TECHNICAL ASSISTANCE REPORT

BANGLADESH

Report on Residential Property Price Index (RPPI) Mission (May 19–27, 2024)

JULY 2024

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Acronyms

BB   Bangladesh Bank

D4D   Data for Decisions Trust Fund

DBH   Delta Brac Housing Finance Corporation Ltd

RPPA   Residential Property Price Analysis

RPPI   Residential Property Price Index

TA   Technical Assistance

Summary of Mission Outcomes and Priority Recommendations

1.   **A technical assistance (TA) mission was conducted from May 19–27, 2024 to assist the Bangladesh Bank (BB) with the ongoing development of their Residential Property Price Index (RPPI).** The mission was conducted under the auspices of the Data for Decisions (D4D) Trust Fund. This was a continuation of previous TA missions in December 2019 and February 2023. The mission completed the following tasks: (i) assisted with the practical implementation of improved methods for the development of an experimental RPPI for Dhaka, (ii) designed a quarterly report for the dissemination of the RPPI, along with an accompanying methods document, (iii) updated the workplan which outlines the next steps for the project, and (v) increased the capacity of staff on the recommended methods used for RPPI.

2.   **The BB should continue to show commitment to developing a publicly available RPPI.** Reliable property price indices and other indicators of real estate markets are essential for the assessment of developments and risks in property markets, understanding the linkages between property markets and financial soundness, as well as to support IMF surveillance.

3.   **The available mortgage loan data was used to compile an experimental RPPI for Dhaka.** The data collection from Delta Brac Housing Finance Corporation (DBH) was initially established in the late 1990s, however, the data is usable from 2009. While the variables collected are limited and valuation prices are used instead of transaction prices, there is still value in developing RPPIs using this data source.

4.   **As a matter of urgency, the authorities should make the new reporting template mandatory and provide additional staff to the Residential Property Price Analysis (RPPA) wing.** The BB introduced a new data collection template in January 2022 for eight financial institutions in the initial pilot phase. The authorities have been slow to make the new template a mandatory requirement and expand the data collection to all financial institutions including other non-banks. Management at the BB have provided their assurances that this issue will be prioritized over the coming months. To support the increased volume of survey forms, the junior level officials (Joint Director and below) with the relevant skills (R programming, database management) within the RPPA wing should be increased to about five staff in total.

5.   **An experimental RPPI following the hedonic approach[1] was successfully calculated.** This was a significant achievement for the authorities. The mission also focused on the practical implementation of the recommendations from the previous mission. To ensure that key improvements were progressed, the mission worked with BB staff to update the R script and develop procedures for the regular production of the RPPI.

6.   **The compilation methods used for the experimental RPPI follow recommended international standards.** The data was stratified into six regional groups and sub-indices were calculated using hedonic methods. The sub-indices were aggregated to an overall index for Dhaka using annually

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[1] Hedonic methods include all regression-based methods for compiling quality-adjusted price indices. Some methods use the estimated (predicted) prices from the regressions for compiling the price indices while others use time-dummy coefficients to directly estimate the change in prices with respect to time.

updated expenditure weights. In addition, a robust statistical method was applied to identify outliers. The regression-based method identifies outliers with greater precision than using other statistical methods.

7.   **The BB should publish the experimental RPPI for Dhaka on their website, along with the sub-indices for the six regional strata.** Initially, the indices can be circulated internally, requesting feedback from researchers and economists. The authorities should then publish the RPPI on their website, labelled as experimental, along with an accompanying methods document and a quarterly dissemination report. The RPPI should be updated quarterly according to a pre-announced publication schedule. Once further improvements outlined in this report have been implemented, the experimental label can be removed. The data should be easily downloadable from the website, e.g., in csv format. The authorities should publish (i) indices, (ii) year-on-year percentage changes, and (iii) quarter-on-quarter percentage changes.

8.   **The authorities should finalize the draft quarterly dissemination report and the draft methods document that were developed during the mission.** The dissemination report should be updated quarterly and published on the website alongside the RPPI time series data. The report highlights the key inflation information and trends for the user. A methods document is an important step for finalizing each step of the compilation, ensuring transparency for users, and solidifying the knowledge and understanding of BB staff.

