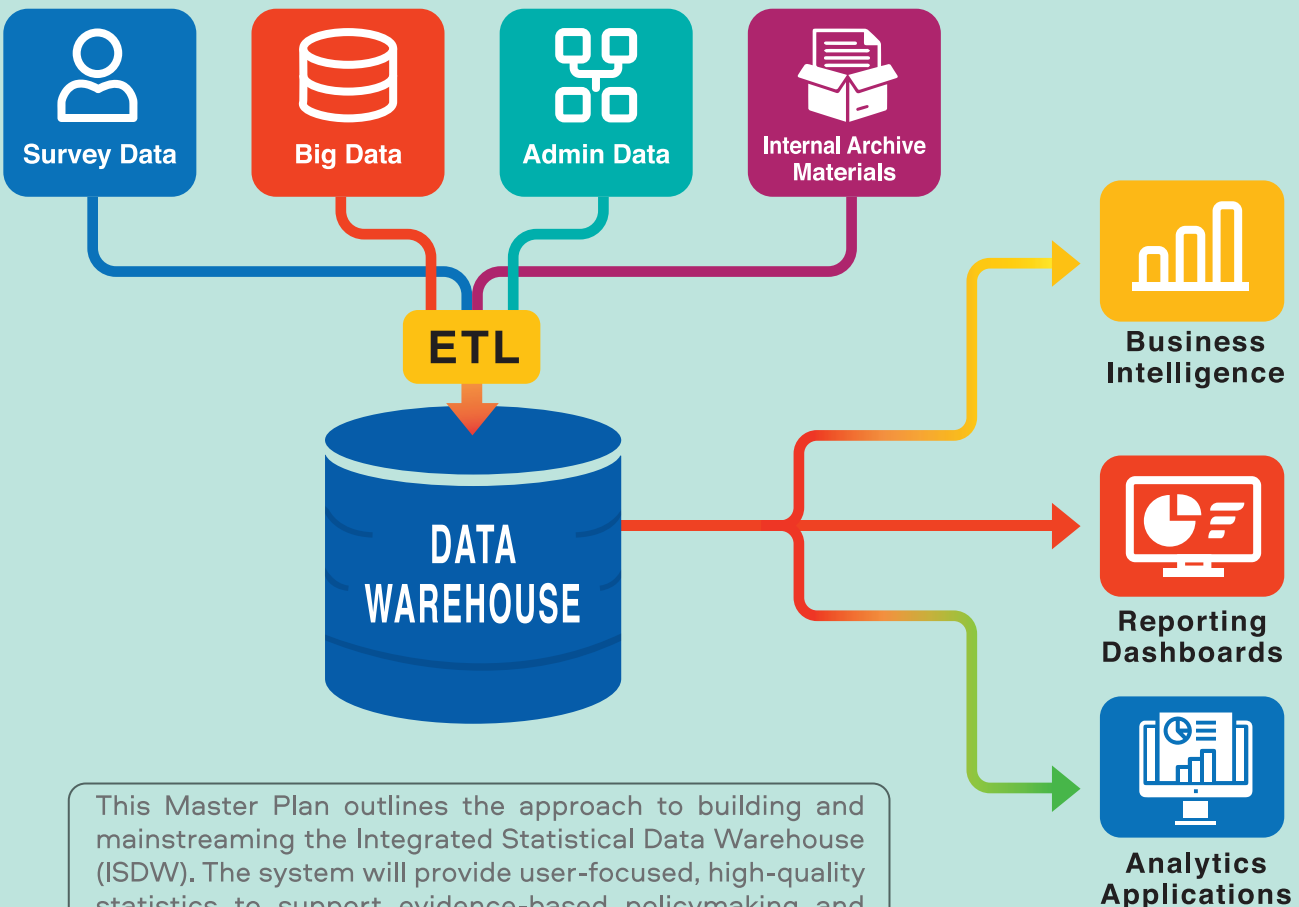
Master Plan

Integrated Statistical Data Warehouse (ISDW)

April 2026



This Master Plan outlines the approach to building and mainstreaming the Integrated Statistical Data Warehouse (ISDW). The system will provide user-focused, high-quality statistics to support evidence-based policymaking and development planning in Bangladesh.

Bangladesh Bureau of Statistics (BBS)
Statistics and Informatics Division (SID)

KOICA
KITC CONSORTIUM

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Master Plan

Integrated Statistical Data Warehouse (ISDW)

April 2026

Bangladesh Bureau of Statistics (BBS)
Statistics and Informatics Division (SID)

KOICA
KITC CONSORTIUM

Director General
Bangladesh Bureau of Statistics(BBS)
Ministry of Planning

PREFACE

Bangladesh Bureau of Statistics (BBS), the National Statistics Office (NSO) of the country, has the mandate to produce, compile and disseminate official statistics that are essential for informed policy formulation, planning and monitoring. Over time, BBS has expanded its scope of work, conducting a wide range of censuses and surveys and collaborating increasingly with line ministries and other partners. While this growth has enriched the country's statistical resources, it has also highlighted challenges arising from fragmented data systems, diverse formats and limited integration across datasets.

