & D can only be ensured by rigorous research in the country and where education and the research institutions may lead. Universities, public research institutions and private think-tanks may contribute to innovation through disseminating knowledge and information which may create the basis for possible technological innovations of the businesses sector.

Furthermore, how the endogenous take-off of the neighbouring countries may impact on the technological spill-over in Bangladesh may be a future scope of study and this may open new window of effective implementation of patent in the country. We can leave this thought-provoking extension to future research.

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## **Cricket-based Betting and University Students: A Thrill or a Threat?**

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Mahfuzul Mithun<sup>2</sup>

### **Abstract**

*Due to the widespread interest in cricket in this nation, many individuals are participating in cricket-specific online betting, and university students are also participating. University students' lives are being impacted in a variety of ways by betting on cricket. Existing literatures and newspaper articles have been explored to identify variables and a semi-structured questionnaire was developed by using the variables. Based on the identified variables, 9 university students from Sylhet were interviewed through in-depth interviews (IDIs). Universities were selected through the purposive sampling technique, and respondents were determined by using snowball sampling. The study demonstrated that university students started betting in student life to earn additional money, but the outcomes seemed largely unpleasant. Engaging in betting negatively affects students' academic performance and their personal and family relationships. Additionally, they must deal with a variety of mental challenges after starting betting. Even while most university students stop betting after substantial losses, still it influences their life.*

**Keywords:** Online betting, Youth Gambling, University Students, Social Sciences, Youth Crime.

### **1. Introduction**

In recent decades, the sports betting industry has flourished. Sports betting has grown from a small sector to a significant one, and its earnings are now comparable to those of traditional sports. Sports betting is therefore comparable to conventional sports betting. On their preferred team or other game-related events, players can place real money wagers. People wager on sports all over the world, but the most common regions are in Europe, where it has a long history and is generally legal. Currently, this activity has developed into a significant industry that generates income for both bettors and bookmakers.

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Before 1983, there was a little amount of cricket betting; but organized group betting did not begin until India's victory in the World Cup in 1983. It got more structured, and several bookies began operating in India's major metropolises. In particular, a few series between India and Pakistan that were played in Sharjah gave crime syndicates a way in. Mafia gang played a significant influence in hosting players and planning extravagant celebrations with players and Bollywood celebrities. The opportunities and large sums to wager on these games were made possible by the widespread adoration of millions in India and Pakistan. Players and organizers soon became involved in manipulating outcomes so that crime gangs could profit handsomely from the games.

The game of cricket is associated with the emotions of the people of Bangladesh. Since getting Test status in 2000, the popularity of cricket in Bangladesh has gradually increased. A dark chapter of cricket has come forward with the banning of Mohammad Ashraful in the fixing case in BPL. The impact of betting on IPL, BPL or domestic T20 cricket of any country is no longer a matter of concealment.

From tea stalls to five-star hotels in Bangladesh, betting takes place everywhere during the glittering T20 leagues. People can be seen betting from all walks of life. Since the advent of mobile application-based betting medium, cricket-based betting has spread everywhere. School-college or university students are also affected by the effects of these bets. The influence of cricket-based betting on students has come up in various media of Bangladesh. From this point, the present study aims to identify the effects of cricket-based betting on the university students.

## **2. Literature Review**

Several young people appear to be heavily involved in gaming and are having serious gambling related issues (Gupta & Derevensky, 2000). According to studies, gambling throughout adolescence can result in negative consequences like strained relationships, criminal behavior and delinquency, despair, and even suicide (Derevensky and Gupta, 2004). Gambling is indeed a fiercely disputed social policy topic on a global level (Collins and Barr, 2001).

The psychopathology of addictive behaviors can be better understood by taking risk and protective factors into account and by seeing how they interact, according to a substantial body of research (Latimer, Newcomb, Winters, & Stinchfield, 2000). Frequent drug users, delinquent histories, regular drug use, and poor academic performance were all associated with higher gambling involvement in youth. The largest correlation between gambling recurrence and antisocial conduct was found to be three concepts about vandalism, violent

altercations, theft, and enjoying risky activities (Stinchfield et al., 2001). Boys engage in gambling more than girls do, according to almost every study on the topic, this is true for both play and problem gambling behaviors (Fisher, 1992; Gupta & Derevensky, 1998; Ladouceur, Dubé & Bujold, 1994; Stinchfield, 2000; Stinchfield, Cassuto, Winters & Latimer, 1997; Volberg, 1998; Wynne et al., 1996).

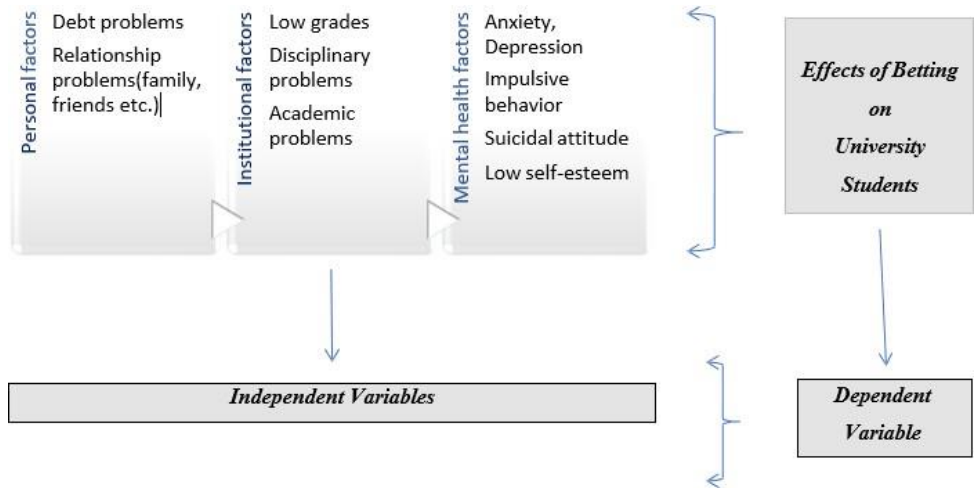
Impulsivity, experience seeking, taking risks, and an antisocial disposition have all been linked to patterns and correlates of gambling and betting (Vitaro et al., 1997; Coventry and Constable, 1999; Petry and Casarella, 1999; Petry, 2000). But not all gamblers exhibit impulsivity as their main trait (Blaszczynski and Nower, 2002). Like gloominess, loneliness, and social isolation, gambling motivations have been studied but are not always present (Trevorrow and Moore, 1998; Getty et al., 2000).

University students in Bangladesh are entering the world of betting to earn extra money (*The Daily Manab Zamin*, 2019). During the BPL in 2017, a student at a private university was killed in a dispute over betting (*BDNews24*, 2017). The stakes for university students are not huge in terms of money, but the addiction is terrible. Many of them have already lost everything. But they have no idea about it. Instead, they collect money in various ways and indulges in gambling in the name of cricket betting every day (*ShareBiz*, 2022).

Several assertions made by researchers show that structured clinical interviews with courses of time may be initiated to improve the comprehension of the temporal relationship between depression and gambling (*Beaudoin & Cox*, 1999). The extra psychological, biological, and cognitive components of suicidal conduct should be taken into consideration by any theory linking gambling and suicidality (Cornelius et al., 1995; Driessen & Veltrup, 1998). Surveys (Shaffer et al., 1994; Wallisch, 1993; Zitzow, 1996) have revealed the strongest evidence for a connection between adolescent gambling and drug use habits.

### **3. Conceptual Framework**

Prior to a study, a conceptual framework is a tool that is used. A conceptual framework is thereafter a tool for analysis. It is employed to assemble many thoughts and draw conceptual differences. Solid conceptual foundations enable the actualization of the intended goal. This study aims to identify the effects of cricket based betting towards the university students. Conceptual framework of the study has covered the objectives of the study by analyzing existing secondary data, such as: literatures and newspaper articles.

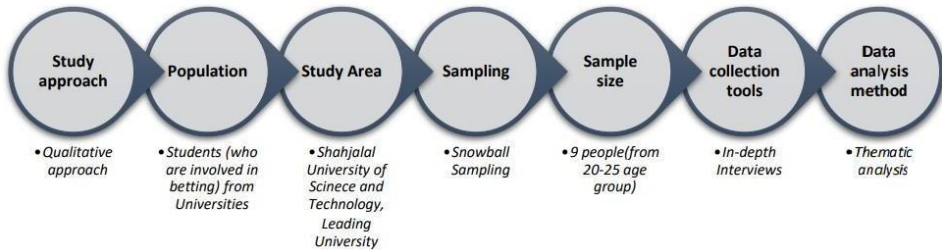


**Figure-1:** Conceptual Framework of the Study

The independent variables have been divided into three segments, they are: personal factors, institutional factors, and mental health related issues. All the variables under these segments largely indicate the dependent variables of the study.

#### 4. Methodology

Shahjalal University of Science and Technology and Leading University have been taken as study area for the study. The study was conducted through qualitative research approach. The study is exploratory in typology. A qualitative approach allows us to learn more about the existing effects of betting on university students. For conducting in-depth interviews, students from two universities included in the study and the 9 respondents have been selected by using snowball/chain sampling method. Every student does not involve with betting, so here we had to use snowball sampling to get proper respondents for the study. Thus, snowball sampling method has been used to conduct the study.



**Figure-2:** Methodology of the Study

All information of the study have been collected through in-depth interviews and observation methods. Interviews were taken by a semi-structured questionnaire. The independent variables were used to create a checklist. On the other hand, observation approach conducted by researchers’ hand notes, participant observation and field recordings. After transcription of the audio and field notes, several themes and sub-themes were generated based on research objectives, research questions, and conceptual framework. Thus, the data collected from the students has been analyzed using thematic analysis.

## 5. Major Findings

Through interviewing the participants in the study, various information related to betting emerged. Its impact on their lives is multifarious. Despite the initial financial benefits, it eventually became apparent that most students were experiencing losses and even having to incur debt. However, there is unrest in their personal lives for an assortment of reasons, and many have stated that they do not get along well with their family or close friends. Low self-esteem and lack of confidence are the repercussions of this.

After getting involved in betting, the educational life of the students has become a disaster. They start being inattentive in class and their academic results also start to decline. In addition to everything else, their mental health began to deteriorate. Overall, the research showed that after betting, individuals were less likely to have pleasant things happen in their life.

### ***5.1 Despite a favorable beginning, the overall situation quickly worsens***

Most of the participants reported that they were attracted to betting or gambling with hope of earning extra money during their student life. They are primarily attracted to gambling by playing cards or betting on outdoor games. Currently,

with the advent of mobile application-based betting and running cricket league throughout the year, university students are increasingly attracted to betting. Betting has become an addiction to betters because a large amount of profit comes in at a deal. But gradually the students face the loss. As a result, they confront various problems in life.

### **5.1.1 Betters' Needs of Loan**

Currently, due to the app-based betting, the money comes in the fastest time. This makes students more attracted to betting. In this way, they fast face the loss in time too, or the profit money is spent by them in one way or another. But due to gambling addiction, they cannot come back from there. So, they often have to borrow money to gamble. One says in this regard:

*"I was losing money in the first few matches during the BPL, but I couldn't help betting. Later, I borrowed money from someone at high interest to bet further."*

On the other hand, there are cases of selling valuable things for betting. Many times, valuable items such as mobile phones, laptops are sold for not being able to pay off the loan or to make a bet. Students think that they can make up for it later when they get more money, but later they face more problems. One of the respondents claims:

*"I sold my laptop for betting. I thought that when the time comes, a lot of money will come together, then I can buy another. But it was not possible after losing a lot of money in some consecutive matches."*

### **5.1.2 Problems with Friends Family**

In the social context of Bangladesh, gambling or betting is not regarded positively. Its effect is also not pleasant. Present study shows that distance between betting and non-betting students increases after classmates and friends know about it.

Family is mostly influential on one's life. University students usually live away from their families, so a distance is naturally created. Students involved in betting claim that if they were with their families, they would not have indulged in such activities. They feel depressed about this matter and as a result distance from their family increases. A respondent said:

*"The biggest reason I grew distant with my friends was because I used to bet. My friends used to ignore me, but I didn't care to them that much. After continuous losing in gambling, I feel sorry and I feel I have been dishonest with my family and friends by not focusing on my studies, so I feel ashamed to talk to them."*



## **5.2 Disruption of Education and Academic Life**

After admission to the university, a student's main goal is to graduate well. A good result is a wish for every student. It has been proved that since the involvement in betting, it starts to have a negative effect on the academic life of all the students. Most of the students who used to earn from tuition have demanded not to pay tuition. An overall negative impact of betting on the academic life of students is visible.

### **5.2.1 Low Grades, Absenteeism Impacting Education Life**

The negative effects of betting on the academic life of students are manifold. Among these the tendency for poor outcome is greatest. The students also claimed that they used to miss classes due to staying awake at night to keep up with the news of various sports. Which would affect their results. Moreover, they said that when money starts to come, they do not care much about the results. When they get a punch, they realize how much damage they have done.

One of the respondents says:

*“After starting bet, academic results got very bad. I did not attend to classes properly. I used to wake up all night and sleep during the day. I left myself in a very bad state.”*

Another respondent claims,

*“I used to hang out with my friends all day, because I didn't care about academic life because I saw money coming in. On the other hand, the condition of education became deplorable.”*

### **5.2.2 Giving up Income from Tuition**

During education, most of the students earn their income through tuition. By doing this, their pocket money comes up, even many students support their families through the income from tuition. Learning and study practice would be better through tuition. But when money starts coming through betting, students drop tuition, and this negatively affects their academic life as well. One says:

*“I used to earn 7 thousand per month by doing tuition. But if the luck is good in betting, 7 thousand can come in a night. That's why I gave up tuition. But if I did, the previous readings could be covered, it would be beneficial for me in the job examination.”*

### ***5.3 Mental Issues as Source of All Evil***

Various psychological problems are seen after getting involved in sports betting. Depression, anxiety, lack of confidence and impulsive behavior are common mental problems. Because of being involved in betting, a kind of inferiority complex works among the students. When this is coupled with prolonged loss, mental instability is created between them. It is normal to experience depression and anxiety as a result.

#### ***5.3.1 Anxiety and Depression***

The survey respondents found that after engaging in betting, they often had to borrow from various sources. Since then, they never have money for long. They had to go through a kind of financial instability. This results in anxiety and depression. A respondent said in this regard:

*“The money won through betting is never actually in your control; it is always used for somewhat. It causes a financial crisis by nature, which is bad for the mental state.”*

Mental problems start from economic instability. One such person says:

*“Money related problems make me depressed. I always become worried when my pocket gets empty.”*

Another person says,

*“I am no longer involved in betting on cricket. The only reason I came back was because I was very depressed mentally. I always felt like I was earning money unfairly.”*

#### ***5.3.2 Greed***

Most of the participants in the study had been involved in betting for a certain period. Apart from this, some are still involved in betting. They claim that there is a tendency for greed to increase among those who are still involved in betting. One such claims,

*“If you bet once and win some money, the next day you seem to bet more money. In this way a greed comes. Because of this greed, I can't leave betting.”*

Similar words were heard from another participant,

*“Betting is an addictive behavior. I started to smell like money everywhere. You don't want to play without betting right now, even if you sit down to play cards with conventional mates.”*

### **5.4 Consequences Pleasant**

Respondents claimed that most of the members who took part in the study were no longer involved in any form of betting. But the harmful effects of gambling remain in the lives of many. Drug addiction is the most common. There is also a tendency to decrease self-esteem. All in all, many people are not able to get out of its harmful effects even after leaving betting and the harmful effects of betting are quite long term.

#### **5.4.1 Drugs**

Bettors have a tendency to take drugs. Although they started with cigarettes, they later turned to bigger drugs. Many people turn to drugs out of curiosity. One says:

*“I didn't even smoke before. I started smoking cigarettes with my friends while betting while watching the game. After that slowly I often took other drugs.”*

Once one enters the world of addiction, it is difficult for him to get out. So, once they get addicted to drugs, it is difficult for them to quit. One such person says,

*“I want to quit smoking, but I can't quit. Meanwhile, after giving up betting, I don't have income like before.”*

#### **5.4.2 Low self-esteem**

There are many variables involved in self-esteem. After getting involved with betting, various changes started to occur among the students. Their studies suffer, their personal life suffers, their self-esteem goes down through depression and anxiety etc. One says in this regard,

*“I don't have much interest in doing anything anymore, I feel like whatever I do, I'll be fooling myself.”*

## **6. Discussion and Conclusion**

According to the study, those who bet or gamble do so to supplement their income. University students are becoming more interested in betting because of the introduction of application-based betting and a year-round cricket league. It has been established that all students' academic lives suffer as soon as they become involved in gambling. Many psychological issues are observed after participating in sports betting. Drug abuse and other issues are also evident. Mental health issues frequently include depression, anxiety, lack of confidence, and impulsive behavior. Drug abuse follows on its heels. Students appear to be becoming greedier.

Boys engage in gambling more than girls do. All the respondents of the current study were male, and their data informed that men are most active in betting; not women. Which has been implicated on the other studies.

The top priorities of gambling and betting for a person have all been experience seeking, taking chances, and having an antisocial nature (Vitaro et al., 1997; Coventry and Constable, 1999). In contrast, the current study has discovered that undergraduate students primarily start betting for additional money while they are currently students. Gambling motivations have been linked to negative outcomes of betting, such as depression, loneliness, and social isolation (Trevorrow and Moore, 1998; Getty et al., 2000), which is relevant to the present study.

Young university students experience depression because of their frequent betting losses. Which also supported by a number of research-based claims and demonstrates the understanding of the temporal association between depression and gambling (Beaudoin & Cox, 1999). Further investigation revealed the analogous relationship between the theories of gambling and suicidality (Cornelius et al., 1995; Driessen & Veltrup, 1998). However, the current study has not found any instances of betters being driven to commit suicide.

The strongest evidence for a link between adolescent gambling and drug use behaviors has been found in a significant number of surveys (Shaffer et al., 1994; Wallisch, 1993; Zitzow, 1996). The survey results make a significant connection between the current study and thus the respondents' claims of drug addiction.

Finally, the paper identifies that university students bet for extra income due to the development of apps and the continuous holding of cricket leagues. However, this involvement has been proved to harm their grades or performance and lead to various psycho-social problems like depression, anxiety other related vices like impulsive behavior. The study thus establishes that the male students are more vulnerable to gambling as compared to the female students in concurrence with the previous studies. Previous research also connects gambling motivations to experience and antisocial personality traits, however, this study refers to financial necessity as the main students' motivation. Also, the adverse effects of gambling are validated; these are depression, loneliness, and social isolation. While binge gambling was not certified to be involved with suicidality in the current study, there is affirmation of the proposition that bettors are likely to be related to substance use as reported by the respondents and scholars. These results imply the imperative call for prevention and treatment of gambling and its impacts on students' psychological and academic functioning.