TABLE 1. Priority Recommendations

Target Date	Priority Recommendation	Responsible Institution
October 31, 2024	Publish the experimental RPPI for Dhaka on the BB website.	Bangladesh Bank
November 31, 2024	Make the new reporting template mandatory.	Bangladesh Bank
December 31, 2024	Provide additional staff to the RPPA wing.	Bangladesh Bank

9.   **Further details on the priority recommendations and the related actions/milestones can be found in the action plan under Detailed Technical Assessment and Recommendations.**

Section I. Detailed Technical Assessment and Recommendations

TABLE 2. Action Plan, 2024–2025

Priority	Action/Milestone	Target Completion Date
Topic: Publication of the experimental RPPI		
M	Finalize the quarterly dissemination report	September 31, 2024
M	Finalize the draft methods document	September 31, 2024
M	Publish the experimental RPPI for Dhaka on the BB website	October 31, 2024
Topic: Data collection using the new reporting template		

Priority	Action/Milestone	Target Completion Date
H	Make the new reporting template mandatory	November 31, 2024
H	Provide additional staff to the RPPA wing	December 31, 2024
H	Apply additional checks to the new reporting template to ensure all relevant mortgage loans are being provided	December 31, 2024
Topic: Improved compilation methods for the experimental RPPI		
M	Carry out a detailed visual examination of the DBH dataset	Complete
M	Limit the scope of the index to dwellings in the city of Dhaka for the period from Q1 2009	Complete
M	Use six regional strata within Dhaka	Complete
M	Use expenditure weights (i.e., flow weights) for the strata	Complete
M	Implement a robust system for outlier and error detection	Complete
M	Use the rolling window time-dummy approach for quality adjustment within strata	Complete
M	Combine categories for location before including the variable in the models for the regional strata	Complete
M	Finalize the specifications of the models e.g., whether or not to take log of floor area	Complete
M	Use an annually chained Laspeyres-type aggregation formula to calculate the headline RPPI	Complete
M	Update the R code to implement the improvements to the compilation methods	Complete
M	Apply data smoothing to the indices to reduce volatility	Complete
M	Improve the quality adjustment being applied in the hedonic models by including additional property characteristics	December 31, 2025
M	At the same time as implementing updated models, begin using purchase prices rather than valuation prices	December 31, 2025
M	Accumulate four quarters of data before adding a new respondent to the sample	December 31,2025

A. INTRODUCTION

10.   **A TA mission was conducted from May 19–27, 2024, to assist the Bangladesh Bank (BB) with the ongoing development of their Residential Property Price Index (RPPI).** The mission was conducted under the auspices of the Data for Decisions (D4D) Trust Fund and was a continuation of previous TA in 2019 and 2023.

11.   **A pre-mission meeting was held on May 9, 2024, attended by officials from the BB and the mission team.** The objectives for the mission were discussed and agreed. The BB also shared the most recent microdata to allow for advanced data analysis and preparation for the mission. This was very

helpful for the success of the mission and ensured that the time spent on-site at the offices of the BB could be used as efficiently as possible.

12.   There was a focus on the practical implementation of the recommendations from the previous mission. The progress made since the last mission was impeded by shortages of staff, with the relevant skills (R programming, database management), in the RPPA wing. There are currently two junior level officials (Joint Director and below) in the RPPA wing, one of whom only joined earlier this year. In this regard, placing some officials from the Statistics Department and the IT Department with the relevant skills in the RPPA wing would be beneficial. To ensure that key improvements were progressed, the mission worked with staff to update the R script and develop procedures for the regular production of the RPPI. During the mission, an experimental RPPI following the hedonic approach was successfully calculated. This was a significant achievement for the authorities. In the short-term, the RPPA wing will need support from staff in other divisions to finalize the procedures for the calculation of the RPPI, prepare the quarterly dissemination report and develop the accompanying methods document.

13.   The BB requested training on all aspects of RPPI compilation. While the main focus was on the practical application of the methods, the mission also delivered training on key aspects of RPPI compilation e.g., hedonic modelling, time-dummy method, aggregation, annual chaining etc. Staff from the monetary policy department and research department also attended the training to ensure wide dissemination of knowledge. The mission team will continue to collaborate remotely as necessary as the authorities work towards finalizing the experimental RPPI.

B.   DATA SOURCES FOR THE RPPI

14.   The BB used the available mortgage loan data to compile an experimental RPPI for Dhaka. The BB has two data sets available to them, both of which relate to mortgage data collected from financial institutions and other non-banks. The first data set was received quarterly from a single financial institution called Delta Brac Housing Finance Corporation (DBH). This is one of the largest mortgage loan providers in the market. This data collection was initially established in the late 1990s, however, the data is useable from 2009. While the variables collected are somewhat limited and valuation prices are used instead of transaction prices, there is still value in developing RPPIs using this data source.