The Integrated Statistical Data Warehouse (ISDW) initiative responds directly to these challenges. Under the project titled "Capacity Building of Statistics Service based on Platform Project (2024–2028)", supported by the Korea International Cooperation Agency (KOICA), BBS is embarking on the development of a modern, secure and standards-based platform that will bring together priority data sources and enable more efficient, coherent and user-oriented statistical services. The ISDW will be central to BBS's digital transformation and will serve as a foundation for advanced analysis, geospatial integration and improved microdata access.

This Master Plan sets out the strategic framework and detailed roadmap for the ISDW. It describes the vision and guiding principles, the proposed architecture and data governance arrangements, the phased implementation plan, and the measures required to ensure sustainability and institutionalization. The preparation of the Master Plan has involved extensive consultation with BBS wings, SID, line ministries and development partners. It reflects a shared commitment to strengthening the national statistical system and to aligning with international standards and best practices.

First and foremost, we express our sincere gratitude to the Ms. Aleya Akter, Secretary of the Statistics and Informatics Division (SID) for her invaluable cooperation and steadfast support. I would like to acknowledge the valuable technical and financial support provided by KOICA and the contributions of the Korean and Bangladeshi experts engaged in this work. I also record my appreciation for the efforts of the project team, BBS officials and all stakeholders who contributed their time and expertise to the development of this Master Plan.

It is my expectation that the successful implementation of this Master Plan will significantly enhance the capacity of BBS to deliver high-quality, timely and integrated statistics in the service of national development.



Dhaka
April 2026

Md. Forhad Siddique

KOICA

Country Director
KOICA Bangladesh Office

MESSAGE

The Korea International Cooperation Agency (KOICA) is honored to support the Government of Bangladesh in its efforts to strengthen the national statistical system and promote evidence-based policy-making. Reliable, timely and integrated statistics are essential for effective planning, monitoring and evaluation, as well as for tracking progress towards national development priorities and the Sustainable Development Goals.

The project "Capacity Building of Statistics Service based on Platform Project (2024–2028)" represents a strategic partnership between KOICA, the Statistics and Informatics Division (SID) and the Bangladesh Bureau of Statistics (BBS). Through this project, KOICA is pleased to provide financial and technical assistance for the design and establishment of an Integrated Statistical Data Warehouse (ISDW) and a complementary platform for big data and advanced analytics. These initiatives are closely aligned with KOICA's broader commitment to support digital transformation, good governance and sustainable development in partner countries.

The Master Plan for the Integrated Statistical Data Warehouse is a key output of this cooperation. It presents a clear and practical roadmap for building a modern data infrastructure that can integrate diverse statistical and administrative data sources, support robust data governance and security, and provide improved access to statistics for policymakers, line ministries, researchers and the public. The Master Plan also emphasizes the importance of institutional arrangements, capacity development and long-term sustainability, which are critical for ensuring that the benefits of the ISDW are fully realized.

KOICA greatly values the professionalism and dedication demonstrated by SID, BBS and the project team in the preparation of this Master Plan. We are confident that its implementation will significantly strengthen Bangladesh's statistical capabilities and contribute to more effective and transparent development policies.

On behalf of KOICA, I reaffirm our commitment to continued collaboration with the Government of Bangladesh and look forward to witnessing the positive impact of the ISDW on the quality, accessibility and use of official statistics in the years ahead.



Dhaka
April 2026

Jihoon Kim

Project Director
Capacity Building of Statistics
Service based on Platform Project
Bangladesh Bureau of Statistics

ACKNOWLEDGEMENT

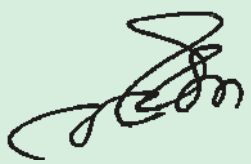
The preparation of the Master Plan for the Integrated Statistical Data Warehouse (ISDW) is the result of the collective efforts of many institutions and individuals. As the Project Director of the "Capacity Building of Statistics Service based on Platform Project (2024–2028)", I take this opportunity to express my sincere appreciation to all who have contributed to this important milestone.

First and foremost, I am grateful to Ms. Aleya Akter, Secretary, Statistics and Informatics Division (SID), Ministry of Planning, for her guidance, encouragement and strategic direction throughout the process. I also acknowledge with thanks the leadership and support provided by Md. Forhad Siddique, Director General, Bangladesh Bureau of Statistics (BBS), whose commitment to the digital transformation of BBS has been instrumental in advancing this initiative.