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## College Teachers' Perceptions and Practices of Continuous Professional Development (CPD) Activities in Bangladesh

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Yuichi Sasaoka<sup>2</sup>

### Abstract

*Teachers' multifaceted competencies are very important to address the changing curricula and issues head-on. Subsequently, enhancing teachers' professional skills has become a worldwide priority aspect in this century. In Bangladesh, less attention has been given to obligating and motivating teachers to take up career- long CPD. This study investigates some personal and college-based activities for teachers' professional development. The author used a mixed methodology for this study, where 200 questionnaire data were collected from college teachers and 11 interviews were conducted with the teachers, principals and training specialists. The study found significant differences between the perceptions and practices of different personal and college-based CPD activities. It exposed rigorous self-study, in-house training, sound professional environment as significant facets for teachers' CPD. Based on the findings, this study recommends, in addition to training, introducing some policies to obligate and motivate teachers to engage voluntarily in different CPD activities for their professional development.*

**Keywords:** Professional Development. Continuous Professional Development (CPD), Self-study, Inhouse training

### 1. Introduction

The context of this study is about the broader range of teachers' professional development and the Continuing Professional Development (CPD) of college teachers in particular. According to Leung's (2009), professional development encompasses 'sponsored professionalism' (institutional) and 'independent professionalism' (teacher's individual professional growth) (Al-Lamki, 2009). Teachers' professional development depends on the career-long need-based training, individual and school-based activities in a sound teaching professional environment. More significantly, this study focuses on policy gaps towards the

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motivation to the teaching profession and teachers' personal and college-based activities for their CPD throughout the career. The paper highlights the interactive relationship among three important areas, i.e., training programmes, personal and college-based activities for teachers' professional development.. Hanushek and Rivkin (2006) claimed that quality education largely depends on quality teaching. Under the agenda of SDG-2030, Bangladesh is promised to ensure qualified teachers for quality education. Additionally, the National Education Policy (NEP) of 2010 highlights the increasing number of qualified teachers in the education sector. Therefore, it demands wide-ranging training programs, motivation and facilitation for individual and collaborative activities for improving teachers' professional skills to expand and sustain a high standard of teaching-learning for quality education.

The aim of this study is to investigate the policies and directives regarding the personal and college-based professional development activities that can enhance teachers' professional skills and can help implement the learning of the ongoing training programs in their institutions concurrently.

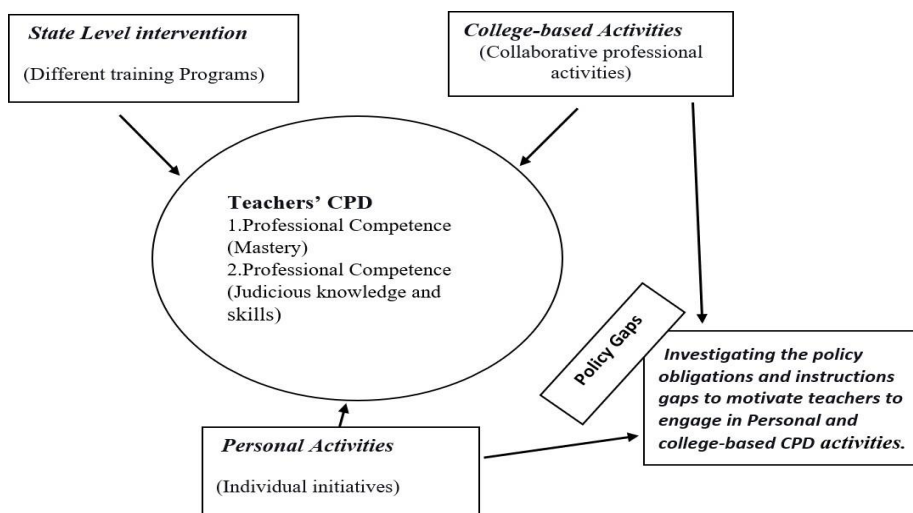
## **2. Problem Statement**

A qualified teacher is crucial for quality education to continue the country's drift of holistic development. The frequent recruitment of teachers without pre-service education and pedagogical training impedes school-level efforts to improve quality education (Richards, 2008). Besides, the promotion or professional upliftment is provided subject to the length of services, whereas in developed countries, teachers' competencies are being evaluated for promotion and thus increase remuneration accordingly. On the other hand, teacher education system of Bangladesh did not develop any specialized list of competencies for teaching profession.

In developed country, mandatory teaching licenses (Banks & Smith, 2017), legal obligation to acquire required teaching skills, and school-wide professional development activities (Yamasaki, 2016) are essential for teachers' professional development. Literature shows that, in Bangladesh the current teachers' training learnings do not come into fully practice due to the lack of legal obligation and school-wide informal directives for professional development. Although training enhances professional skills, there is a lack of instructions and facilitation for internalizing the acquired knowledge. As McMillan, McConnell, & O'Sullivan (2016) strongly argued that individual initiatives (teachers), school environment (medium), and the state (teacher education) can facilitate teachers' professional development. Therefore, not only training but also legal obligations, healthy



school environment with efficient leadership are crucial for teachers' professional development. Researchers now provide more importance to the personal initiatives and school-based activities for teachers' CPD than traditional training programs (Gartia & Sharma, 2013). Unfortunately, there is almost no motivating policy and competency-based career path to encourage teachers in the personal and college-based activities for their CPD in Bangladesh. Subsequently, teachers' voluntary engagement in personal and college-based activities for their CPD, along with training programs is barely seen in most colleges. That is why; the effectiveness of current training programs and teachers' professional skills are relatively low, jeopardising quality teachers' prospects in Bangladesh (United Nations, 2018).



**Figure-1:** The Problem Statement

*Source: Author (from the discussion of problem statement)*

The figure 1 indicates that training, personal, and college-based activities enhance teachers' CPD. But there is a lack of policy obligations and instructions to motivate the teacher to engage in those CPD activities. Recently many educationists have acknowledged that only the formal training interventions cannot effectively ensure teachers' CPD if there is less opportunity to share and transmit the knowledge or strategies into their professional field (Garet et al. 2011). Therefore, the teachers' and training specialists' views about the policy measures regarding the personal and college-based activities for teachers' CPD should consider highly and need to be explored. and. Thus, this study tries to

inspect the required policy and the personal and college-based activities for teachers' CPD in Bangladesh.

### **3. Research Objectives**

The general objective of this study is to identify the important CPD activities of college teachers in Bangladesh. Because, in addition to training and sound professional environment, some personal and college-based activities play a significant role in the professional development of teachers. Therefore, the specific objectives of the study are,

- i. To identify the gaps in policies and initiatives for teachers' professional development.
- ii. To explore personal activities needed for teachers' continuous professional development.
- iii. To find out college-based activities required for teachers' ongoing professional development.
- iv. To detect the importance of teaching professional environment for teacher continuous professional development.

### **4. Research Questions**

Based on the problem mentioned earlier, the research questions are:

1. What are the gaps in policies and initiatives for teachers' professional development in Bangladesh?
2. What types of personal activities are needed for teachers' continuous professional development?
3. What types of college-based activities are needed for teachers' continuous professional development?
4. What types of policy improvements and activities are needed for teacher's Continuous Professional Development (CPD) in Bangladesh?

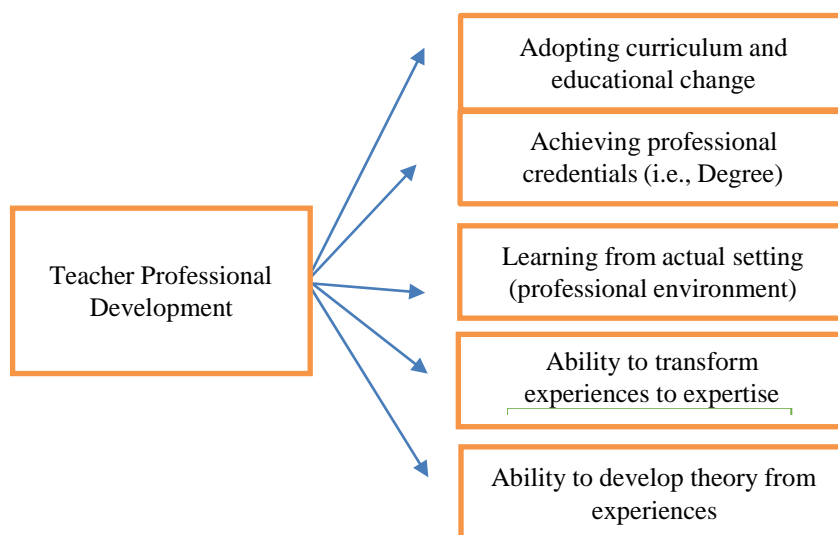
### **5. Literature Review**

#### ***5.1 Teaching as a Dynamic Profession***

The nature and scope of the teaching profession and its responsibilities have been changed over time and will continue to change. In the 21<sup>st</sup> century, knowledge is no longer confined to books and teachers. Likewise, the content of the curriculum is not limited to any specific textbook. That is why; teaching is being more challenging and skill oriented. Hence, teachers must be expertized in their fields

and become facilitators in constructing knowledge in the classroom rather than delivering textbook knowledge. For this reason, teachers need a long-term training to adapt to the extensive change in education. Craft (2002) states that “being a professional means taking responsibility for identifying and attempting to meet the professional needs of oneself and one's institution.” The term „professional“ includes an enhanced level of autonomy and responsibility. Hargreaves (2003) remarks that the development of teachers' professionalism is varied in different parts of the world. For the last few decades teaching profession have witnessed a move towards school-based professionalism emphasizing collaboration among colleagues. Globally, the education policies of each country have become more competitive and teaching profession have become more dynamic.

### 5.2 Teachers' Professional Development (TPD)



**Figure-2:** Indicators of Teachers' Professional Development

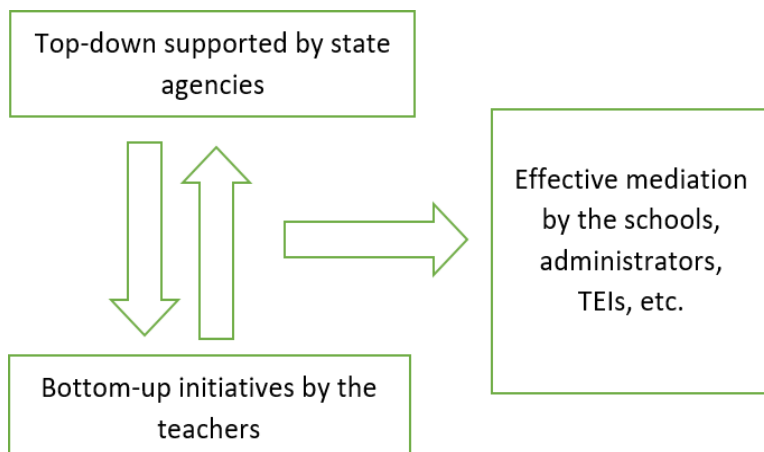
*Source: Author (utilizing the study of John & Fargo, 2017; Whinkler, 2001; Penuel et al., 2011)*

Teachers develop their knowledge and skills within changing circumstances and taking new responsibilities. The above discussion can be summarized that teacher's professional development indicates teachers' teaching, pedagogical and professional competence. In developed countries, pre-service education for the teacher is mandatory and in-service training is also emphasized for teachers'

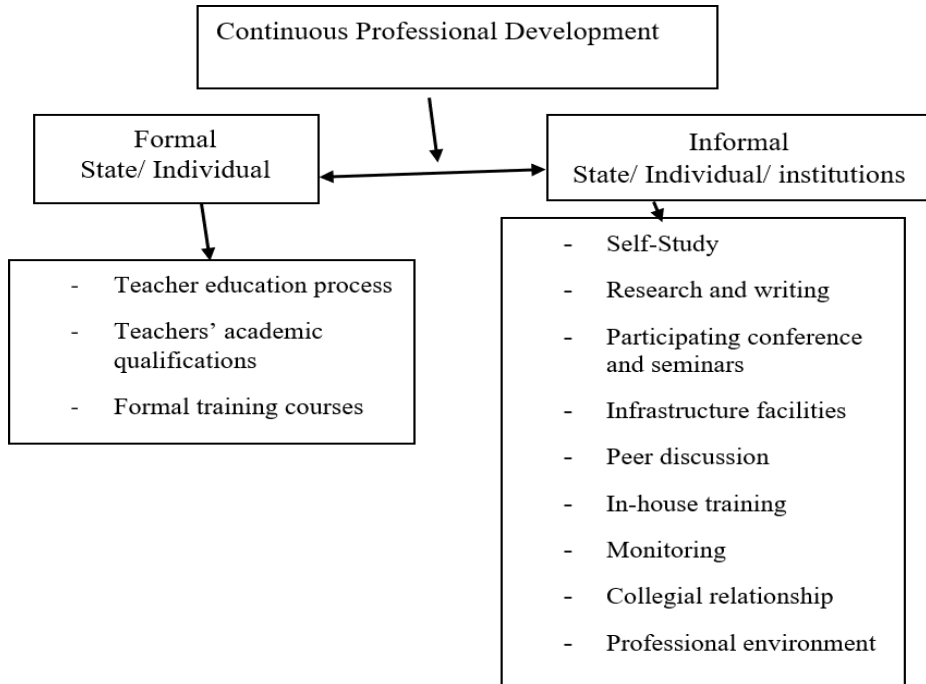
professional development. For example, Japan's public-school teachers are legally obligated to engage in continued professional development (Yamasaki, 2016). In the least developing countries, like Bangladesh, in-service training (INSET) is the leading element for teachers' professional development. Still, there is a lack of obligation and motivation to engage in continued professional growth.

### 5.3 Teachers' Continuous Professional Development (CPD)

CPD is ongoing process through which professional remains up to date by augmenting and enhancing their competence. According to Sachs (2016), teachers' CPD is central to the practice of teaching and responding to the continuous challenges that teachers face. Therefore, teachers must be involved in multifaceted professional development activities. Zepeda (2016) stated that CPD activities consist of in-context informal learning experiences and planned formal activities to benefit the individual, group, or school, contributing to the quality of education. These settings provide a comprehensive insight that teachers can acquire CPD through on-the-job training, at home, and in the classroom/workplace. Therefore, CPD incorporates a broad range of learning activities that can be achieved by both formal and informal experiences and activities. Therefore, teachers' professional development remains in shared responsibility.



**Figure-3:** Shared Responsibility for Effective CPD



**Figure-4:** Formal and Informal Continuous Professional Development (CPD) Activities

Source: Author (Utilizing the research of Gartia & Sharma, (2013), Saches (2016), Park & So (2014).

#### **5.4 Teachers' CPD Activities in Bangladesh Context**

Over the last decade the national government and development partners have invested significantly to modernize and improve the teacher education system (ADB, 2017). The maximum investment has been used for the infrastructural development of educational and training institutions. A remarkable amount is paid for the primary and secondary teacher professional development. Very little emphasis is paid for the technical and policy improvement regarding teachers' Continuous Professional Development (CPD). Although few studies have raised the issue of inadequacy of teacher training, very few policies and informal initiatives have been launched to make the ongoing training learning effective. According to National Education Policy (NEP) 2010, "The existing teacher training system of our country is very traditional, insufficient, certificate-based, loaded with theoretical knowledge, incomplete in practical learning, based on

rote learning and conventional testing system." Therefore, teacher education policy, including the teacher training system, seems not standardized. There are only few research on CPD which are conducted from secondary sources do not reflect the views of teachers, principals, and training specialists.

Researcher/ writer	Research/ article Title	Methods	Participants	Results
Kazi Enamul Hoque, Gazi Mahabubul Alam & Abdul Ghani Kanesean Abdullah	Impact of teachers' professional development on school improvement—an analysis at Bangladesh standpoint	Questionnaire survey	From 127 city secondary schools 127 principles 694 teachers	Put more emphasis on teachers' collaboration, in-service training and classroom observation and less emphasis on individual action enquiry for professional development.
M Mahruf C Shohel & Frank Banks (2010)	Teachers' professional development through the English in action secondary teaching and learning program in Bangladesh: Experience from the UCEP schools	Mixed method	school administrators (SAs), teachers and students.	Open and distance learning (ODL) are contributing significantly to TPD as an in-service training
Nazneen Akhter & Shafiqul Alam	Status of Teachers Education and Training at Secondary Level of General Education in Bangladesh	Secondary data analysis	(BANBEIS)	There is increasing trend of trained teacher in Secondary Schools.
Ajay Kumar Singh, Irfan Ahmed Rind, and Zia Sabur 2020	Continuous Professional Development of School Teachers Experiences of Bangladesh, India, and Pakistan	Secondary data analysis	Data from different sources	This study indicates approaches, modalities, and institutional arrangements for teachers' professional development.
Mohammed Shamim Khan, PhD January 2021	Continuing Professional Development for Strengthening Teachers' Classroom Performance in Teachers' Training Colleges	Secondary data	Author	Importance and the responsible factors and suggestions in the implementation of CPD in higher education.
Asian Development Bank (ADB)-2017	Innovative strategies for accelerated Human resource development In south Asian teacher professional development special focus on Bangladesh, Nepal, and Sri Lanka	Secondary Data	ADB	Increased attention and substantial investment in strengthening teacher professional development as a crucial and integral strategy to achieve quality
Ministry of Primary and Mass Education (MoPME)	Report on Continuous Professional Development (CPD) For Primary teachers, teacher Educators and Education Supervisors	Desk Review	Ministry officials	This report has ongoing projects activities and status and challenge of CPD of primary school teachers in in Bangladesh.

The above-mentioned studies have shown the importance of the formal training intervention, but the practicing of informal CPD activities in college level and taking policy measures to facilitate CPD activities for teachers did not address effectively.

## **6. Methodology**

This study followed a mixed method approach. Samples were selected purposively ensuring representative population. Total 200 college teachers and 11 persons were the main respondents of the survey questionnaire and interview respectively. This study dealt with the Higher Secondary School (11-12 grade) teachers. The reasons for selecting the Higher Secondary level is:

- participants have similar background experiences and qualifications;
- author's first-hand experience leads him to believe that training learning did not come into practice accordingly;
- this level's teacher's quality is significant in ensuring quality education.