15.   The BB introduced a new data collection template in January 2022 for eight financial institutions in the initial pilot phase. The new template consists of detailed questions on (i) the financial aspects of the loan e.g., purchase price, valuation price etc., (ii) the geographical details of the property e.g., division, district, upazila/thana etc., and (iii) the property characteristics e.g., floor area, number of bedrooms, number of bathrooms, lift, parking etc. Further details on the new data collection template are available in the TA report for the RPPI mission to Bangladesh during February 2023.[2] The new data collection is still in the early stages of development and is not yet a mandatory requirement for all financial institutions. In addition, it is not clear whether the financial institutions and other non-banks that do complete the survey are providing all relevant mortgage loans.

16.   As a matter of urgency, the authorities should make the new reporting template mandatory and provide additional staff to the RPPA wing. The previous mission in 2023 also recommended that the new collection should be mandatory, however, progress has been slow. The BB are required to issue

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[2] https://www.imf.org/en/Publications/CR/Issues/2023/08/04/Bangladesh-Technical-Assistance-Report-Residential-Property-Price-Index-Mission-537582#:~:text=IMF%20Staff%20Country%20Reports&text=Summary%3A,for%20Decisions%20(D4D)%20Fund.

a formal circular to the reporting institutions to make the new template a mandatory requirement. Management at the BB have provided their assurances that this issue will be prioritized over the coming months. To support the increased volume of survey forms, the junior level officials (Joint Director and below) with the relevant skills (R programming, database management) within the Residential Property Price Analysis (RPPA) wing should be increased to about five staff in total.

17.   **Additional checks should be applied to the new reporting template to ensure financial institutions and other non-banks are providing all relevant mortgage loans**. The statistics department at the BB collects aggregate data on the total value of residential property loans issued by each mortgage provider. The RPPA wing should crosscheck this information with the data provided on the new reporting template. While not every mortgage loan may be relevant for the RPPI e.g., loan for constructing a dwelling, this additional check would provide a clear indication if the financial institutions and other non-banks are disclosing all relevant transactions.

18.   **In the medium to long term, the authorities should continue to monitor the potential of listings data from property websites to expand the coverage of the real estate market**. The existing mortgage data used by the BB does not provide coverage of cash purchases of residential property. Ideally, the index would cover all transactions. During the mission, a meeting was organized with one real estate agent with an online presence. This meeting with very helpful to provide additional information on the residential property market in Dhaka and wider Bangladesh. However, due to the low number of transactions currently organized through the website, this data source is not yet ready to be used for the RPPI. Residential property transactions in Bangladesh are generally facilitated via informal channels e.g., relatives or local shop owners, rather than through professional real estate agents and online portals. As formal channels for the sale of residential property become more established, the potential of listings data for the compilation of the RPPI may increase over time.

Recommended Actions:
- Use the available mortgage loan data to compile an experimental RPPI for Dhaka
- As a matter of urgency, make the new reporting template mandatory and provide additional staff to the RPPA wing.
- Apply additional checks to the new reporting template to ensure financial institutions and other non-banks are providing all relevant mortgage loans.
- Continue to monitor the potential of listings data from property websites to expand the coverage of the real estate market.

C. METHODS FOR COMPILATION

19.   **The mission assisted with the practical implementation of improved methods for the experimental RPPI for Dhaka.** The data used was the DBH data set from Q1 2009, supplemented by additional data collection from other financial institutions and non-banks from Q1 2022. The mission worked with BB staff to implement the updated methods in the R scripts. While most of the compilation procedures were carried out in the R statistical package (data cleaning, weights calculations, hedonic regressions, and outlier detection), the stratification was performed in MS Access at the database level and the index compilation and aggregation were implemented in MS Excel. New worksheets were devised in MS Excel for aggregation purposes. This approach was taken as the authorities wanted to ensure that the regular production of the RPPI was transparent and maintainable over time.