I wish to place on record our deep appreciation to the Korea International Cooperation Agency (KOICA) for its generous financial and technical assistance. The contributions of the KOICA Country Office, the Korean expert team and the consultants engaged under the project have been invaluable in shaping the vision, architecture and implementation strategy of the ISDW, drawing on international experience and good practice.

Special thanks are extended to the Project Manager, Mr. Son Young Tae, and to Mr. Song Young-chol, Master Plan Leader of the KITC Consortium, for their outstanding contributions to the project. Our gratitude also extends to the members of the Project Management Consultancy, the BBS working groups and focal points from the different wings of BBS, who devoted significant time and effort to consultations, technical discussions and review of draft materials. We are also grateful to representatives of SID, line ministries, development partners, academia and other stakeholders who participated in stakeholders consultation workshops and provided constructive feedback on the proposed approach.

Finally, I acknowledge the dedication of the technical and administrative staff working behind the scenes to coordinate meetings, compile information and support the production of this Master Plan. It is my sincere hope that this Master Plan will serve as a practical roadmap for the successful establishment and institutionalization of the ISDW, and that, with the continued cooperation of all stakeholders, it will contribute meaningfully to strengthening Bangladesh's system and to supporting evidence-based decision-making.



Dhaka
April 2026

Kabir Uddin Ahmed

ABBREVIATIONS & ACRONYMS

API	Application Programming Interface
BBS	Bangladesh Bureau of Statistics
CADE	Computer-Assisted Data Entry
CAPI	Computer Assisted Personal Interviewing
DW	Data Warehouse
ETL	Extract - Transform - Load
GDP	Gross Domestic Product
GIS	Geographic Information System
GSBPM	Generic Statistical Business Process Model
HR	Human Resource
ICT	Information and Communication Technology
IDS	Intrusion Detection System
IPS	Intrusion Prevention System
ISCO	International Standard Classification of Occupations
ISIC	International Standard Industrial Classification
ISDW	Integrated Statistical Data Warehouse
KOICA	Korea International Cooperation Agency
M&E	Monitoring and Evaluation
MOU	Memorandum of Understanding
NPR	National Population Register
NSDS	National Strategy for the Development of Statistics
NSS	National Statistical System
NSO	National Statistics Office

ABBREVIATIONS & ACRONYMS

PMC	Project Management Consultancy
RAS	Remote Access System
RBAC	Role Based Access Control
SAN	Storage Area Network
SASI	Smartphone-Assisted Self Interviewing
SCEMP	Statistical Capacity Enhancement and Modernization Project
SDGs	Sustainable Development Goals
SDMX	Statistical Data and Metadata e-Xchange
SID	Statistics and Informatics Division
SIMS	Single Integrated Metadata Structure
SNA	System of National Accounts
SR	Service Request
StatCan	Statistics Canada
SW	Software
SWOT	Strengths, Weaknesses, Opportunities, Threats
TOT	Training of Trainers
UN	United Nations
VLAN	Virtual Local Area Network
VM	Virtual Machine
SOP	Standard Operation Procedures

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EXECUTIVE SUMMARY

Bangladesh Bureau of Statistics (BBS), the National Statistics Office (NSO) of Bangladesh under the Statistics and Informatics Division (SID), Ministry of Planning, is embarking on a major modernization initiative to strengthen the country's statistical infrastructure and support evidence-based policy-making. With direct financial and technical assistance from the Korea International Cooperation Agency (KOICA), BBS is establishing an Integrated Statistical Data Warehouse (ISDW) under the project titled: "Capacity Building of Statistics Service based on Platform Project" (2024-2028).

This Master Plan provides the strategic and technical roadmap for designing, implementing and institutionalizing the ISDW as core assets of the National Statistical System (NSS).

BBS has a long tradition of producing official statistics through censuses, surveys and the compilation of administrative data, supporting national frameworks such as, the Perspective Plan of Bangladesh 2021-2041 and sectoral plans, as well as international reporting obligations including the Sustainable Development Goals (SDGs).

However, the current data environment is fragmented and siloed. Multiple stand-alone systems, heterogeneous formats, incomplete metadata and largely manual data-sharing arrangements make it difficult to produce timely, integrated and disaggregated statistics. At the same time, policy-makers are demanding more granular, coherent and geospatially enabled information, and there is growing interest in using administrative and "big data" sources to complement traditional statistics.

In this context, the ISDW are conceived as strategic enablers of statistical modernization - not simply ICT upgrades. They will provide a unified, standards-based infrastructure for storing, integrating, managing and using data from multiple sources, thereby strengthening BBS's ability to fulfil its mandate as the central hub of official statistics for the Government of the People's Republic of Bangladesh.