The questionnaire has prepared on the basis of the philosophy of teachers' professional competences and international standard CPD activities implemented by the works Al-Lamki, N. (2009) on thousand teachers in Oman. Total eleven (11) interviews have been conducted from principals, college teachers and training specialists. Every tool was tested before finalizing at the field level.

The author developed a survey questionnaire in Microsoft Form to collect survey data online due to the COVID-19 pandemic and social distance issues. In this Form, all the responses had been gathered in the response sheet by the default-in system. The author used social networking like Facebook, Messenger, Whatsapp and Email for collecting questionnaire data. Interviews were conducted through „Zoom Application“ just after finishing the questionnaire survey. The author considered several issues in selecting interviewees like availability of the respondents, individual affiliation and smooth online accessibility.

Several strategies suggested by various researchers (Cohen et al., 2007) were maintained in this study to ensure reliability. For instance, the author adopted a 'precise yet flexible' approach in conducting an interview where the author asked a specific question that was varied from respondent to respondent to personalise each interview's nature. Those strategies built up a reliable picture in both questionnaire and interview that helped enhance reliability differently. Additionally, aggregating the different data sources and involvement of other groups helped providing a broad picture of the views and opinions regarding teachers' CPD activities.

Various procedure for approaching data analysis (Cohen et al., 2007) were used for similar purposes of supporting the research argument. In this study, for questionnaire data, simple Statistic Package for Social Science (SPSS) was used

for descriptive statistics (means, standard deviations, frequency distributions). Interview data were brought into one document coded (Rubin & Rubin, 2011) and classified by questions and themes for understanding the pattern of data responses.

## 7. Findings

### 7.1 Respondents Profile

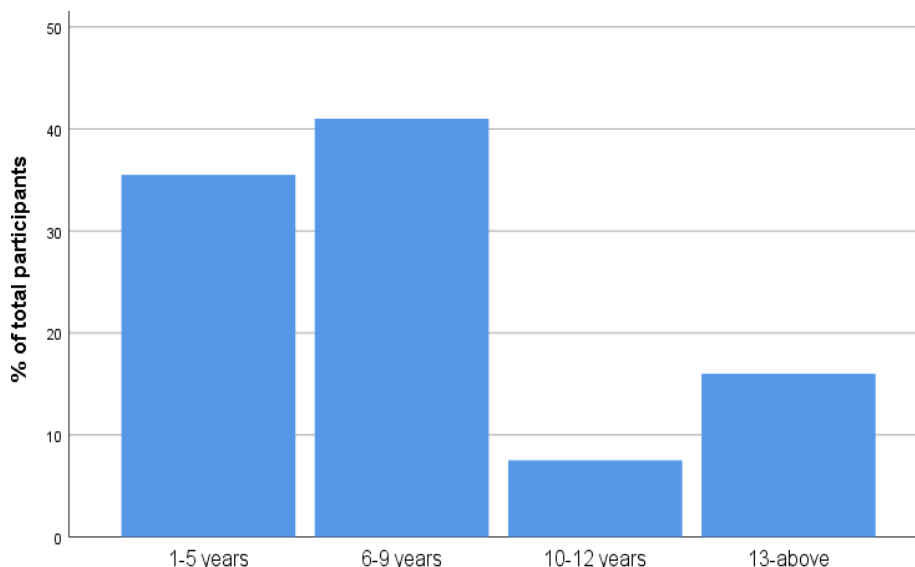
The survey questionnaire consisted of two parts. In first part of the questionnaire survey, respondents were asked about the gender, college types, year of service experiences and workplace. Among 200 respondents, 157 (78.5%) were government college teachers and 43 (21.5%) were non-government teachers. Regarding gender, the data contains 173 (86.5%) male and 27(13.5%) female participants.

**Table-1:** Table Distribution of Respondents by Gender, Region and Types of College

Division	Number of districts	Number of Respondents	Types of institution		Gender		Percentage of total Respondents
			Government	Non-government	Male	Female	
Dhaka	13	37	32	5	31	6	18.5%
Chattogram	11	38	32	6	34	4	19.0%
Barisal	06	13	13	0	11	2	6.5%
Khulna	10	66	34	32	60	6	33.0%
Rajshahi	08	18	18	0	13	5	9.0%
Rangpur	08	15	15	0	13	2	7.5%
Mymensingh	04	4	4	0	3	1	2.0%
Sylhet	04	9	9	0	8	1	4.5%
Total	64	200	157	43	173	27	100.0%

The participants had 6-13 above years of experience (76.5%) in teaching professions. It is signifying that the participated teachers were already experienced in different training and various activities to develop their skills.





**Figure-5:** Participants Distribution Based on Year of Service Experiences

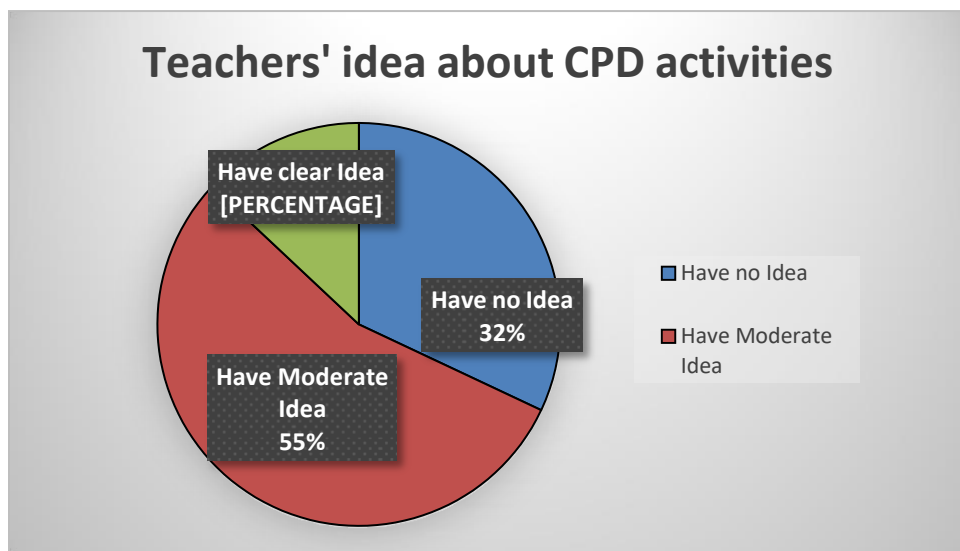
Table 2 shows that among the respondents, 19 (9.5%) of 200 did not receive any training yet. For those who participated in different training programs, teachers' participation in the Computer and Multimedia training (4.44) received the highest mean scores, while 'others training' (3.35) received slightly more than average scores.

**Table-2:** Mean Scores of Respondents in Participating Different Trainings

Mean scores of respondents participating different related trainings						
		Subject based training	Computer & Multimedia training	Classroom management and student counselling	College Management and administrative Training	Others training
N	Valid	181	181	181	181	181
Mean		2.83	4.44	2.67	2.23	3.35
Std. Deviation		1.255	.626	1.048	.965	1.010
Variance		1.576	.392	1.099	.932	1.019

**7.2 Teacher's Understanding of CPD activities**

The second part of the questionnaire consists of 10 items under 3 dimensions with 3-to-5-point rating scale. All the sampled respondents were asked about the perception regarding personal and college-based CPD activities. The values of teachers' idea for rating scale were set as „No Idea“=1; „Moderate Idea“= 2; „Clear Idea“= 3



**Figure-6:** Teachers' Idea about Continuous Professional Development

The figure parades that among the 200 respondents, 65 (32%) had no idea about CPD; 110 (55%) had a moderate idea, and 25 (13%) had a clear Idea. That means teachers are not formally aware of the detailed concept of their CPD. Interviewees had theoretical idea about CPD of teachers. They commonly expressed their views that CPD adapts teachers' teaching competence to the changing educational pattern through training.

**Table-3:** Frequency of Taking Multimedia Classes

Conducting multimedia class	Number of respondents	Percentage (%) of the response
Never	28	14.0%
No need	19	9.5%

Sometimes	122	61.0%
Regular	31	15.5%
Total	200	100.0%

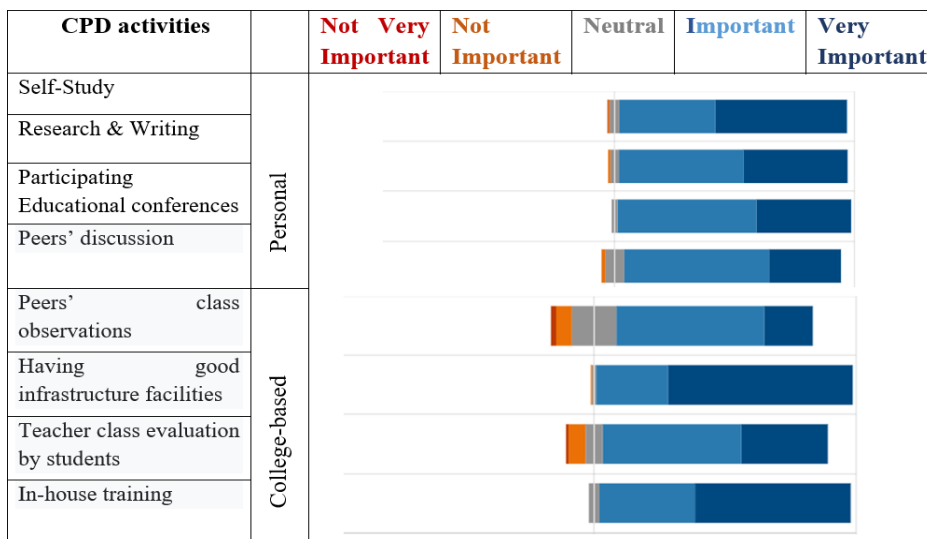
Table 3 shows that only 31 (15.5 %) teachers conducted multimedia classes in the class, 122 (61.0%) of them used sometimes, 19 (9.5%) thought there is no need of using multimedia and 28 (14.0%) never conducted multimedia class. It means performing multimedia class is very low at college level. These were manifested by the words of interviewees. There is lack of monitoring and infrastructure facilities for taking the multimedia class.

### 7.3 Teachers Perceptions of CPD activities

In the questionnaire survey, two questions with four statements each, asked teachers to rate various CPD activities according to their level of importance for teachers’ professional development. The values of rating scale were set as 1=Not Very Important, 2=Not Important, 3=Neutral, 4=Important, 5=Very Important. Statistics show a strong positive inclination regarding the importance of the inserted activities for teachers’ CPD. Among those activities, respondents' mark 'very important' to the 'self-study', 'having good infrastructure facilities' and 'In-house training'.

**Table-4:** Teachers' perceptions of personal and college-based activities

		Personal Activities				College-based activities			
		Self-Study	Research and Writing	Participating Educational conference	Peers' discussion	Peer Class Observation and counseling	Having good Infrastructure	Class performance Evaluation by student	In-house Training
N	Valid	200	200	200	200	200	200	200	200
Mean		4.49	4.38	4.37	4.19	3.84	4.68	4.11	4.56
Std. Deviation		.650	.606	.533	.637	.867	.528	.859	.573
Variance		.422	.367	.285	.406	.752	.279	.738	.329
Percentiles	25	4.00	4.00	4.00	4.00	3.25	4.00	4.00	4.00
	50	5.00	4.00	4.00	4.00	4.00	5.00	4.00	5.00
	75	5.00	5.00	5.00	5.00	4.00	5.00	5.00	5.00



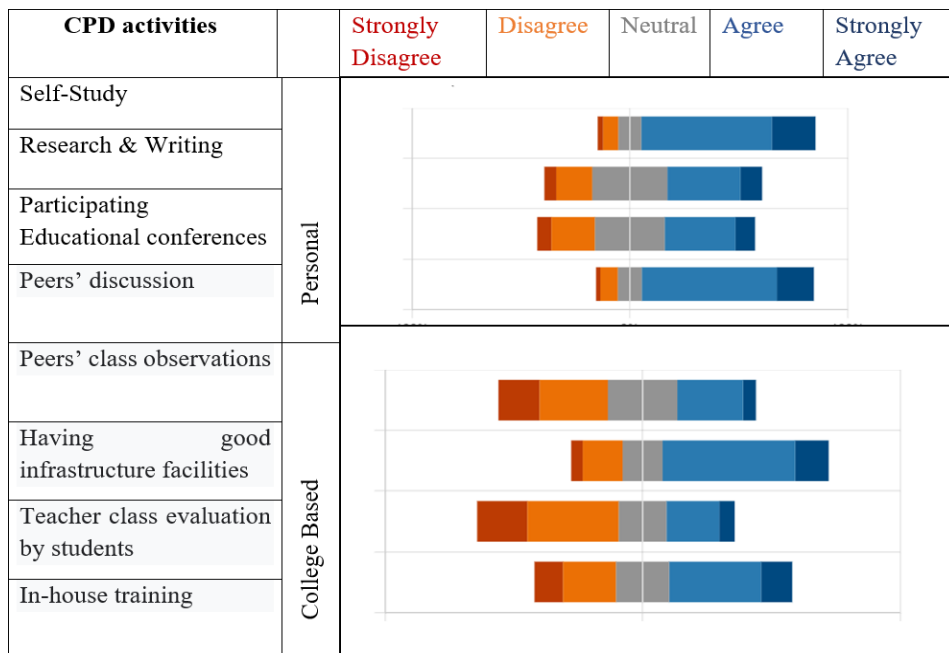
**Figure-7:** Teachers' tendency to put importance on different CPD activities

The table shows infrastructure facilities (4.68), inhouse training (4.56), self-study (4.49), research and writing (4.38), and Participating in Educational conferences (4.37) received relatively high mean scores. The rest of the CPD activities, peers' discussion (4.19), 'Class performance evaluation by students' (4.11) and 'Peer class observation' (3.84), received relatively low mean scores. According to the respondents, all the mentioned CPD activities are essential for the teachers' professional development. In open-ended question, total of 136 (68%) responses had been covered by the questionnaire. 'Doing action research' and 'teachers' collaboration' had newly added by some of them. One of the interviewees raised the concept of conducting 'small-scale action research' in the classroom to enhance teachers' professional skills. All interviewees have manifested the indicated activities as essential for teachers' CPD.

**7.4 Teachers' Current Practice of CPD Activities**

The third part of the questionnaire includes 8 items under 2 dimensions, mainly focuses the tendency of current practices of the sampled teachers CPD activities. The values of rating scale were set as 1=Strongly Disagree, 2= Disagree, 3=Neutral, 4=Agree, 5= Strongly Agree. Statistics show a strong positive





**Figure-8:** Inclination of teachers' current practiced CPD activities

The above table illustrates that among the mentioned personal and college-based CPD activities, 'Peer Class Observation and counselling' (2.77) and 'Class performance Evaluation by the student' (2.58) received the lowest mean scores. 'Having good Infrastructure' (3.53), 'Self-Study' (3.88), and 'Peers' discussion' (3.84) received comparatively high mean scores. The remaining CPD activities, i.e., 'Research and Writing' (3.26), 'Participating in Educational conference' (3.18) and In-house Training (3.17), received a slightly high than average score. Therefore, the table informs about the teachers' participation in different CPD activities for their professional development is significantly lower than their putting importance.

**7.5 Gap Between Perceptions and Practices of CPD Activities**

It is observed in the previous discussion that teachers' perceptions regarding the CPD activities are satisfactory but their practices according to their perceptions are frustrating. The statistics on teachers' personal and college-based activities show a significant difference between the perception and current practices for their CPD.

**Table-6:** Mean Difference between Perceptions and Practices of CPD Activities

Types of Activities	CPD activities	Perceptions (Mean scores)	Perception Average Mean	Practices (Mean scores)	Practices Average Mean	Perception & Practices (Mean differences)	Average (mean differences)		
Personal CPD activities	Self-Study	4.49	4.33	3.88	3.28	0.61	0.81		
	Research and Writing	4.38		3.26		1.12			
	Participating educational conferences	4.37		3.18		1.19			
	Peers' Discussions	4.19		3.84		0.35			
College-based CPD activities	Having Good infrastructure	4.68		4.33		3.53	3.28	1.15	1.29
	In-house training	4.56				3.17		1.39	
	Class performance evaluation by students	4.11				2.58		1.53	
	Peer class observation and counselling	3.84				2.77		1.07	

The table shows that in terms of all personal activities, the mean difference is relatively low especially regarding self-study (0.61) and peer discussion (0.35). Therefore, teachers primarily enhance their professional skills mostly through 'self-study' and 'peer discussion'. On the other hand, the mean difference between perception and practices is relatively high in college-based activities, especially 'class performance evaluation' (1.53) and 'in-house training' (1.39). That indicates that teachers have low involvement in 'In-house training' and 'class performance evaluation'.

Overall, personal CPD activities (0.81) received a lower mean difference between perceptions and practices than college-based CPD activities (1.29). That indicates college-based CPD activities are practised weak than personal CPD activities. There is a significant gap between the mean scores of perceptions (4.33) and practices (3.28) of personal and college-based professional development activities for teachers' CPD. It is proved that those teachers consider personal and college-based activities essential for their professional development, but they cannot practice accordingly. From the viewpoint of interviewees, there are the dearth of several required and motivational policy and instructions to boost the teachers in personal and college-based activities for their professional development.

## 8. Discussion

All the participants accredit the importance of personal and college-based CPD activities in addition to formal training program including the sound professional environment. College infrastructure facilities received the highest importance among all personal and college-based CPD activities. In interview, one of the college teachers shared the demerits of inadequate college facilities; he said,

“Although we received computer & multimedia training to perform multimedia class, we forget everything due to not having opportunities for conducting class in our college accordingly”.

Previous research found about 41% of secondary institutions in the country neither have a multimedia classroom nor an ICT lab. Among teachers who use multimedia, two-thirds stated several difficulties in using such technology in the school including power failure, lack of adequate training, defective equipment, and materials (CAMPE, 2019). In the interviews, training specialists justified the importance of available infrastructure.