20.   The stratification within Dhaka was updated from four to six strata. Following a re-examination of the data, it was decided to expand the number of strata as follows; (i) Mohammadpur Zone, (ii) Dhanmondi Zone, (iii) Gulshan Zone, (iv) Mirpur Zone, (v) Uttara Zone, and (vi) Southeast Dhaka Zone. This increases the homogeneity of the observations in each group. The total number of observations in the sample was sufficient to support this additional breakdown. An updated map of the six strata is presented in Appendix A.

21.   The authorities used annually updated expenditure weights to compile an overall RPPI for Dhaka. Appendix B outlines the weights from 2009–2023 used in the calculation of the experimental RPPIs for Dhaka. The same data source was used for the weights as for the prices i.e., DBH data set. The weights were calculated by summing the price information within each strata for a calendar year. It would be preferable to use more comprehensive administrative data sources, e.g., land register or tax data, to calculate the weights. However, these data are not accessible to the BB. In addition, there is a lack of acceptance among stakeholders about the accuracy of declared prices recorded for the purposes of taxation and property registration.

22.   The BB used Cook's Distance to identify outliers. The regression-based method identifies outliers with greater precision than using the interquartile range. Therefore, the method preserves the sample to the extent possible. The suggested threshold for outlier determination is four divided by the number of observations used in the regression. It is recommended to apply the method separately for each stratum and each rolling window, i.e., four quarters of data. Typically, around five to ten percent of observations were identified as outliers. The outliers should be checked regularly to ensure no market segment is being systematically excluded. In addition to outlier detection, the sample was checked for (i) duplicates, (ii) missing values and (iii) errors. A significant number of duplicates were identified, while the data had no missing values. A minimum and maximum threshold for price per square foot to identify unreasonable values, which would indicate an error. A small number of observations were omitted after implementing the thresholds.

23.   The BB used a log-linear functional form for each stratum model. The hedonic regression method used was the rolling window (four quarters) time-dummy approach. The relatively simple model used the log price as the dependent variable, with floor area and location as the characteristic variables. Before the location variable was included in the models, some locations were combined to ensure an adequate number of observations in each location category. The coefficients on the time dummies were exported to MS Excel for index compilation.

24.   The authorities carried out quality checks on the results of the hedonic regressions. The regression models generally showed high explanatory power, and the explanatory variables were statistically significant and in line with a priori expectations (in respect of both sign and slope) over time.

25.   Experimental quality adjusted RPPIs, following the hedonic approach, were compiled during the mission. Figure 1 show the aggregate index for Dhaka, comparing the hedonic approach with the stratification with medians (price per square foot) approach. Due to volatility in the indices, a two-quarter rolling average is used for smoothing purposes. Figure 2 shows the year-on-year (YoY) growth rates for both indices. As can be seen, the resulting indices from both methods are quite similar. Regardless, the hedonic approach is preferred as there is further quality adjustment being applied to the stratum level indices using the location variable. The six stratum-level sub-indices were also calculated. These are shown in Annex C.