Respondents stretch second-highest importance to in-house training for teachers' CPD. Statistics show that teachers are commonly urged to provide "professional training" in the name of 'regular training', 'overseas training', and 'need-based training', to improve the quality of the teacher. Indeed, teachers argued the practical implications of in-house training on need-based diversified aspects. Through in-house training, the teacher can scaffold one another by disseminating knowledge. In-house training works as the Zone of Proximal Development (ZPD)<sup>3</sup> where individuals learning together by sharing each other. Learners discover and internalise new concepts, psychological tools, and skills through collaborative endeavours with more skilled persons (Wertsch, 1984). One of the interviewees from the best college in Bangladesh, argued that in-house training is convenient and even common place for learning from each other and a silent competitive ground for skill development. Therefore, practising need-based in-house training is a must for the teachers' overall collaboration and professional development. Self-initiatives act as one of the catalysts of any success. One of

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<sup>3</sup> ZPD, the concept of Lev Semenovich Vygotsky, emphasizes learning together and scaffolding one another to do well in a particular context.



the interviewees attached great importance to self-study taking much about self-devotion; he said,

“Teachers should be curious and proactive about their skill development; they should search for 'online' or 'offline' training. Unfortunately, the Ministry of Education (MOE) didn't develop any roadmap for teacher career-wide competence-based training framework so that teachers become aware of their professional needs”.

This study also shows that teachers typically depend on self-study to enhance their teaching skills. In this regard, interviewees agreed that teachers' content knowledge of their subject and competency-based pedagogical training may help them. Interviewees also contended that a curriculum-based skill should be identified for teaching competence to construct teachers' self-study. The author found a checklist of individual professional competencies for teachers' CPD in the Japanese education system (Yamashita, 2016). Banks and Smyth (2014) show that opportunities and challenges for career advancement can motivate teachers to voluntarily engage in self-study their professional development.

Research is the source of knowledge and expertise. Although University Grant Commission (UGC) demanded that authority allocates an enormous amount of money for research activities yearly, educationists complained that the allocated money is relatively low and comes with strict conditions for research activities. In this sphere, interviewees argued that it is complicated to engage all teachers in large scale research offered by UGC, but to involve in small-scale 'action research' is very affordable for the teachers in college. In the open-ended question section, respondents also emphasised the need for action to initiate research in the classroom as a source of professional development. Clark and Hollingsworth (2000) believes that 'action research is one of the adequate learning opportunities for teachers.

Participating in school-wide research activities and academic conferences upgrades teachers' skills because education research continuously improves education. For example, in Japan, „*Konai Kenshu*’ (School-wide professional development), a form of co-operative research is conducted in every school, all teachers participate in joint research to improve education at school, and the results are shown in public meetings held by more well-known schools. Reports are printed and distributed to other schools and the local board of

education. "National Education Policy (NEP) of 2010 has mentioned establishing the Regional Academy for Educational Management (RAEM) that will accelerate teachers' professional development activities locally. Local training institutions can accelerate research activities and organize education conference". Therefore, central and local initiatives may be effective for encouraging teacher to engage in professional development activities.

Peers' discussion is the robust informal ways of sharing knowledge. In Japan, there are large staff rooms where all teachers gather to engage in school-wide practical and cooperative research. This gathering improves teachers' skills and expertise, fosters teamwork among teachers, and positively impacts school administration (Yamasaki, 2016).

This study reveals that teachers have less experience in class performance evaluation. Principals are neither legally authorized nor self-motivated to introduce class performance evaluation. Except for Annual Credential Report (ACR), which does not fully reflect teachers' professional competencies, there is no evaluation system. In the name of monitoring, the central authority only inspects and monitors the administrative affairs of the institutions, not teachers' professional matters. In this regard, most interviewees agreed that teacher performance evaluation systems are needed for teachers' CPD, either student-centric or administrative. One of the interviewees stressed that teachers are always effective facilitators. If there is a system to evaluate teachers by any means, the teachers will always enhance their related skills. One principal of a non-government college said that he tried several times to arrange in-house training for ICT but failed because most of them have no laptop. Teachers come to college only to take classes, after class goes away, and engage with another source of income because the salary is inadequate to lead their lives. Consequently, they cannot fully concentrate on his profession, he added. Therefore, teachers' salaries and other facilities should increase. For instance, in Japan, teachers' salaries are approximately 4% higher than the average college-educated civil servants (Yamasaki, 2016). At last, it can be concluded infrastructural facilities, In-house training, Self-study, Research & writings, Participating educational conferences, Class performance evaluation, principals' leadership received great importance for teachers' career long continuous professional development.

## **9. Limitations and the Scope of Future Research**

It is important to mention some methodological and unavoidable limitations of this study. The limitations are discussed below,

1. The collected data did not ensure proportional representation. Among the targeted population of this study, almost 50% of teachers are non-government, but due to unavoidable barriers, in this study, they represent only 21% of the whole data. Results derived from a perfect representation of the population might be more reliable.
2. Due to online survey questionnaire; there was no way of supporting respondents to make understand if they needed assistance. It was noticed that respondents could not understand some questions well. So, they could not answer appropriately. If they understood the merit of the question correctly, the findings might be more reliable.
3. Interview participants were limited to only eleven (11) that could not reflect the comprehensive view of this study.

In this study, students' and guardians' voices were not investigated. Thus, an empirical study can be conducted to justify the importance of those activities on students' learning.

## **10. Conclusion and Recommendations**

This study sought to measure teachers', principals' and training specialists' perceptions of personal and college-based CPD activities influencing CPD take-up. This study has paid a little effort to explore the importance of different CPD activities. The findings of this study have some policy and practical implications on CPD activities and can provide an argument base for future policy making.

1. National Teacher Education Council' should impose a solid career-long plan with curriculum-based comprehensive training programs for the professional development of teachers.
2. To provide comprehensive training and instructions to the principals and teacher leaders on teachers' CPD activities to play a significant role in arranging, pursuing, and conducting college-based CPD activities.
3. To introduce a few days of a training program (contents including philosophy of teaching and education, the process of student development etc.) for newly recruited teachers before entering the class as a teacher.

4. To provide subject-based pedagogical training to teachers as early as possible to offer quality teaching to the students and teaching license and certification should be introduced.
5. A list of teaching and professional competencies should introduce and maintain as performance standards for the teachers. Those competencies will stimulate and expand self-awareness concerning their competencies.
6. Throughout the career, teachers should be transferred to different colleges to contribute to their professional growth and expertise.
7. To introduce individual competency-based career paths for promotion or professional upliftment so that teachers become self-motivated to engage in multi-dimensional self-study. Yearly „Individual's Professional Plan“ should be introduced for teacher professional development.
8. In every college, all teachers should join a faculty-wide collaborative research or small-scale action research on various educational topics and organize a regional yearly academic conference for sharing each other colleges' research reports. To motivate joint research activities, 'Research Leave' should be granted weekly to interested teachers.
9. To ensure required facilities such as standard class size, internet, multimedia classroom, learning equipment, library with required book etc.

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## Socio-economic Status and Women's Reproductive Health: A Study on Rural Areas of Bangladesh

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### Abstract

*The policy design for eliminating gender inequality from capital factors of socioeconomic status (CAPSES) has been prioritized in recent sociological studies. Hence the aim of this study was to determine the reproductive health behavior of women in rural areas of Bangladesh based on human capital, social capital and material capitals. For this purpose, data were collected from 382 rural women aged 15-49 years from the selected areas. The data were gathered using a simple random sampling and survey method. Then the collected data were analyzed through Smart PLS software. According to the coefficient of determination value ( $R^2$ ), this model can explain 31.8 percent of reproductive health behavior of women in the study areas and  $Q^2$  value (0.204) indicates that reproductive health behavior has significant predictive power. Thus, the study finds that women with high socioeconomic status have better reproductive health behavior than those of the poor socioeconomic status. As such this study suggests, firstly the government should emphasize on more campaign for creating awareness among the rural women who belong to lower socio economic status. Secondly, government should focus more on the women empowerment in terms of rural area. And finally, sociologists should conduct further studies in this field to reduce limitations of this study and contribute to the scientific and social sector regarding reproductive health behavior of women in the rural areas in Bangladesh.*

**Key Words:** CAPSES Model, Reproductive health behavior, Human Capital, Social Capital, Material Capital

### 1. Introduction

The phrase 'reproductive health of women' is a trendy issue of public health (George, Terrian and Ahmed, 2014). In 1994, the International Conference on

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Population and Development (ICPD) and the United Nations adopted the notion of reproductive health along with the concept of sexual health and reproductive right (Chandra-Mouli *et al.*, 2015). Reproductive health is defined as a condition of complete physical, mental, and social well-being at the end of the procedure (Fathalla, 1992). In Bangladesh, rural women suffer from various types of illness in the domain of reproductive health (Ross *et al.*, 2010). Thus, reproductive health requires special attention from the public health experts (Fathalla, 1992). In 2010 per 100000 live births, the maternal mortality was 194 (Rahman *et al.*, 2017). A report of Bangladesh Demography and Health Survey (BDHS 2019) claimed that 62 % of married women of Bangladesh use contraceptives for family planning (NIPORT and ICF, 2019). In comparing 27 % of births were attended by medically trained personnel in 2010. This percentage has increased to 50 % in 2016 (NIPORT, ICDDRDB and Evaluation, 2017). Comparing 11 % of deliveries in private facilities in 2010, the percentage was 29 % in 2016 whereas the statistics in the public sector was changed from 10% to 14%. From 2010 to 2016 the percentage of C-section deliveries increased from 12% to 31% (NIPORT, ICDDRDB and Evaluation, 2017).

The WHO estimates that 45000 maternal fatalities occurred in India in 2015, making India the country with the second highest number of maternal deaths, following Nigeria (Kanchan *et al.*, 2019). World Health Organization (2018) report states that low- income and middle-income countries account for 99% of maternal fatalities (Parsekar *et al.*, 2019). Bangladesh, India and Nepal have high rates of poverty and for a variety of reasons, income-expenditure inequality and opportunity.

This inequality had an impact on education, health, and other aspects of development (Parsekar *et al.*, 2019). In India, it has been found that rural women are more likely to experience infertility than urban ones (Patra & Unisa, 2020). It has been observed that rural women experience delays in getting treatment due to informational gaps, insufficient infertility services, and the presence of reproductive tract infections (RTIs). Furthermore, research has revealed that most rural women who seek treatment for infertility receive traditional or cheaper, basic medical care (Patra and Unisa, 2020).

However, this is high time to predict the reproductive health status of women depending on the CAPSES factors as suggested by Oakes and Rossi (2003) who found in their study that human capital, material capital and social capital (CAPSES) were parts of socioeconomic status. They asked to use these capital factors for the interpretation of health behavior in social science. There are various uses of this model in the health sector throughout the world. But in the

context of Bangladesh, Azad (2018) examined the usefulness of these CAPSES factors to predict the rubella vaccination behavior (Azad, 2018). But still now, CAPSES model has been unexplained in the field of reproductive health of women in the rural areas of Bangladesh. So, the study attempts to predict the reproductive health status of women based on CAPSES factors.

## **2. Rationale of the Study**

This study contributes not only to the reproductive health of women in Bangladesh but also to the sociology of health and gender inequality. Thus, this study add value to explain reproductive health of women in Bangladesh depending on CAPSES factors. And this study also helps developing effective policies so that rural women can adopt better reproductive health behavior in Bangladesh.

## **3. Literature Review**

The concept of sound reproductive health denotes physical, mental and social wellbeing and does not mean only the absence of illness linking with the reproductive health (World Health Organization, 1997). Fathalla (1992a) classified reproductive health in terms of the people's ability to reproduce, regulate their fertility and sustain sexual relationships. A study of Canada defined reproductive health behavior as personal views, attitudes, and perceptions, as well as any behaviors or acts that may lead to the preservation, improvement, or restoration of health (George, Terrion and Ahmed, 2014). Overall, Mercer *et al.* (2013) and Kim *et al.* (2018) saw the reproductive health behavior as the natural traits developed via learning about sex and sexuality, such as personal views, perceptions, and sexual manifestations. In the context of South Asian countries, Hotchkiss (2013) understood the reproductive health behavior in terms of contraception before first childbirth, pregnancy termination, undesired pregnancies, four or more antenatal visits, delivery by competent professionals and institutional delivery. Islam and Gagnon (2016) mentioned some other indicators of reproductive health, such as, married women's current use of modern contraceptives, Antenatal Care (ANC) used during the previous pregnancy, treatment sought for sexually transmitted infections (STIs), modern birth facilities, medical check after birth, and vitamin A after birth (Islam and Gagnon, 2016).

According to numerous research, age, marital status, wealth, educational level, and parity all have a significant impact on women's reproductive health behavior (Adhikari, 2010; Mehdi *et al.*, 2012; Rai *et al.*, 2014). Many studies have shown that the components of CAPSES have a great influence on people's disease and health (Oakes and Rossi, 2003). Based on Coleman's (1990) social theory, Oakes

and Rossi (2003) defined SES as diversified possession to expected resources. They were highly tense about how social position can construct the social structure and how such position motivates people to acquire them (Coleman, 1990; Oakes and Rossi, 2003). As a result, they asserted that this diversity of interest and possession over resources leads to social inequality, which they divided into three categories: (1) material and monetary goods, (2) skills and talents, and (3) social relationship strengths. As a result, they advocate for the equation of  $SES = f(\text{Material Capital, Human Capital, and Social Capital})$  (Oakes & Rossi, 2003).

There are few studies that explained how capital factors affect the reproductive health behaviors of women in rural areas of Bangladesh. So, the study explains the reproductive health behavior of women in rural areas of Bangladesh based on CAPSES factors.

#### **4. Research Objectives**

The main goal of the research is to assess the reproductive health behavior of women in rural areas of Bangladesh based on three capital factors of socio-economic status (CAPSES) namely the human capital, social capital and material capital.

#### **5. Research Methodology**

##### ***5.1 Study Areas***

The study was conducted in two sub-district or Upozila (Pangsha and Kalukhali) of Rajbari district. Four unions namely Babupara and Maurat union under Pangsha Upozila and Madapur and Ratandia union under Kalukhali Upozila were selected by lottery method.. The total population of the study areas was 72799 among them total women were 35362. According to BBS 2018 data 54.7% of women belongs to reproductive age. Thus, total number of reproductive age women in the study area were 19,343. We selected an equal number of respondents from each of the unions randomly. Since the study population was finite, two steps of Cochran's formula were followed to determine the sample size. After conducting step 1 the initial sample size stands at 385, then the second step of the formula was used to finalize the sample size. Finally, the sample size was determined 382.

### 5.2 Research Design

The study employed a survey method for data collection. The survey questionnaire was based on (1) socio-demographic statuses of the respondents; (2) Social Capital (SC); (3) Material Capital (MC); (4) Human Capital (HC); and (5) Reproductive Health Behavior in the research area. For a better understanding of the magnitude of the respondents' behavior, a 5-point Likert Scale (e.g., strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, and Strongly Agree=5) was employed in this study to convert qualitative data into quantitative one. Based on the research objectives and questions as well as considering the gap of the existing literature, the study was designed through the proposed model below:

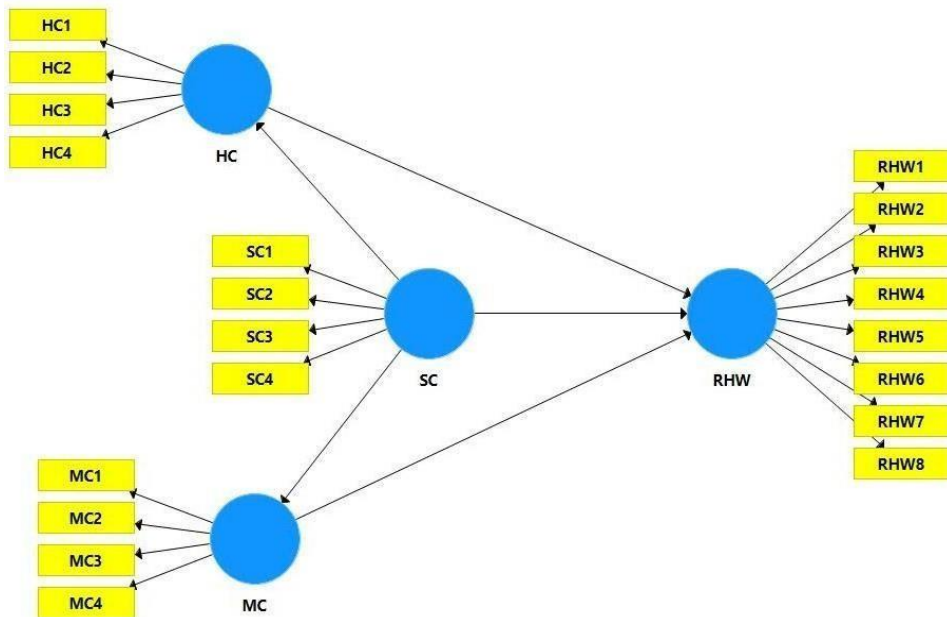


Figure – 1: Hypothesized Model *Reproductive*

### Health Behavior

Use of Contraceptive (RHW1), Pregnancy Termination (RHW2), Multiple Unwanted Pregnancies (RHW3), Four Antenatal Visits (RHW4), Skilled Personnel (RHW5), Institutional Delivery (RHW6), Medical Checkup after Child Birth (RHW7), and Vitamin-A after Birth (RHW8) was used to measure reproductive health behavior.

**Human capital**

Human capital was measured by individual competency (HC1), knowledge (HC2), physical abilities (HC3) and academic achievement (HC4).

**Social Capital**

To assess Social Capital, the social network (SC1), trustworthiness (SC2), status (SC3), and power (SC4) was maintained.

**Material Capital**

Finally, for measuring the material capital construct indicators including real property (MC1), income from earnings (MC2), and income from investment (MC3), fungible goods (MC4) were employed.

**5.3 Research Instrument and Statistical Analysis**

A structured and semi-structured questionnaire was developed for data collection which consisted of 3 sections: 1) Socio-demographic characteristics of the respondents, like age, occupation, personal income, family income, number of children, and religion. 2) Capital factors of the socioeconomic status of the respondents was evaluated with 12 items and 3) characteristics of reproductive health of the respondents was measured with 8 items.

Measurement model and structural model has been analyzed by using Smart PLS software (Windows Version 3.3.2), after data collection. However, three steps are taken to measure the hypothesized model. At first, the internal consistency is assessed using composite reliability (CR) where all of the values are higher than the threshold value of 0.70 (Nunnally, 1994; Urbach and Ahlemann, 2010; Wong, 2013; Hair, *et al.*, 2016). Second, the convergent validity of those constructs is confirmed by the values of outer loadings, which required to exceed the acceptable threshold of 0.5 (Wong, 2013). Thirdly, the HTMT ratios have been used to test the discriminant validity of data where all of the results need to remain below 0.85 criterion. (Watson *et al.*, 1995).

Structural path coefficients were evaluated to understand relationships between dependent and independent variables of structural model where values need to be greater than the threshold value of 0.1 (Wong 2013). Without this there are another four steps to assess the structural model. First to avoid the problems of multicollinearity of independent variable variance inflation factor (VIF), values have been checked where the values should be less than 3 (Diamantopoulos and

Siguaw, 2006; Kock and Lynn, 2012). Here after T-statistics (higher than 1.96) and P values (less than 0.05) have been checked to understand the significant relationship among the variables. Then, to check explanatory power of independent variable coefficient of determination ( $R^2$ ) has been checked (Wong, 2013). Finally, Stone-Geisser’s  $Q^2$  has been employed here by using the Blindfolding method to measure the model’s predictive power or predictive relevance of the dependent variable RHW where the examined values were greater than the threshold value of 0 (Geisser, 1973).

**5.4 Ethical Consideration**

Ethical clearance was obtained from the ethical clearance committee before data collection. Researcher maintained research ethics. To avoid unethical issues, the study used references. Privacy and confidentiality were maintained. While surveying the respondents, no force or coercion was used.

**6. Results**

**6.1 Socio-demographic Status of the Respondents**

Table 1 shows that the highest percentage or nearly 42.9 percent of the respondents were aged from 31 years to 40 years, with regards to occupation, highest nearly 81.7 percent of the respondents were house-wife, In regards to women’s personal income in the rural area highest 77.5 percent women had no income, In terms of Family income in the rural areas highest 45.5 percent family of the respondent had income above 30000. In regard to several children of the respondent there were some 8.6 percent women had no child, 25.1 percent women had 1 child only, 38 percent had 2 children and 28.3 percent women had 3 or more than 3 children. And in terms of religion, almost 95.3 percent are found to be Muslim (Table 1).

**Table-1:** Socio-demographic Status of the Respondents

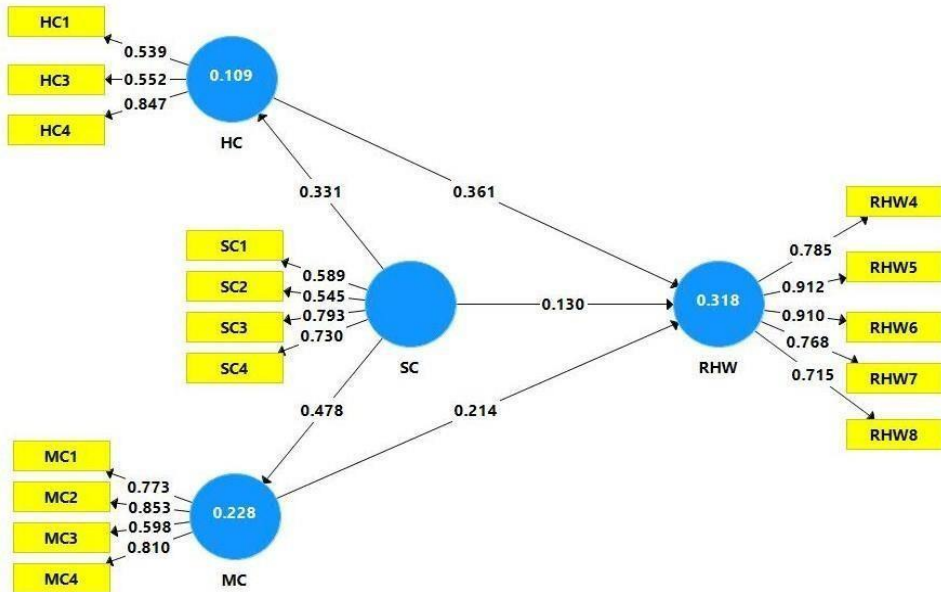
Socio-demographic Respondents	Feature of the	N	%
<b>Age</b>	15-20	<b>20</b>	<b>5.2%</b>
	20-30	<b>124</b>	<b>32.5%</b>
	30-40	<b>164</b>	<b>42.9%</b>
	40-49	<b>74</b>	<b>19.4%</b>

<b>Occupation</b>	Housewife	<b>312</b>	<b>81.7%</b>
	Private service holder	<b>25</b>	<b>6.5%</b>
	Govt. service holder	<b>11</b>	<b>2.9%</b>
	Others	<b>34</b>	<b>8.9%</b>
<b>Personal Income</b>	Have no income	<b>296</b>	<b>77.5%</b>
	1000- 5000	<b>42</b>	<b>11%</b>
	5000-10000	<b>20</b>	<b>5.2%</b>
	Above 10000	<b>24</b>	<b>6.3%</b>
<b>Family Income</b>	5000-10000	<b>7</b>	<b>1.8%</b>
	10000- 20000	<b>126</b>	<b>33.2%</b>
	20000-30000	<b>74</b>	<b>19.5%</b>
	Above 30000	<b>173</b>	<b>45.5%</b>
<b>Number of Children</b>	I have no children	<b>33</b>	<b>8.6%</b>
	1	<b>96</b>	<b>25.1%</b>
	2	<b>145</b>	<b>38.0%</b>
	3 or more than 3	<b>108</b>	<b>28.3%</b>
<b>Religion</b>	Muslim	<b>364</b>	<b>95.3%</b>
	Hindu	<b>18</b>	<b>4.7%</b>
	Buddhist		
	Christian		



### 6.2 Measurement Model

After Confirmatory Factor Analysis (CFA), it was found that the indicators of the dependent variable use of contraceptive, pregnancy termination, and multiple unwanted pregnancies and one of the indicators of Human Capital called physical ability are less than 0.5. That is why, these were omitted to develop the model. And then the final model was developed as given below:



**Figure – 2:** Measurement Model

**Table – 2:** Construct Reliability and Validity (explain the table contents)

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
HC	0.422	0.476	0.690	0.438
MC	0.756	0.768	0.847	0.585
RHW	0.880	0.906	0.912	0.675
SC	0.603	0.639	0.763	0.451

Since all of the values except HC1, HC3, SC1, and MC3 in terms of composite reliability are higher than the threshold value of 0.70 the internal consistency of the data has been validated (see table 2).

**Table- 3:** Outer Loadings

	HC	MC	RHW	SC
HC1	<b>0.539</b>			
HC3	<b>0.552</b>			
HC4	<b>0.847</b>			
MC1		<b>0.773</b>		
MC2		<b>0.853</b>		
MC3		<b>0.598</b>		
MC4		<b>0.810</b>		
RHW4			<b>0.785</b>	
RHW5			<b>0.912</b>	
RHW6			<b>0.910</b>	
RHW7			<b>0.768</b>	
RHW8			<b>0.715</b>	
SC1				<b>0.589</b>
SC2				<b>0.545</b>
SC3				<b>0.793</b>
SC4				<b>0.730</b>

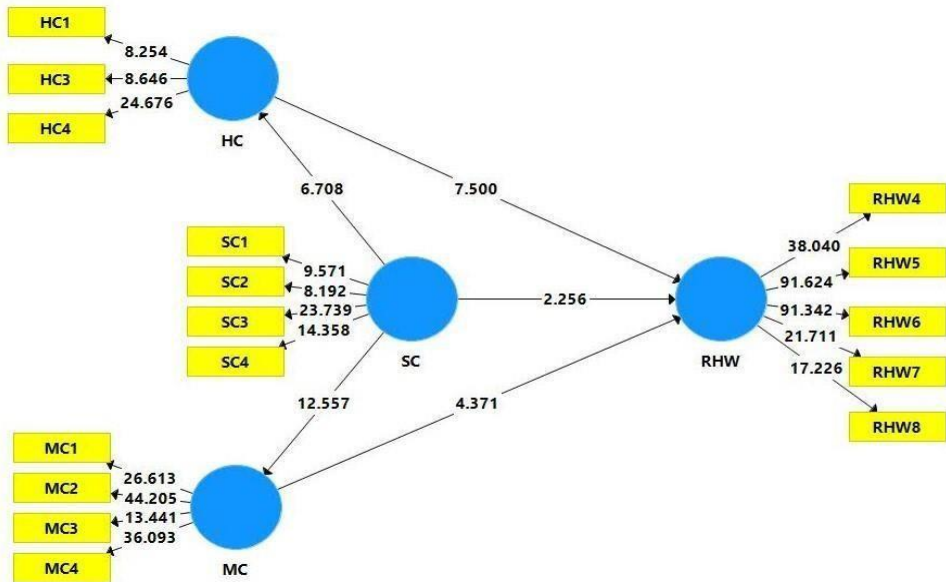
Table 3 shows the values of outer loadings, which exceeded the acceptable threshold of 0.5. Thus convergent validity has also been confirmed.

**Table-4:** Heterotrait-Monotrait Ratio (HTMT)

	HC	MC	RHW	SC
HC				
MC	<b>0.659</b>			
RHW	<b>0.711</b>	<b>0.511</b>		
SC	<b>0.610</b>	<b>0.666</b>	<b>0.463</b>	

And we observed that all of the results of HTMT ratio remain below the 0.85 criterion. So, it can be said that the discriminant validity of data has been confirmed (Table 4).

### 6.3 Structural Model



**Figure- 3:** Structure Model

**Table- 5:** Path Coefficients

	HC	MC	RHW	SC
HC			0.361	
MC			0.214	
RHW				
SC	0.331	0.478	0.130	

Since the standardized path coefficients are greater than the threshold value of 0.1(See Table 5), the hypothesized path relationships between capitals (Human Capital, Material Capital, and Social Capital) and reproductive Health Behavior are statistically significant.

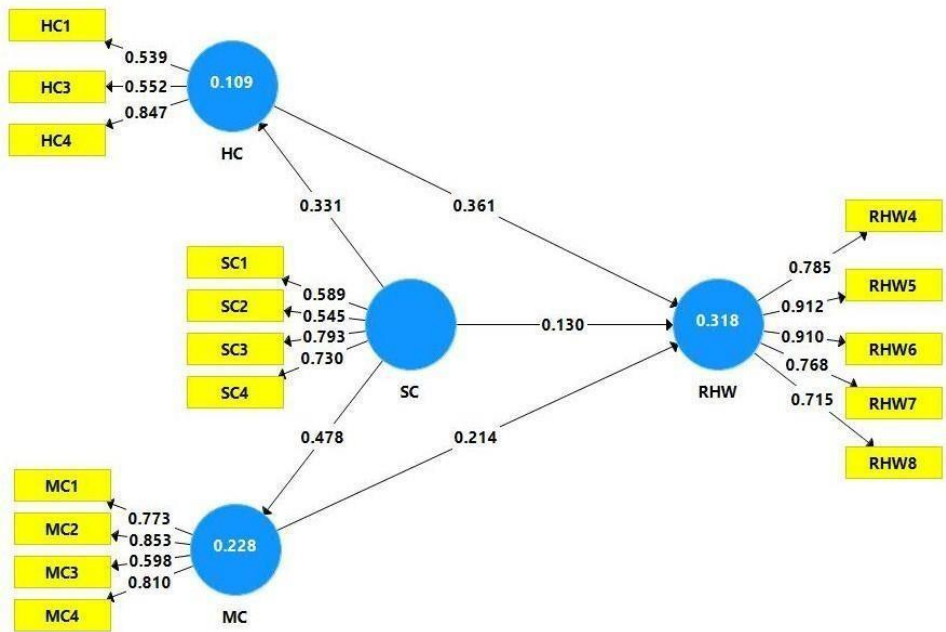
**Table-6:** Inner VIF Values

	HC	MC	RHW	SC
HC			<b>1.266</b>	
MC			<b>1.461</b>	
RHW				
SC	<b>1.000</b>	<b>1.000</b>	<b>1.328</b>	

Then, the study found all of the VIF values to be less than 3 (See table 6) means there is no problem of multicollinearity. Secondly, all of the links (**HC -> RHW**, **MC -> RHW**, **SC -> HC**, **SC -> MC**, and **SC -> RHW**) are found to be significant after testing T-statistics (higher than 1.96) and P values (less than 0.05) (See Table 7 Mean, STDEV, T-Values, P-Values).

**Table- 7:** Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
HC -> RHW	0.364	0.367	0.048	7.500	0.000
MC -> RHW	<b>0.216</b>	<b>0.218</b>	<b>0.049</b>	<b>4.371</b>	<b>0.000</b>
SC -> HC	0.331	0.334	0.049	6.708	0.000
SC -> MC	<b>0.478</b>	<b>0.482</b>	<b>0.038</b>	<b>12.557</b>	<b>0.000</b>
SC -> RHW	0.127	0.126	0.056	2.256	0.024



**Figure- 4:** Model of Algorithm Method

Thirdly, using algorithm method found that value of R<sup>2</sup> (0.318, see figure 4) indicates that 32% of the total variances in the dependent variable (Women’s Reproductive Health Behavior) can be explained by the CAPSES factors.

**Table- 8:** Table for Q<sup>2</sup>

	SSO	SSE	Q <sup>2</sup> (=1-SSE/SSO)
<b>HC</b>	1146.000	1099.276	0.041
<b>MC</b>	1528.000	1333.439	0.127
<b>RHW</b>	1910.000	1520.941	0.204
<b>SC</b>	1528.000	1528.000	

Finally, Reproductive Health Behavior has significant predictive power and usefulness because the Q<sup>2</sup> value (0.204) is greater than the threshold value of 0 (Geisser, 1973).

## 7. Discussion

This study found that the effects of human capital, material capital and social capital on reproductive health behavior of women ( $HC \geq RHW$ ,  $MC \geq RHW$ ,  $SC \geq HC$ ,  $SC \geq MC$ , and  $SC \geq RHW$ ) are significant. The value of  $R^2$  showed strong explanatory power, claiming that capital factors have strong explanatory power to explain reproductive health behavior of women in the study area. And  $Q^2$  value revealed that reproductive health behavior of women (endogenous construct) can be effectively predicted by CAPSES factors (exogenous construct).

Reproductive health behavior is a complicated phenomenon with various social, material, and humanitarian factors that is influenced by a variety of contexts. These factors could be specific to the current situation. Studies on reproductive behavior that look at quantities or qualities of capital factors are available. Recent studies reported that women's sexual and reproductive health and rights were influenced by social capital (Ireland, Tran and Dawson, 2021). This study only focused on social capital, and their study was a secondary data-based qualitative research. Qualitative research is rarely generalizable (Firouzbakht *et al.*, 2018). And we know that nowadays in Bangladesh more than half of the population is women. In this case, quantitative research is more relevant to have more credible information so that better policies can be adopted to improve the reproductive health behavior of this vast population. On the other hand, Neil L. Price and Kirsten Hawkins in studying Social Analysis of Reproductive Health found that urban American women with low economic status (Dynamics of social exclusion) exhibit vulnerable reproductive health behavior (Price and Hawkins, 2007). Social and material aspect of reproductive health behavior is focused on this study and human capital is missed here. Besides this, it is an urban-centered research.

A secondary data-based research of 2018 revealed that African American women may be more at risk of experiencing vulnerable sexual and reproductive health outcomes due to poverty, unemployment, and residential segregation (Prather *et al.*, 2018). As a race focused study, this study highlights the social and capital aspects, excluding human capital aspects, of sexual and reproductive health outcomes. Another study of 2016 claimed that reproductive health behavior (prenatal vitamin use and exclusive breastfeeding, behavioral risk factors for STIs and smoking during pregnancy) is highly influenced by health literacy (Kilfoyle *et al.*, 2016). This study was totally based on the secondary data and only focused on human capital (knowledge, education and capacity to understand basic health information) to understand reproductive health behavior where with

evidence of the previous studies we can find that social and material capitals are also important to understand reproductive health behavior of rural women in Bangladesh.

## 8. Conclusion and Recommendation

The main goal of the research was to assess the reproductive health behavior of women in rural areas of Bangladesh based on capital factors of socio-economic status. The study found that Capital Factors have a significant impact on RHW in which effect size was 0.383, after calculating T-statistics and P values using a two-tailed t-test with a significance level of 5%, it was found that all the linkages and HC -> RHW, MC -> RHW, SC -> HC, SC -> MC and SC -> RHW are statistically significant since all the T-statistics are greater than 1.96 and the P values are smaller than 0.05. The study, however, found this explanation as strong since the coefficient of determination value of the model (R<sup>2</sup>) is 0.318. On the contrary, the model has enough predictive relevance as evident from the Q<sup>2</sup> value of RHW (0.204). After calculating the value of Q<sup>2</sup>, it was found that RHW, as an endogenous construct, has a strong predictive power and relevance since the Q<sup>2</sup> value is 0.204 that is greater than the threshold value of 0. SO, this study found that people with high socioeconomic status have better reproductive health behavior of women than the people with lower socioeconomic status. Therefore, it may be recommended that government should focus on women empowerment in rural areas and should mobilize much more campaigns for creating awareness among the rural women who belong to low socioeconomic status.

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8 March 2023].

## Environmental Policies in Bangladesh: Development of Three Decades (1990-2020)

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Raihan Sorker<sup>3</sup>

### Abstract

*Over the years, Bangladesh has experienced environmental degradation and climate change consequences, which prompted policymakers to incorporate environmental issues into the policy. Even though a study collated environmental policies from 1973 to 2010. Policies beyond 2010 were missing, and not all policies were included. Hence, this article aims to integrate the national policies of Bangladesh regarding the environment and climate change perspective for the first time in the past thirty years (1990-2020). This qualitative descriptive study systematically analyzed 32 national policies under four categories: developmental policy, different sectoral policy, environment and biodiversity- related policy, climate change, and disaster management policy. Moreover, the analysis revealed that national policy documents mainly emphasize protecting, preserving, and managing the country's natural ecosystems. After evaluating strengths, weaknesses, and challenges, this study recommends that the government adopts nature-based solutions (NBS) like bioremediation, organic waste to energy, and implementing renewable energy policy in 2008. Moreover, enhancing inter-ministry cooperation, ensuring the participation of youth, marginalized people, and women in policy formation, and increasing research and capacity-building training are needed to foster sustainable development.*

**Key Words:** Environmental policy; National policies; Ecosystem services; Biodiversity; Climate change

### 1. Introduction

Environmental policy takes action to manage human behavior deliberately, intending to prevent damaging effects on the natural environment and ensure that these man-made activities do not become harmful to humans (Jordan &

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Lenschow, 2010). Two essential terms, the environment, and policy, make up environmental policy, where the environment stands for the physical ecosystem and other dimensions such as soc

ial and economic. "Policy" is any trajectory adopted or proposed by a government body, business, or individual. Therefore, environmental policy is a set of rules and guidelines that are taken into action to minimize harmful artificial environmental outcomes (McCormick, 2001). The environmental issues may include different kinds of pollution, such as in the air, water, soil, waste management, ecosystems, endangered wildlife species, protection of natural resources, and biodiversity, which is already discussed in environmental policy (Islam et al., 2021). Bangladesh has already been exposed to the effects of climate change due to its geography. The country has taken the seventh position among the most extreme weather-affected countries in the world in the 20 years until 2018, following the Global Climate Risk Index 2020 (Eckstein et al., 2019). Resources such as fresh water and coastal and agricultural areas are significantly vulnerable to temperature changes, rising sea levels, and precipitation. These increase the harmful effects of climate change in our country (USAID, 2013; Islam & Nursey-Bray, 2017; Mondal et al., 2019).