FIGURE 1. RPPI for Dhaka (2016=100), 2-Quarter Moving Average, Hedonic & Stratification Approaches, 2010Q2–2024Q1
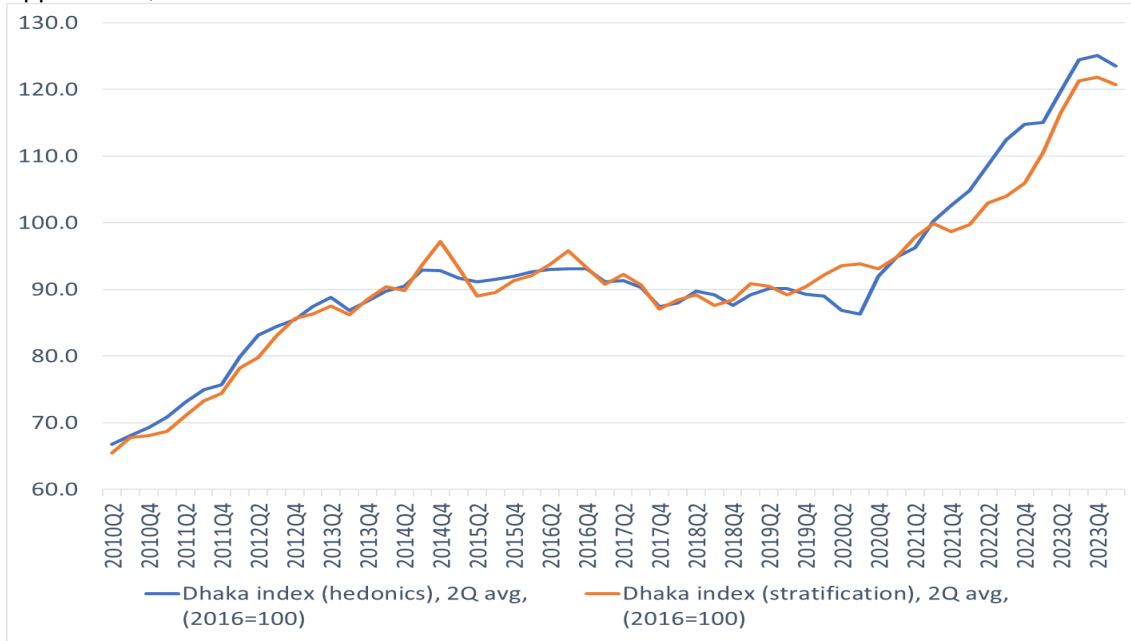
FIGURE 2. RPPI for Dhaka (YoY%), 2-Quarter Moving Average, Hedonic & Stratification Approaches, 2011Q2–2024Q1.
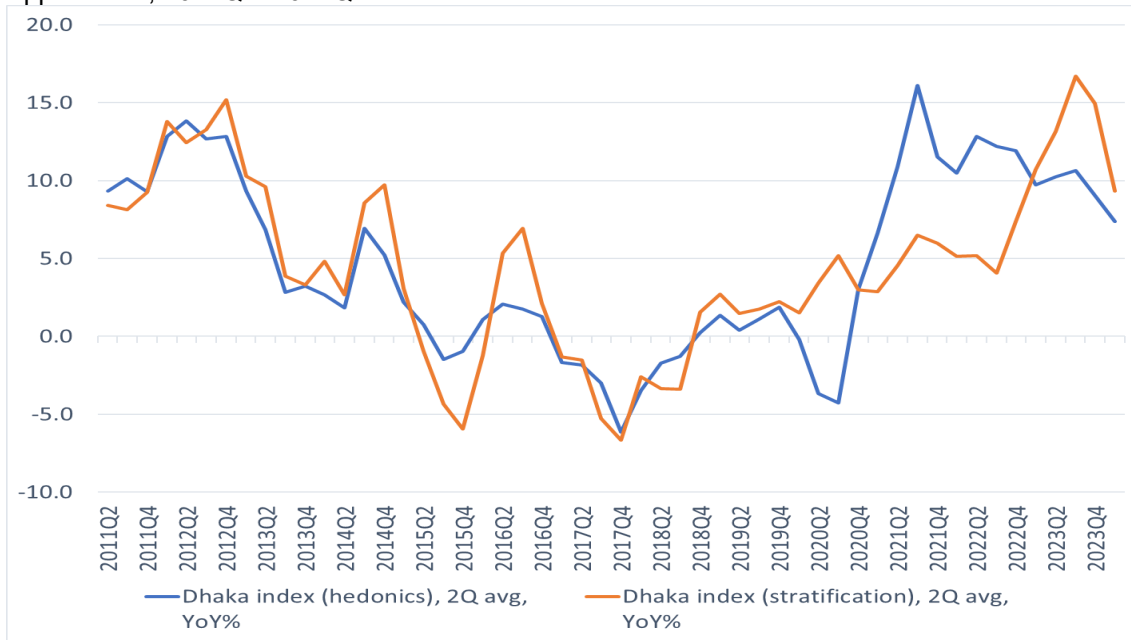
26.   The BB should improve the quality adjustment being applied in the hedonic models by including additional property characteristics. The new template implemented by the BB in 2022 includes several additional property characteristics, such as more granular geographical information and more detailed physical attributes e.g., number of bedrooms, number of bathrooms, floor level etc. The BB should specify a new regression model using these variables. Once specified, the new model can be applied from the first quarter of 2023, as four-quarters of data are required for the rolling window. It is also preferable that the new model is first used in the compilation at the same time as the annual update of the

weights i.e., first quarter. After running the new model, the coefficients on the time-dummy variable are used for index compilation in the normal way.