Moreover, climate change harms low-income aquaculture and agricultural lands largely dependent on seasonal conditions (Mondal et al., 2019). In recent times, it has been found that change was recognized by 80% of the country's farmers. Moreover, climate change also affects the fisheries sector. Storm surges and climate change can hamper aquaculture industries (MoFA, 2018). In these circumstances, to pursue the Stockholm mandate, our country and other nations actively protected the global environment. As a result of the 1973 act, the first Water Pollution Control Ordinance was promulgated, and a further Environmental Pollution Control Ordinance was promulgated in 1977 (Hossan, 2014). After a few years, in 1985, the Department of Environment (DoE) structure started with creating the Department of Pollution Control Ordinance. Environmental Policy was first adopted and declared in 1992, and the idea of protecting the environment with efforts at the national level was recognized. With the development of the Environmental Policy, two types of actors, external and internal, were playing direct and indirect roles (Momtaz, 2002). Some donor agencies, such as USAID, IDA, ADB, and UNDP, played significant roles among external actors. Within the internal actors, the NGOs related to environments, such as BCAS, CARDMA, FEJB, IUCN and ADAB, DOE, the Planning Commission, agencies of the government like the Ministry of Environment, Forest and Climate Change (MoEFCC), concerned ministries, civil society, and consultants were significant. All actors played pertinent roles,

whether internal or external, in the policy formulation (Rabbani, 2015). The National Environment Management Action Plan (NEPAM) formulation was significant. Moreover, the Bangladesh government has implemented several additional policies regarding environmental and development concerns. Besides those policies, NEMAP and NCS have also been implemented to support the action plans in response to environmental issues and promote sustainable development. However, one of the leading causes of poverty in this country is the degradation of the environment, which is acknowledged by the second poverty reduction strategy. According to the constitution of Bangladesh, many of these policies are partially enforceable. Despite this fact, they are still significant in ruling and manipulating the activities of the concerned ministry and agencies (Chowdhury et al., 2022).

Therefore, it is significant that Bangladesh addresses the challenges and adapts to climate change. In addition, the promotion of sustainable development can be greatly enhanced by the adoption of nature-based solutions, offering a beacon of hope for Bangladesh's future. The Bangladesh government has already implemented several additional policies to address environmental and development issues. However, while the evolution of environmental policies from 1973 to 2010 has been thoroughly discussed, there is a notable gap in research regarding the integration of all environmental policies in Bangladesh from 1990 to 2020. Thus, the integration of these policies is not just desirable, but a pressing need to understand the current state of environmental policy in Bangladesh and identify areas that require immediate attention for effective sustainable development.

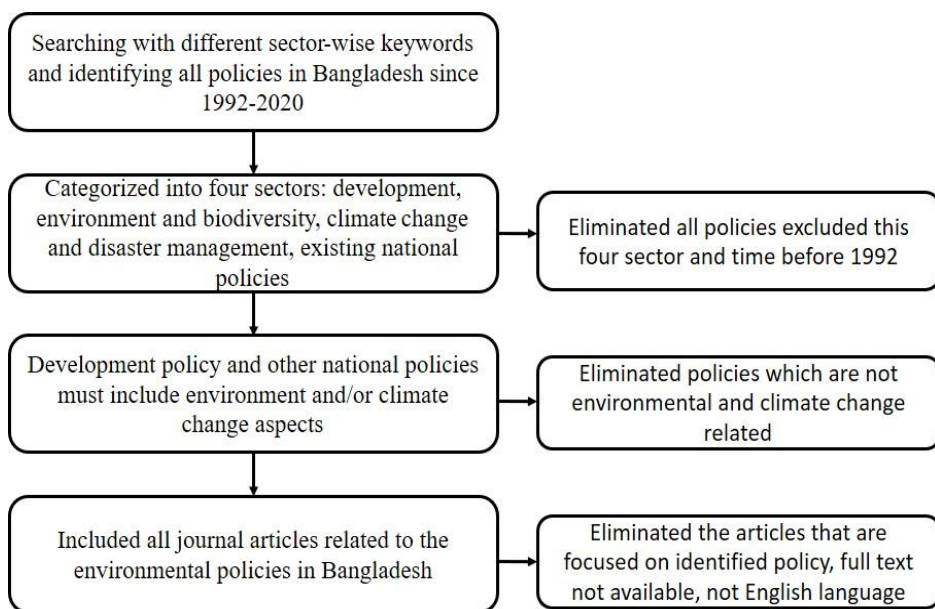
### **1.1 Objectives of the Paper:**

The general objective of conducting the review is to integrate and analyze the evolution of environmental aspects in Bangladesh's national policies over three decades. The specific objectives are-

1. To analyze the national development policy, different ministerial policies, disaster management and climate change policy, forestry and biodiversity environmental policy documents where environmental concerns are addressed.
2. To explore how environmental protection and climate change aspects are incorporated into environmental and developmental policies over time, as well as the policies' strengths, weaknesses, and challenges from 1990-2020.

## 2. Methodology

This study integrated and analyzed 32 national policies of Bangladesh from 1992 to 2020 (Table 1). This article mainly highlights short-term and long-term national environmental, biodiversity, and climate change policies. This research was conducted through secondary analysis of different policies and integrated the environmental aspects from different national policies, determining that the study is descriptive and qualitative. The primary knowledge of this study was acquired through secondary data, which was gathered from the google search engine and google Scholar.



**Figure 1.** Systematic identification approach for environmental policies and related articles

Firstly, this study identified all the sector-wise national policies of Bangladesh by searching different keywords like “five-year plans,” “perspective plan,” “delta plan,” “national policies of Bangladesh,” “environmental policy of Bangladesh,” and “climate change policy of Bangladesh”. After completing the keywords searching activities, all the policies are categorized into four sectors: environmental perspective in developmental policy, environmental aspects in other national policies, environment and biodiversity-related policy, and disaster



management and climate change-related policy. The five-year plans, prospective plans, and delta plans are included in the developmental policy. Afterward, all the development and other national policies were eliminated based on environmental and/or climate change aspects. Different journal articles related to these identified policies are included to incorporate the other logical perceptions of this analysis (Figure 1).

**Table 1.** Analyzed environment aspects related policy in Bangladesh across four sectors

Sectors	Policies
<p>(a) Environmental Perspective in developmental policy</p>	<ul style="list-style-type: none"> <li>▪ 4th Five Year Plan (1990-1995)</li> <li>▪ 5th Five Year Plan (1997-2002)</li> <li>▪ 6th Five Year Plan (2011-2015)</li> <li>▪ 7th Five Year Plan (2016-2020)</li> <li>▪ 8th Five Year Plan (2021-2025)</li> <li>▪ Perspective Plan (2010-2021)</li> <li>▪ Perspective Plan ( 2021- 2041)</li> <li>▪ Bangladesh Delta Plan (BDP), 2100 (2018)</li> </ul>
<p>(b) Environmental aspects in the different sectors of national policies.</p>	<ul style="list-style-type: none"> <li>▪ National Energy policy (1996)</li> <li>▪ The National Fisheries Policy (1998)</li> <li>▪ The National Water Policy (1999)</li> <li>▪ The National Land Use Policy (2001)</li> <li>▪ National Integrated Pest Management Policy (2002)</li> <li>▪ The Coastal Zone Policy (2005)</li> <li>▪ The national 3R strategy (2010)</li> </ul>

<p>(c) Environment and Biodiversity related policy</p>	<ul style="list-style-type: none"> <li>▪ National Environmental Policy (1992)</li> <li>▪ National Forest Policy (1994)</li> <li>▪ National Environmental Management Action Plan (1995)</li> <li>▪ Environment Conservation Act (1995)</li> <li>▪ Environment Conservation Rule (1997)</li> <li>▪ National Biodiversity Strategy and Action Plan of Bangladesh (2005)</li> <li>▪ Revised National Forestry Policy (2016)</li> <li>▪ National Biodiversity Strategy and Action Plan of Bangladesh (2016)</li> <li>▪ Bangladesh Biodiversity Act (2017)</li> <li>▪ Revised National Environment Policy (2018)</li> </ul>
<p>(d) Policies related to Climate change and Disaster management</p>	<ul style="list-style-type: none"> <li>▪ Bangladesh Country Investment Plan for Environment, Forest and Climate Change (2016-2021)</li> <li>▪ Bangladesh Climate Change Strategy and Action Plan (2009)</li> <li>▪ National Adaptation Program of Action (2009)</li> <li>▪ Climate Change and Gender Action Plan (2013)</li> <li>▪ Intended Nationally Determined Contributions (2015)</li> <li>▪ The National Plan for Disaster Management (2017)</li> <li>▪ Nationally Determined Contributions (2020)</li> </ul>

### 3. Results (Integration of Environmental Policy since 1992-2020)

#### 3.1 Environmental Perspective in Developmental Policy

4<sup>th</sup> five-year plan introduced environmental aspects to the national developmental policy. Chronologically, environmental concerns have increased and included different environmental aspects in national developmental policies. Eight short and long-term national developmental policies from different time frames have been discussed in this study (Figure 2).



**Figure 2.** Evolution of developmental policy in respect of environmental perspective

### 3.1.1 Evaluation of Environmental Perspectives in Developmental Policy Since 2010

After the independence of this country, a lack of precision was observed in the environmental policy sector in Bangladesh. It has been found that some national planning processes began in 1973 (Hossan, 2014). The initial three FYPs (1973–1990) reflected the importance of industrialization and agriculture, whereas the fourth five-year Plan (1990–1995) is known to include the first chapter reflecting the environment, with the title "Environment and Sustainable Development" (Hossan, 2014). The fifth FYP (1997-2002) was the most significant policy, covering major development sectors while emphasizing sustainable livelihoods and the environment. The post-independence era has observed many unplanned industrial growths that pollute the waters of major rivers (PC, 1997).

### 3.1.2 Evaluation of Environmental Policy Perspectives after 2010

#### 3.1.2.1 Sixth Five-Year Plan (2011-2015)

Following the 5<sup>th</sup> FYP, the 6<sup>th</sup> FYP was divided into three segments and emphasized: "accelerating growth and reducing poverty." The three segments are strategic directions and policy framework, statistical annex and technical framework, and sectoral strategies, programs, and policies. In addition, the eighth

chapter on sustainable development discussed the environment, climate change, and disaster management. To manage the environment, the 6<sup>th</sup> FYP aimed to (a) lessen the use of fossil fuel by introducing green energy, (b) improve air quality using clean fuel, and (c) strengthen DoE and other ministries about the dealing environment (GED, 2011). On the other hand, attending to a sustainable environment is significant. Therefore, the sixth FYP has included some policies, programs, and strategies in this context. First, the participation of stakeholders will activate the environmental committees established at the root levels. Second, the effective enforcement of the EIA will be ensured under the Environment Conservation Act (ECA) by drafting the EIA guidelines, including those for all sectors. Third, revising the existing laws and regulations will provide new environmental laws and regulations (GED, 2011). Although sixth five year plan has contributed a lot in the context of Bangladesh, the broader aspects and guidelines of EIA is an inadequately discussed in this plan. Moreover, the enforcement criteria of EIA should be varied from projects to projects. However, variations of enforcement criteria is yet to be discussed in this 6<sup>th</sup> FYP.

### **3.1.2.2 Seventh Five-Year Plan (2016-2020)**

The seventh FYP included a strategy focusing on green growth for better environmental sustainability by harmonizing economic growth. Three key themes cover the large array of actions in the seventh FYP. The main features are (i) climate change management and resilience (comprised of adaptation and mitigation), (ii) environmental management, and (iii) disaster management (GED, 2015). Some of the plans in the seventh FYP include productive coverage of forests up to 20%, 20% promotion of ecotourism, a permanent green belt of 500 meters along the coastline, and an announcement of a critical ecological area (ECA). The goal included a climate change management strategy illuminating other essential matters such as disaster risk reduction, green technology, low carbon development, and mitigation. Green building codes are also significant in the national building code to ensure sustainable cities. Another suggested action was the protection of fisheries to ensure food security (GED, 2015). To improve the air quality, a target was set for the reduction of particulate matter (PM) to 105  $\mu\text{g}/\text{m}^3$  (PM10) and 73  $\mu\text{g}/\text{m}^3$  (PM2.5) by 2020. Thus, the Green Climate Fund (GCF) was introduced to initiate the green technology-based Bangladesh Environmental Specimen Bank.

### **3.1.2.3 Eighth Five-Year Plan (2021-2025)**

Over the years, several regulations and laws have been enforced to ensure environmental protection in Bangladesh. The 6<sup>th</sup> and 7<sup>th</sup> FYP continued the progress while giving special attention to water and air pollution. The main goal of the 8<sup>th</sup> FYP was to start the initial phase implementation of the PP2041 environmental management strategy. According to the PP2041, Bangladesh will have a strategy for green growth. This strategy will include: (a) introducing a microeconomic framework to coalesce the environmental costs, (b) combating climate change to ensure the implementation of Delta Plan-2100, (c) lessening the water and air pollution, (d) elimination of fuel subsidies, and adding green tax for limiting the consumption of fuel (GED, 2020b). The 8FYP will prioritize water and air pollution, strengthen forestry management, and implement the BDP 2100 in its initial phase. Institutional capacity will be built up as weak as policies and regulations for initiating Environmental Fiscal Reforms (EFR). In addition, to achieve funds at global levels, Bangladesh needs to negotiate to invest in green building, green energy, transportation, and agriculture necessary in the 8th FYP. However, implementation of climate change related strategies are not adequately discussed in this five year plan. Moreover, estimation of greenhouse gases (GHGs) emissions with spatial-temporal variations are not emphasized in this five-year plan. As a result, it is crucial to include these strategies for ensuring environmental sustainability.

### **3.1.2.4 First Perspective Plan of Bangladesh (2010-2021)**

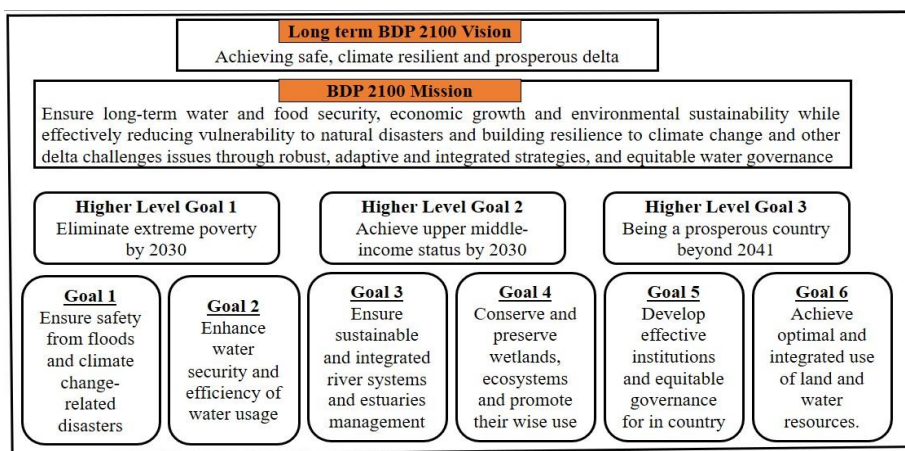
The main objective of the perspective plan (2010-2021) stands for implementing strategies that will shield against global warming and climate change to protect Bangladesh. The Plan will make necessary arrangements to safeguard the people from natural disasters. The NAPA, BCCSAP, NPDM, NFP, NEP, and NSDS suggest the sustainable usage of natural resources, development initiatives for climate resilient and disaster, green growth, disaster-risk reduction based on ecosystem, and urban development that is resilient to risk and management of pollution (GED, 2012). Although, as a least-developed country, Bangladesh does not need to reduce greenhouse gas emissions, it is crucial to follow the path of low carbon emission for sustainability. On the other hand, Bangladesh will not compromise the need for accelerated economic growth and poverty reduction. Therefore, the planning commission took the initiative to integrate concerns about poverty, the environment, climate change, and disasters into the budgetary and planning processes for development.

### 3.1.2.5 Second Perspective Plan (2021- 2041)

The PP2041 focuses mainly on an environmental management strategy that would add the thought of climate change and the environment to the growth strategy. The distinct policies, strategies, and institutional reforms consist of (a) microeconomic framework will incorporate the environmental costs; (b) delta plans are implemented to decrease the vulnerability of climate change and develop resilience; (c) prevention of pollution (air, water, and soil); (d) implementation of green tax on fossil fuel and taxation on emission from industrial units; and (g) geospatial analysis will be used to take appropriate decisions (GED, 2020a). However, it is crucial to estimate the GHGs emissions rate in Bangladesh as the country is already well-recognized as a methane contributing nations.

### 3.1.2.6 Bangladesh Delta Plan (BDP) (2100)

The deltaic geographical condition makes Bangladesh face substantial risks such as population density, natural disasters like floods, tidal surges, rising sea levels, eroding riverbanks, salinity intrusion, waterlogging, and cyclones. Moreover, water demand from urbanization and industrialization is growing. BDP 2100 aims to achieve upper-middle income (UMIC) status by integrating Bangladesh's short- and medium-term aspirations. The time 2016-40 is the medium-time delta agenda considered by BDP2100. By the end of the 21st century, it sets a long-term goal for implementing the BDP. The long-term goals will be achieved by taking short-term objectives. The goals of the delta plan and its strategies and nationwide strategies are shown in Figure 3.

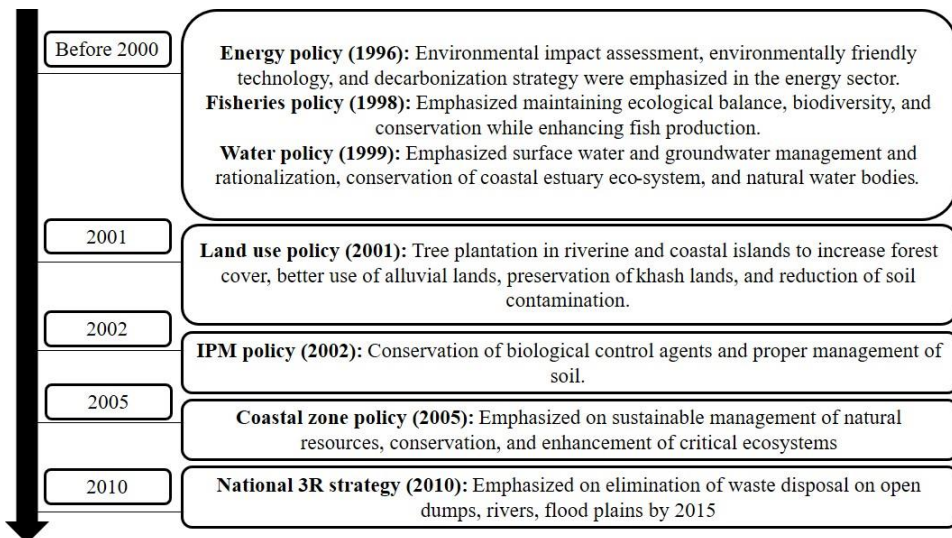


**Figure 3.** Bangladesh Delta Plan 2100 and its vision, mission, and goals

Managing risks and uncertainty, being prepared to some extent, and adapting where required with more reliable solutions are known as adaptive delta management. The usual decision-making procedures must change by BDP2100, which will impact the delta and its related institutional environment (GED, 2018). However, as BDP-2100 has mostly focused on the Netherlands Delta Plan (NDP), it is crucial to identify the feasibility of BDP-2100. Moreover, BDP-2100 should be focused on the conservation and management of freshwater distribution.

### 3.2 Environmental Aspects in Other National Policies of Bangladesh

In this study, seven national policies were studied from environmental aspects. These policies are depicted in Figure 4.



**Figure 4.** Evolution of national policies in respect of environmental perspective

#### 3.2.1 National Energy Policy (1996)

Ensuring a sustainable energy development program that causes minimum environmental damage was one of the objectives of the national energy policy in 1996. The environmental priority in this energy policy includes- (a) environmental concerns will be taken into account for all fuel types, (b) environmental impact assessment (EIA) will be made compulsory for any new energy development project to ensure minimum damage to the environment, (C) adopting decarbonization strategy, (d) wood fuel banned in using to burn the bricks and melt bitumen for road carpeting, (e) producing energy from waste, (f) using lead-free petrol and low Sulphur contented diesel, and (g) to reduce

vehicular emission (MPEMR, 2005). Although this policy might be significant in the context of Bangladesh, the implementation of this policy did not see the light of day. Hence, identifying the socio-economic, political, and technological factors are important to implement this policy in root levels to higher.

### **3.2.2 The National Fisheries Policy (1998)**

The Ministry of Fisheries and Livestock (MoFL) formulated the national fisheries policy in 1998. The main intention was to enhance fish production and increase foreign currency in the country by exporting inland and marine fisheries while maintaining sustainable yield, ecological balance, and biodiversity conservation. This policy highlighted the different threats to fisheries and inland water, such as chemicals from fertilizer, population pressure, infrastructure construction in the floodplains, pesticides, and insecticides. This policy identified the indigenous fishes and their impacts on the ecology and introduced the environment-friendly shrimp culture to ameliorate the environmental circumstances (MoFL, 1998). However, most of the valuable fishes in our country presents in the higher depth of aquatic body. Unfortunately, due to the lack of technological advancements, it is quite impossible to catch these valuable fishes. As a result, our country is losing massive economy each and everyday. Hence, technological advancements should be emphasized on national fisheries policy.

### **3.2.3 The National Water Policy (1999)**

The Ministry of Water Resources (MoWR) prepared the national water policy in 1999 to provide guidelines to all water-related institutions and agencies. The priorities of the policies are- (a) to manage all kinds of ground and surface resources in a manner of equity through ensuring water availability to all and rational uses of this resource and (b) to expedite the establishment of a water supply system appropriately and sustainably by incorporating water rights and water pricing. Although the national water policy is an important addition of our environmental sectors, types of water contaminants with emerging pollutants related knowledge are yet to be discovered. Hence, more scientific research is needed to discover the water pollution as well as the implementation of national water policy-1999.

### **3.2.4 The National Land Use Policy (2001)**

The National Land Use Policy (2001) aims to identify elements to ensure land-use activities are consistent with environmental conservation and sustainability. This policy defined the land zoning methods for Bangladesh's rural and urban



locations. To ensure the promotion of sustainable use of the country's land resources, the policy encourages initiatives such as planting trees on coastal islands and riverine areas, which will increase forest cover. In addition, alluvial and khash lands will be used to decrease soil contamination (MoL, 2001).

### **3.2.5 National Integrated Pest Management Policy (2002)**

The importance of IPM (integrated pest management) is growing, highlighted in the fifth five-year plan. The main elements of IPM policy include the following: maintenance of the ecological balance; carrying out suitable pesticide activities; establishing a successful system for carrying out the national program for IPM; progress of manpower and human resources as the cornerstone of IPM; and directing IPM research. The IPM policy would prioritize efforts to preserve and grow several bio-controlling agents in agricultural fields by implementing IPM principles and methods. Pest management would also be emphasized by employing parasitoids, predators, insect diseases, proper practices of cultivation, varieties that can tolerate pests, mechanical control measures, diversification of crops, botanical products, and bio-pesticides (MoA, 2002).

### **3.2.6 The Coastal Zone Policy (2005)**

The Coastal Zone Policy was established by the Ministry of Water Resources (MoWR) in 2005 to provide a guideline for managing coastal zones, ensuring better environmental safeguards and the lives and livelihoods of coastal communities. The primary goal of the development process in coastal areas is to achieve the Millennium Development Goals. Moreover, integrated coastal zone management focuses on constructing the conditions for poverty eradication, expanding sustainable livelihoods, and incorporating the coastal zone into national processes (MoWR, 2005).

### **3.2.7 The Renewable Energy Policy (2008)**

Energy security is one of the essential pillars of sustainable development for a developing nation such as Bangladesh. Bangladesh has produced substantial energy from nonrenewable sources, such as fossil fuels, coal, and oil, contributing to climate change and global warming. Moreover, Bangladesh has already seen the adverse effects and repercussions of climate change on the survival of humans, wildlife, and ecosystems. Consequently, reducing GHG emissions to counteract climate change has become a significant issue for

virtually everyone. The government of Bangladesh created a renewable energy (RE) Policy in 2008, focusing on four dimensions: (I) availability, (II) applicability, (III) acceptability, and (IV) affordability, in response to these negative impacts and to achieve sustainable development objectives. Following this policy, the government encouraged public-private investments to produce RE and reap CDM benefits. This policy assumes that renewable energy sources will produce 5% of energy by 2015 and 10% of total electricity generation by 2020. This policy identifies the key sources of renewable energy in Bangladesh as follows:

1. Solar Thermal Power: The government has established a new project, "500 MW Solar Power Mission," to meet the rising need for electricity.
2. Wind Energy: The government has installed 2 MW of wind turbines in Feni and Kutubdai.
3. Biomass: Bangladesh's potential to convert biomass to electricity is enormous.
4. Biogas: Biogas derived from organic waste has significant potential. Meanwhile, this source could be an excellent alternative for cooking and rural and peri-urban electricity.
5. Hydro: Bangladesh has some prospective hydropower sites, but no meaningful capacity has been installed as of yet. One hydroelectric power station at Kaptai was built in the 1960s and had an installed capacity of 230 MW.

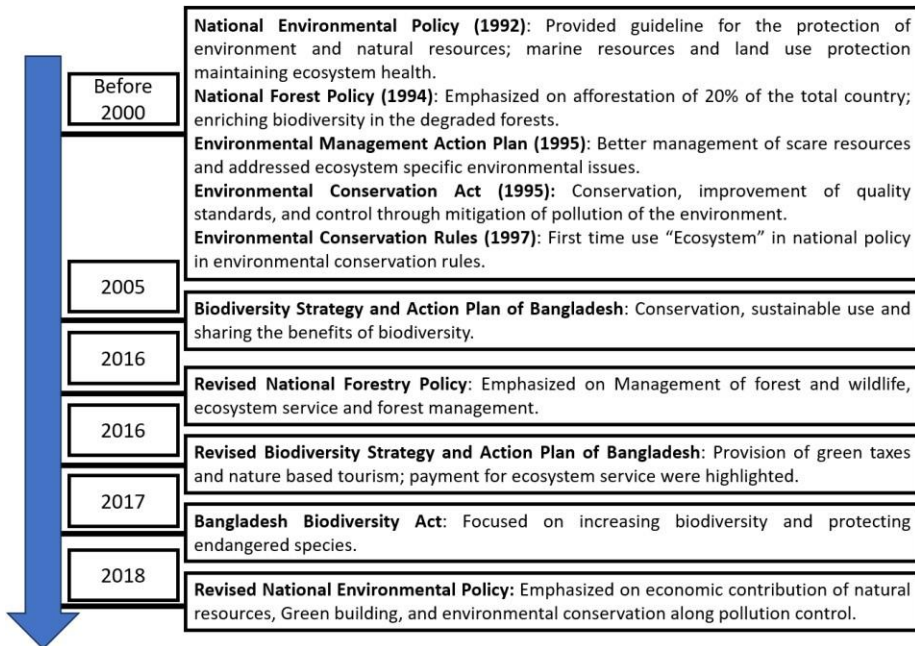
### **3.2.8 The National 3R Strategy (2010)**

The "3Rs" idea refers to reducing waste, reusing, and recycling resources. This 3R strategy, by 2015, was chosen to ensure the complete eradication of the system of dumping waste in open locations, open dumps, waterbodies, and floodplains. Moreover, the strategy fosters waste recycling by mandating waste separation at the source, building merchandise for recovered goods, and offering incentives for waste recycling (MoEF, 2010).

### **3.3 Biodiversity Conservation Related Policy**

After being concerned about reducing environmental issues and protecting biodiversity, the national environmental policy of Bangladesh was first published in 1992. After that, different environmental and biodiversity-related policies are

formulated and revised over time. This study studied ten environment and biodiversity-related policies from the conservation and sustainability perspectives (Figure 5).



**Figure 5.** Timeline of environment and biodiversity related policy

### 3.3.1 National Environmental Policy (1992)

The government of Bangladesh created the Environment Policy 1992 after the Rio Earth Summit. Sustainable development depends on the wellness of the environment, as they contribute services that are significant for the socio-economic needs of people. It was acknowledged that the degradation of the environment hurt soil fertility, quality and availability of pure water, quality of air, wildlife, fisheries, and forests. Thus, the policy was developed to maintain balance in ecology and protect the country against natural disasters, providing advantages for climate change mitigation and adaptation. The policy also encouraged the protection of marine resources and land use and the maintenance of healthy ecosystems (MoEF, 1992). The policy provides a delicate outline of the need to ensure sound environmental development in every sector.

### **3.3.2 National Forest Policy (1994)**

1994, the National Forestry Policy (NFP) was formulated to start a forestry master plan for the next 20 years. Afforesting 20% of the country was the primary goal of this policy. Additionally, it enriches biodiversity and fulfills global warming-related national responsibilities and commitments (GoB, 1994; Reza & Hasan, 2019). The main focus points are given below:

1. The rural and national economy will be strengthened by creating employment opportunities.
2. Biodiversity enrichment will be done in the present degraded forests, and the existing natural habitat will be conserved.
3. The local people's participation will prevent illegal actions such as illegal occupation of forest lands, wild animal hunting, tree felling, etc.
4. Forest goods will be utilized and used effectively, and their processing at various stages will be encouraged.
5. Forestation programs will be implemented for both private and public lands.

### **3.3.3 National Environmental Management Action Plan (1995)**

A suitable management plan was promoted by the National Environmental Management Action Plan (NEMAP) in order to change the current trends in degrading the environment and to raise environmental awareness (MoEF, 1995a). NEMAP prioritized some environmental issues; those are: 1. sanitation and clean drinking water lacings, 2. lack of awareness along with poverty, unemployment, and illiteracy, 3. fuel crisis and deforestation, 4. different kinds of pollution (air, water, industrial), 5. There are various natural hazards (floods, cyclones, drought), 6. surface and groundwater scarcity 7. agrochemical usage, and others (soil erosion, biodiversity depletion, decrease in fisheries, energy crisis).

### **3.3.4 Bangladesh Environment Conservation Act (1995) and Rules (1997)**

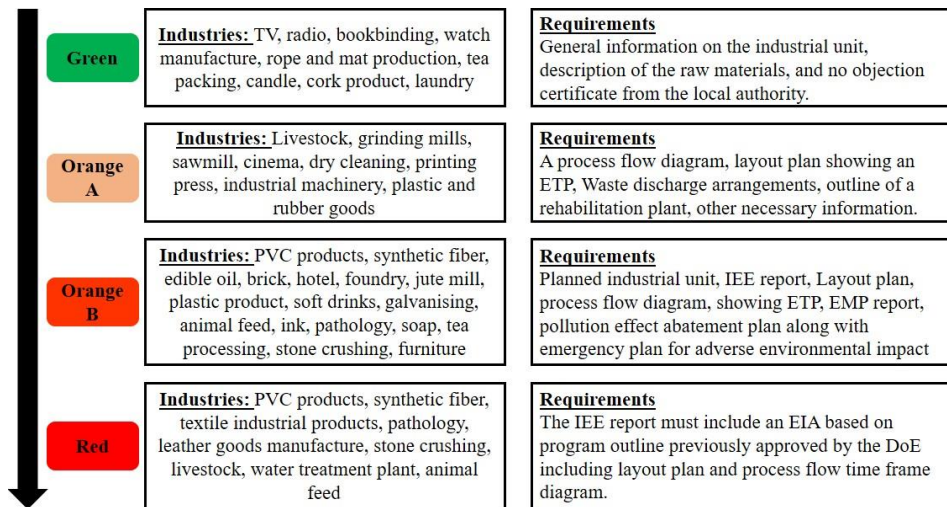
In 1995, the Bangladesh Environment Conservation Act was passed, and in 1997, rules were passed that are known as indispensable legislative documents in cases of industrial water pollution. The act is concerned with the development of the environment. The rules were made in line with the 1995 Act, which gives

supplementary directions for distinct compartments of the act. The DoE enforces the act, which has several responsibilities, such as:

- Coordination with agencies or authorities for applying to the act’s objectives.

Preventing accidents to potentially cause environmental degradation by adopting safety measures.

- Sound use of storage, import, export, and transportation of hazardous materials and their components.
- Performing research and helping different authorities conserve and improve the environment.
- Investigating locations, ingredients, materials, and equipment ensures environmental improvement and mitigating pollution.
- Banned plastics for the betterment of environment in 2002.



**Figure 6.** Classification of industrial units and projects based on impact

DoE can investigate the industrial plants, registers, records, equipment, and so on to enforce the act (MoEF 1995b). All industries are subject to “environmental clearance” from the DoE since the enforcement of the 1995 Act. All industries were divided into four types based on location and environmental effects. To obtain clearance, the concerned industries must submit applications with appropriate documents. An environmental clearance is valid for three years for the green class but only one year for any other classes (Figure 6). However,

according to Environmental Conservation Rules 2023, industrial projects and activities are categorized into green, yellow, orange, and red. Thus, yellow and orange in these new conservation rules replace the orange-A and orange-B categories.

### **3.3.5 The National Biodiversity Strategy and Action Plan (2005)**

In 1992 and 1994, the Convention on Biological Diversity (CBD) was signed by Bangladesh. The commitments taken by the country were supposed to be fulfilled by the National Biodiversity Strategy and Action Plan (NBSAP) in 2005. A framework is provided for sustainable use, biodiversity conservation, and sharing its benefits for Bangladesh by NBSAP. The majority of the plan ensures cross-sectoral linkages, showing that biodiversity conservation is closely linked with the development of the economy and society in our country. So, frameworks are provided by the NBSAP for poverty reduction, sustainable development, and the Poverty Reduction Strategy Paper (PRSP) (MoEF, 2005).

### **3.3.6 Revised National Biodiversity Strategy and Action Plan of Bangladesh (2016)**

The goals of the international Convention on Biological Diversity (CBD) were implemented by the National Biodiversity Strategy and Action Plan (NBSAP). These goals are the biodiversity conservation; natural resources' sustainable use; and fair sharing and equitable use of the benefits that arise from the utilization genetic resources. Nature based tourism was also included in the document as well as integrated evaluation of the ecosystem goods and services in national accounting. Green tax policies, ecosystem services payment was included along with fines for polluters to safeguard biodiversity and manage pollution (MoEF, 2016a). The protection and management of the natural resources were emphasized by the document.

### **3.3.7 Bangladesh Biodiversity Act (2017)**

The Bangladesh Biodiversity Act (BBA) was adopted by the Forest and Climate Change and Ministry of Environment in 2017 to conserve and protect our environment. Moreover, the document's goal was to preserve traditional knowledge on natural resources and biodiversity. Additionally, guidelines were provided by the act for national to local levels development of biodiversity committees (MoEFCC, 2017).

### 3.3.8 Revised National Forestry Policy (2016)

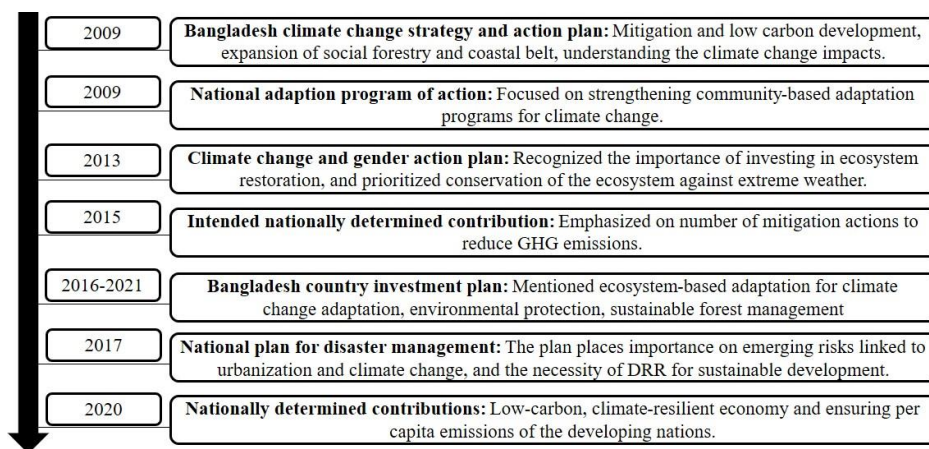
The National Forest Policy (1994) was updated by Bangladesh in 2016. Management of entire existing forests, building sustainable management including climate resilience, wildlife, enrichment of degraded forest lands, producing profound goods and ecosystem services were the main objectives (MoEF, 2016a). Moreover, sustainable forest management was ensured by the policy, including ecosystem services (MoEF, 2016b).