27.   **At the same time as implementing updated models, the BB should begin using purchase prices rather than valuation prices.** Transaction or purchase prices are the target price for the compilation of a RPPI. Due to data constraints, the BB have no other option than to use valuation prices before 2022. The authorities are aware of the problems with using valuation prices and should transition to using purchase prices as soon as possible using the data from Q1 2022. The transition to purchase prices and the update of the regression models outlined in the previous paragraph are significant changes to the compilation procedures. In that case, BB should consider whether a revision to the index is warranted. In addition, the authorities should update the accompanying methods document and inform users by including a short note in the quarterly dissemination report.

28.   **The authorities should accumulate four quarters of data before adding a new respondent to the sample.** When running the rolling window regressions, it is preferable that the sample includes observations from the same financial institutions and non-banks across all four quarters. This ensures that the sample is relatively consistent over time and allows for better estimates of price change. Therefore, when loan data is received from new respondents, the authorities should wait for four quarters before adding the respondent to the sample used for RPPI compilation. It is expected that many new financial institutions and non-banks will begin reporting to the BB after the new template becomes mandatory.

Recommended Actions:

- Improve the quality adjustment being applied in the hedonic models by including additional property characteristics.
- At the same time as implementing updated models, begin using purchase prices rather than valuation prices.
- Accumulate four quarters of data before adding a new respondent to the sample.

D. DISSEMINATION

29.   **The BB should publish the experimental RPPI for Dhaka on their website, along with the sub-indices for the six regional strata.** Initially, the indices can be circulated internally, requesting feedback from researchers and economists. The BB can also consult with key stakeholders in the property market e.g., DBH, real estate agents. The BB should get agreement from DBH in advance of wider publication and provide assurance that the confidentiality of the data will be maintained.
The authorities should then publish the RPPI, labelled as experimental, on their website with an accompanying methods document and a quarterly dissemination report. The RPPI should be updated quarterly according to a pre-announced publication schedule. Once further improvements outlined in this report have been implemented, the experimental label can be removed.

30.   **The experimental RPPIs have been smoothed using a two-quarter moving average.** As the price indices show some volatility, as is common with RPPIs, then a method for smoothing can be applied. The simplest method is a two-quarter moving average. While the smoothed indexes are used for the headline rates of inflation, for transparency purposes, the unsmoothed indices should also be published. As the number of observations used for the calculation of the RPPI increases and the volatility in the resulting indices is reduced, the BB can consider whether they want to continue using a smoothing technique.

31.   The authorities should publish (i) indices, (ii) year-on-year percentage changes and (iii) quarter-on-quarter percentage changes. The data should be easily downloadable from the website e.g., in csv format. The following indicators should be included in the csv file (i) seven indices, smoothed, 2016=100, (ii) year-on-year percent change, smoothed indices, (iii) quarter-on-quarter percent change, smoothed indices, and (iv) seven indices, unsmoothed, 2016=100. The unsmoothed indices should be included for information purposes; however, the headline rate of inflation should be based on the smoothed indices.

32.   The authorities should finalize the draft quarterly dissemination report and the draft methods document that were developed during the mission. The dissemination report should be updated quarterly and published on the website alongside the RPPI time series data. The report highlights the key inflation information and trends for the user. A methods document is an important step for finalizing each step of the compilation, ensuring transparency for users, and solidifying the knowledge and understanding of BB staff.

Recommended Actions:

- Publish the experimental RPPI for Dhaka on the BB website, along with the sub-indices for the six regional strata.
- Publish the indices, year-on-year percentage changes and quarter-on-quarter percentage changes.
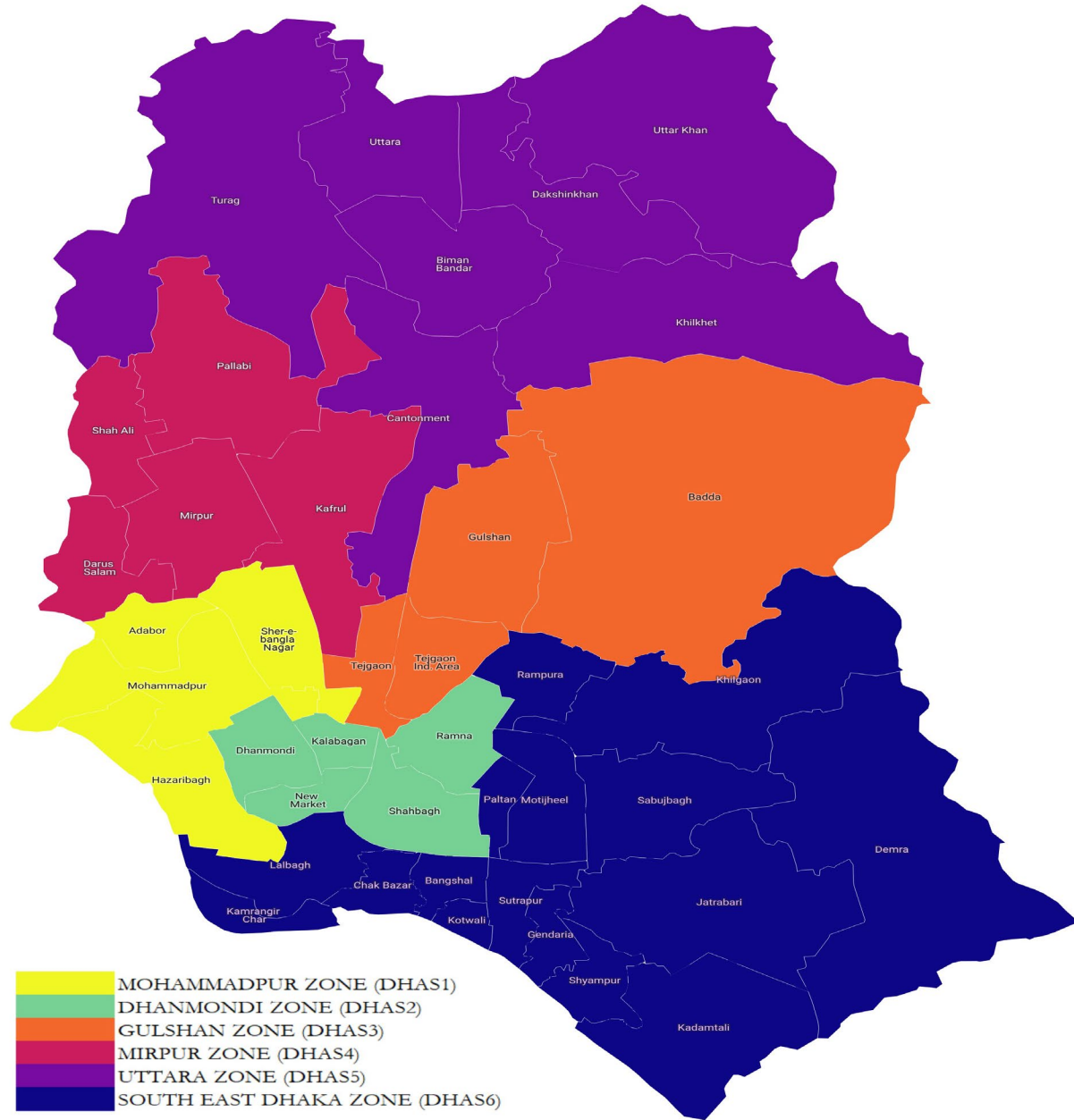- Finalize the draft quarterly dissemination report and the draft methods document.

E.   OFFICIALS MET DURING THE MISSION

Name:	Position:	Department:
Abdur Rouf Talukder	Governor	Bangladesh Bank
Dr. Md. Habibur Rahman	Deputy Governor-4	Bangladesh Bank
Dr. Sayera Younus	Executive Director (Research)-2	Research Department
Mst. Nurnaher Begum	Director-3	RPPA Wing, Research Department
Ms. Zahira Hasin	Additional Director	RPPA Wing, Research Department.
Md. Ahsan Ullah	Joint Director	Monetary Policy Department
Sadia Sultana	Joint Director	Monetary Policy Department
Mohammad Mazharul Islam	Deputy Director (Computer Operation Supervisor)	Monetary Policy Department
Md. Yousuf	Deputy Director	Research Department
Rifat Ara Bindu	Assistant Director	Research Department
Md. Saiful Arefin	Assistant Director	RPPA Wing, Research Department
Sunita Rani Das	Assistant Director	Monetary Policy Department
Shakil Ahmed	Assistant Director	Research Department
Shahin Bhuiyan	Assistant Director	Research Department
Tahsin Sahriar	Assistant Director	Research Department
Mitu Rani Roy	Assistant Director	Research Department
Nishat Tasneem	Assistant Director	RPPA Wing, Research Department

Name:	Position:	Department:
MD. Belaiet Hossain	Assistant Director (Statistics)	Monetary Policy Department