### 3.3.9 Revised National Environment Policy (2018)

The National Environment Policy 2018 was revised and published in 2019, aiming to develop Bangladesh's whole environmental conservation management as environmental and biodiversity conservation challenges must be tackled. The updated policy added nine more sectors and 15 previously held sectors. Particular emphasis was given to biodiversity and environment conservation, mountain environment and eco-friendly tourism. This policy emphasized the economic contribution of natural resources, and some of the strategies were highlighted, such as payment for ecosystem services, polluter fines, and emission taxes (MoEFCC, 2018).

### 3.4 Climate Change and Disaster Management Related Policy

Although climate change was incorporated in previous different policies, to give more emphasis on this matter, distinctive policies were formed to combat this crisis. Disaster management is also important to adapt to this climate change issue. Seven climate and disaster management related article has been studied in this study (Figure 7).



**Figure 7.** Climate change and disaster management related policy

### **3.4.1 Bangladesh Climate Change Strategy and Action Plan (2008)**

Sections I–V of the Bangladesh Climate Change Strategy and Action Plan (2008) highlighted the background information and probable consequences of climate change in Bangladesh, outlined alternative adaptation methods, and briefly explained mitigating concerns. The Climate Change Action Plan stands on six pillars: A. food security, social welfare, and health; B. integrating disaster management. C. facilities D. research and strategic leadership E. mitigation and decarbonization F. strengthening institutions and capacity building (MoEF, 2009a).

### **3.4.2 National Adaptation Programme of Action (2009)**

The government of Bangladesh adopted and updated the National Adaptation Program of Action (NAPA) in 2005 and 2009, respectively. The updated program included results from previous research to cope with the harmful impacts of climate change. Four security issues were emphasized in the updated version that include food, water, energy, and the security of livelihood (MoEF, 2009b; MoEF, 2009b).

### **3.4.3 Climate Change and Gender Action Plan (2013)**

To promote gender equality, the Bangladesh Climate Change and Gender Action Plan was formulated in 2013 and incorporated into climate change policies and strategies. The document recognized how the marine and fresh-water ecosystems are impacted by climate change and directly impacted employment opportunities (MoEF, 2013). To avoid crises and disasters or reduce those consequences, investment in ecosystem conservation was prioritized (MoEF, 2013).

### **3.4.4 Intended Nationally Determined Contributions (2015)**

In 2015, the Ministry of Environment, Forest and Climate Change published the Bangladesh Intended Nationally Determined Contributions (INDC). The document identified several areas vulnerable to adverse climate change impacts and provided a cost estimation for EBA of USD 2.5 million (MoEF, 2015). Moreover, the outcomes of additional analysis and consultation to amplify existing plans are also incorporated into it, along with analyzing future GHG emissions and adaptation and mitigation measures (MoEF, 2015).



### **3.4.5 The Bangladesh Country Investment Plan (CIP) (2016-2021)**

The Bangladesh Country Investment Plan (CIP) wanted to increase its contribution to Environment, Forest, and Climate Change (EFCC) sectors for sustainable development by investing correctly. Therefore, enhanced ecosystem services provision was included in the plan. That would reduce poverty and improve the health benefits of the environment and humans while making an increase in climate change resilience (MoEF, 2017). Nine primary sources of the plan from which the plan highlighted varieties of ecosystem services. For example, some coastal ecosystem services include climate regulation, food, timber, and ecotourism. In addition, ecosystem-based adaptation (EbA) was also mentioned in the EFCC CIP (MoEF, 2017).

### **3.4.6 The National Plan for Disaster Management (2017)**

Followed by the 2010-15 plan, in 2017, the Ministry of Disaster Management and Relief formulated the National Plan for Disaster Management (NPDM) 2016-2020. It focused on the upcoming risks of rapid urbanization and climate change. It also gave priority to disaster risk reduction. Some goals established by the NPDM are 1) the promotion of policy coherence between disaster management and development, 2) making DRR a development practice for achieving resilient public investment, 3) building capacity and leadership for the implementation of the NPDM at a national and local level, 4) promoting knowledge and information from the scientific and academic community (MoDMR, 2017).

### **3.4.7 Nationally Determined Contributions (2020)**

In 2020, the interim Nationally Determined Contributions (NDC) of Bangladesh was submitted by the Ministry of Environment, Forestry, and Climate Change. Priority was given to the forest sector for adaptation to climate change (MoEFCC, 2020).

## **3.5 Discussion**

### **3.5.1 Weakness**

- An environmental strategy should be sufficiently comprehensive to utilize all available mechanisms to safeguard the environment from contamination. It has been found that some environmental strategies fail

because they rely solely on "command-and-control" techniques (Stavins, 2002). Four additional environmental instruments should be adopted to ensure public participation and increase concern for environmental protection. These include charge systems, tradable permits, less market friction, and less government assistance.

- Industrialization is a vital and obligatory component of progress. This sector is expanding in Bangladesh, but conflict and ambiguous sub-sectors make it less environmentally and economically viable. This regulation is concerned with fuel type and environmental impact assessment. However, the specification needs to be specified, prompting stakeholders to file an appeal against national law and policy.
- There is no revisionary or review authority and no general public access to a few policies (conservation act 1995). In these subsections, the authority of the Department of Environment (Director General) needs to be more consistent. Whether in section 4, the Director General is only obligated to take the required steps to save the environment once a problem arises in industries or a natural disaster occurs. However, the function of the position has unrestricted authority. No specific fact relating to scientific findings, predictions, or solutions is presented.
- The current National Fisheries Policy (1998) lacks stakeholder influence on policy formulation, Marine fisheries policy-related reviews, and updates, local initiatives for Marine policy, a long-term policy perspective due to climate change and recent frequent natural disasters, and adequate integrated coastal management, among other deficiencies.
- Some of the policies are provided in a general manner, and there are needs of more monitoring and impact assessment on policy implementation, as well as a lack of next steps for current conditions, such as surface and groundwater pollution. (1999, National Water Policy)
- The National Land Use Policy (2001) is one of the most significant yet least specific and inadequate policies. This should be connected to the water policy, the conservation policy, the forest and biodiversity policy, etc. However, they only acknowledged and mentioned urban housing planning. In other sectors, the implications of ignoring this policy are just

acknowledged. Consequently, 17% of agricultural land is used for shrimp production for export, which is accountable for the absence of vegetation and potable water in coastal regions. The phrase "Right to life" is meaningless if there is no safe environment and no actions are taken to protect it. Even though significant institutions for environmental protection and constitutional guarantees exist, the environment's state is deplorable. The following policy conflicts hinder environmental justice in Bangladesh:

- ✓ Lack of political commitment (enforcement)
  - ✓ Institutional weakness (capacity-commitment)
  - ✓ Lack of mechanism of impartial assessment
  - ✓ Inequity and poverty parties not on equal footing
  - ✓ Limited scopes for people's involvement in decision making
  - ✓ Lack of access to information
  - ✓ Culture of impunity
  - ✓ Non-accountability/mala fide
  - ✓ Incoherent/inadequate sanctions
  - ✓ Absence of bylaws (participation, disclosure)
  - ✓ Conflicts with traditional rights and practices
- These are the deteriorating causes of policies connected to climate change and disaster management, as well as recently changed policies such as the national forest policy of 2016 and the national environmental policy of 2018.

### **3.5.2 Strengths**

- Bangladesh's environment policy covered 15 key categories to address global environmental challenges. The primary strength of the policies is that they are comprehensive and have room for improvement, in some cases requiring merely the addition of more specific subsections.
- The Water Policy earns commendation for its ecological, climate change, and conservation perspectives. It appears that the phrase "inter-basin transfers of water should be assessed based on each case's merits after analyzing the environmental, economic, and social implications of such transfers" acknowledges the difficulty and potential costs of joining rivers.

- The policies suggest a broader definition of the environment and identify and control activities that pollute and damage it.
- Since one of the goals is to ensure the environmentally sustainable and long-term use of natural resources, there is much room for improvement in the existing policies.
- Following the policy, the Environmental Court Act of 2010 is another potential establishment. This was enacted to expedite environmental litigation. In order to accomplish this, it established Joint District Judge-presided Environment Courts and Special Magistrate's Courts in each district.

### **3.5.3 Challenges**

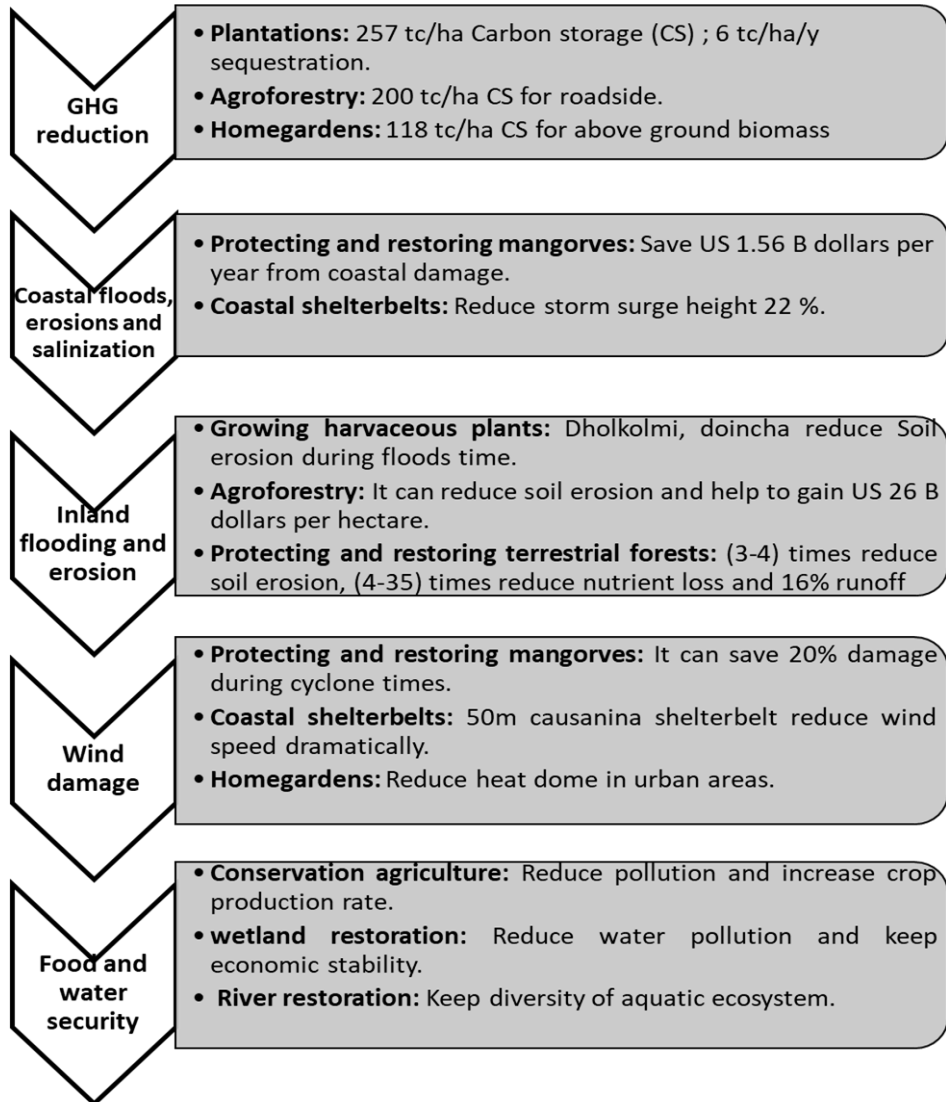
- Institutional failure is the inability to establish legal access to and use environmental resources.
- Relationships between environmental degradation and factors such as population growth, economic growth, and economic activities, as well as poverty, are viewed as some of the most significant environmental protection challenges. It is also said that if some policies fail, the ecosystem could deteriorate. This means that some subsidies may encourage excessive use of natural resources, which could harm the environment.
- Environmental degradation severely impacts human health, making the poor even more vulnerable. Environmental awareness must be increased among the poor in order to safeguard the environment and mitigate the effects of environmental degradation.
- Some environmental challenges, such as climate change, stratospheric ozone depletion, and biodiversity loss, are considered global issues here. The global community needs help determining who is responsible for what in each country.

### **3.6 Policy Recommendations**

#### **3.6.1. Adopting Nature-based Adaptation (NBS)**

"Nature-based solutions" refer to the rational use of nature's own resources (clean air, water, and soil) to address environmental concerns (EC, 2022). EBA is the

component of nature-based adaptation that employs ecosystem service and biodiversity to combat climate change's consequences (Nalau et al., 2018).



**Figure 8.** Nature based solutions (NBS) and its benefits.

NBS could deal with both climate change adaptation and mitigation challenges while providing substantial benefits to both people and the environment at a reasonable cost (Seddon et al., 2020; Pauleit et al., 2017). This strategy is cost-

effective, and 13 initiatives in 12 countries revealed that NBS is wide-reaching and long-term beneficial to overcome social and environmental issues (Reid et al., 2019). For instance, the downstream community can be protected from a flood and rising carbon sequestration by restoring the natural forest in the upper catchment areas (Seddon et al., 2020). EBA focuses on community-based adaptation concerning conservation, sustainable management, and restoration of ecosystems, while NBS focuses on significant societal goals such as human wellbeing, poverty alleviation, and socio-economic development (Seddon et al., 2020; Islam et al., 2021). Thus, the NBS strategy should be adopted in the policy to ensure sustainable development for humans and nature. Rainwater harvesting, bioremediation, organic waste to energy and implement of renewable energy policy-2008 could also be a good NBS in the context of Bangladesh.

### **3.6.2. Enhancing Coordination and Cooperation Between Departments and Ministries**

The environment-related policies have a long legacy in Bangladesh (Hossan, 2014). This article focused on a good number of environmental issues from the different national policies in Bangladesh. It has been found that some policies need to be more balanced and clarify the functions and accountability of various ministries and departments. For instance, there needs to be coordination between environmental and health ministries to manage biomedical waste (Shammi et al., 2022). Therefore, ensuring internal coordination and cooperation between ministers and departments is essential for implementing and formulating effective national policy. In addition, multiple responsible ministries and departments of different sectors, like water, soil, air, disaster, infrastructures, and waste management required strong coordination and cooperation to formulate local to national level policy to ensure sustainable development. Establishing coordination and cooperation among different ministries and divisions can abolish overlapping jurisdiction, conflicts, and lack of cohesion.

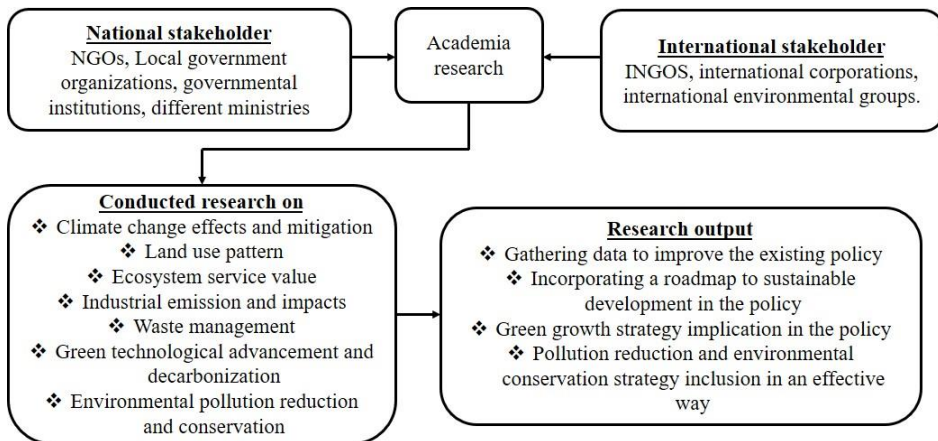
### **3.6.3. Ensure Inclusive Participation of Women, Youth, and Marginalized People in Policy Formulation**

Women, youth, and other marginalized people suffer the most due to environmental and climate change consequences (Dominelli, 2013). Therefore, the participation of women, the younger generation, and marginalized citizens in policy formulation is required to ensure transparent governance and adopt climate change resilience (Islam et al., 2021). Recently environment-related

policies like the National Environmental Policy 2018 and Bangladesh Biodiversity act 2017 focused on equitable ecosystem service distribution among local people, participation of women, a younger generation, and people from disadvantaged groups in policy formulation.

**3.6.4. Lack of Data and Research: Ecosystem Service Loss, Land Use Priorities, Most Climate Vulnerable**

There needs to be more data and research on ecosystem service loss, land use priorities, waste management, and most climate vulnerable scenarios to make an effective environmental policy. There is no alternative to having adequate data and research to make a long-term environmental vision, sustainable development, and regulation of environmental policy. On the contrary, when it comes to diversifying the national economy, environmental and R&D synergies are crucial for resource productivity and energy savings. Therefore, a holistic approach is proposed to research to make the environmental policy effective and enrich data to choose appropriate decisions in policymaking which is delineated in Figure 9.



**Figure 9.** Holistic framework on research conduction to make effective environmental policy

**4. Conclusion**

The study's objective was to explore how environmental protection and climate change aspects are incorporated into environmental and developmental policies over time, as well as the policies' strengths, weaknesses, and challenges from 1990-2020. In this study, it has been found that environmental policy and

regulation are essential not just for safeguarding the environment but also for preserving human life. There are preliminary action plans and insufficient skills and knowledge to guarantee that government and private sector developments adequately address environmental issues. As the Bangladesh Environment Management Program (BEMP), the Sustainable Environmental Management Program (SEMP), and the Department of the Environment (DoE) are currently working for improved water quality monitoring, the production of renewable energy, and the estimation of pollution loads in rivers and watercourses, as well as attempting to strengthen the institutional arrangements through which these initiatives will be implemented. There have also been initiatives such as establishing EIA Guidelines applicable to various industries, including flood control and drainage. The Department of Energy has no cleanup criteria or deadlines. Moreover, it is widely acknowledged that no realistic future strengthening or expansion of the policy will be able to address all climate-related challenges. There are no realistic expectations that this legislation might address even a portion of the climate change-related issues. Lastly, it must be acknowledged that nature plays a significant role in economic development, risk mitigation, and adaptation to a changing climate. Therefore, nature-based solutions can be a vital strategy for establishing environmental sustainability.

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