Appendices

A. REGIONAL STRATIFICATION FOR DHAKA

MOHAMMADPUR ZONE (DHAS1)
DHANMONDI ZONE (DHAS2)
GULSHAN ZONE (DHAS3)
MIRPUR ZONE (DHAS4)
UTTARA ZONE (DHAS5)
SOUTH EAST DHAKA ZONE (DHAS6)

B. EXPENDITURE WEIGHTS

TABLE 3. Expenditure Weights by Strata, 2009–2023

	Mohammadpur Zone	Dhanmondi Zone	Gulshan Zone	Mirpur Zone	Uttara Zone	South East Dhaka
2009	28.7	15.2	15.9	14.8	17.5	7.8
2010	27.2	15.3	18.8	12.9	18.4	7.4
2011	28.8	14.4	18.1	14.5	16.4	7.8
2012	29.5	12.4	21.5	12.8	16.5	7.3
2013	26.4	18.5	16.7	14.5	16.5	7.4
2014	22.3	19.8	21.0	13.1	15.0	8.9
2015	23.9	17.3	20.4	15.4	15.4	7.6
2016	20.1	18.7	23.0	17.7	11.7	8.7
2017	19.4	15.3	20.0	19.1	16.4	9.8
2018	8.9	13.1	28.3	19.7	17.3	12.6
2019	11.0	13.4	25.1	17.2	20.0	13.2
2020	11.6	15.6	25.1	19.1	16.4	12.2
2021	11.4	13.4	27.5	16.0	18.3	13.4
2022	12.2	13.8	25.8	18.0	16.1	14.1
2023	10.0	17.9	30.7	12.6	15.4	13.4

C. RPPI SUB-INDICES FOR DHAKA

FIGURE 3. RPPI Sub-Indices for Dhaka (2016=100), Hedonic Approach with 2-Quarter Moving Average, 2009Q2–2024Q1
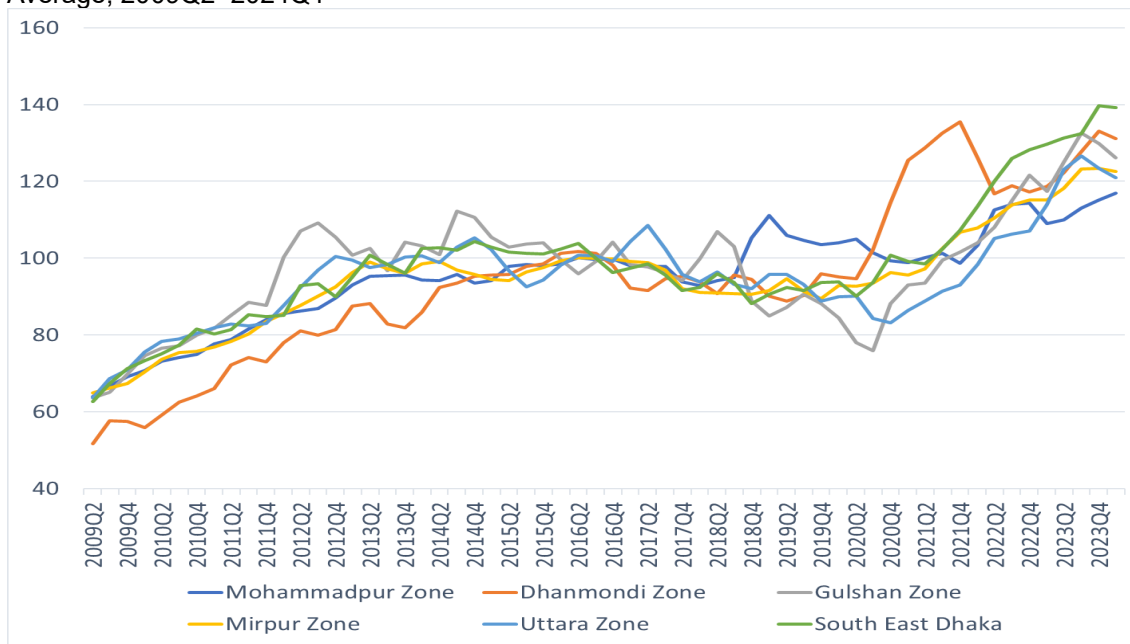
FIGURE 4. RPPI Sub-Indices for Dhaka (YoY percent), Hedonic approach with 2-Quarter Moving Average, 2010Q2–2024Q1.