The Vision of this Master Plan is:

To establish an integrated, secure and standards-based integrated statistical data warehouse within BBS that enables timely, high-quality and user-oriented official statistics to support evidence-based policy formulation, planning and monitoring in Bangladesh.

Implementation of the ISDW is guided by a set of principles. It is mandate-driven and user-oriented, anchored in the Bangladesh Statistics Act, 2013 and national priorities, and responsive to the needs of policy-makers, planners, researchers and citizens. It upholds quality, integrity and professionalism in line with the UN Fundamental Principles of Official Statistics. The design is standards-based and interoperable, using international models and standards such as GSBPM, SDMX, ISIC, ISCO and BBS geocodes to ensure comparability and integration. It is integrated and reusable, promoting a "collect once, use many times" approach through shared data services. The ISDW is also secure and confidential, protecting individual data and ensuring responsible use through robust security, privacy and governance arrangements. The implementation is phased and realistic, focusing on achievable steps and value-for-money investments that are aligned with GoB ICT and procurement policies. Finally, it is institutionalized and capacity-focused, embedding new processes, roles and skills into BBS's organizational structure and culture.

The Master Plan Sets Strategic Objectives to:

- Strengthen BBS's statistical data infrastructure through an integrated data warehouse and analytics environment.
- Improve coherence, comparability and quality of official statistics via standardized classifications, metadata and quality management.
- Enhance access to and use of statistics for policy-making, planning and research, including controlled microdata access.
- Promote systematic integration of administrative and selected big data sources into statistical production.
- Institutionalize data governance, security and compliance frameworks.
- Develop and retain the human capacities needed to operate and sustain the ISDW.

The Architecture of the ISDW:

The Master Plan proposes the following layered, modular and standards-based that is technology-neutral but clearly structured to guide implementation:

A dedicated Data Governance and Management Framework provide policies, roles and processes for data classification, access, sharing, quality, lifecycle management, metadata and master data. It establishes a Data Governance Council and technical working groups, and designates Data Stewards in subject-matter Wings as well as Data Custodians in ICT units. The Framework is supported by formal policies and standard operating procedures on data governance, confidentiality, metadata and master data. It also ensures that microdata access and confidentiality procedures are fully integrated with the ISDW.

A comprehensive Data Security, Privacy and Compliance framework ensures that the confidentiality, integrity and availability of data are protected. It does so through role-based access control and the application of least-privilege principles, supported by secure network architecture, encryption, logging and incident response mechanisms. The framework also provides for de-identification and anonymization of data, as well as controlled microdata access environments. In addition, it is fully aligned with the Statistics Act, e-Government Master Plan, Government of Bangladesh security policies and international good practice.

The Implementation Strategy and Phased Roadmap set out how the Master Plan will be put into practice. It proposes a four-phase implementation roadmap that is aligned with the KOICA project period and with the Government of Bangladesh's planning and budgeting cycles. Phase-by-Phase Implementation Schedule is provided below:

1) **Initiation and Preparation Phase (Q4 2024~Q4 2025):** In this phase, the project starts with selecting the Project Management Consultancy (PMC); hold the kickoff meeting and define the overall scope. System and database requirements will be specified, followed by analysis and design work. Platform Contractor (PC) vendor will be selected and an IT equipment procurement plan will be developed and initiated.

2) **Statistical Data Warehouse Platform Establishment Phase (Q1 2026~Q2 2027):** This phase will focus on developing the core data warehouse platform, including metadata management, the statistical production system, the DW system, OLAP, and legacy data loading and migration. In parallel, servers, storage and network equipment will be procured, installed and tested. Expert dispatch and training will be conducted to ensure effective use of the platform.

3) **Pilot Test Phase (Q3 2027~Q4 2027):** During the pilot phase, actual data will be loaded and used for staged analysis tests. Errors will be identified, corrected and the system optimized. Operators and administrators will receive targeted training to manage and use the platform effectively.

4) **Maintenance and Stabilization Support Phase for BBS Self-Sufficient Operation (Q1 2028~Q4 2028):** In this phase, a BBS-led system operation framework will be established and support will be provided to secure the operational budget. The system will be formally launched, monitored and supported to ensure stable operation in the live environment. A robust maintenance framework will be strengthened, with continuous training to build BBS staff capacity.

Across all phases, the Plan places strong emphasis on change management, communication and capacity building. It includes targeted training for ICT staff, statisticians, Data Stewards, managers and users. It also provides for structured communication and engagement with internal staff, SID, line ministries, partners, researchers and the general public. In addition, the plan introduces clear standard operating procedures for operations, maintenance, incident management and service management.

The Exit Plan and Transition Strategy:

Sustainability is a central concern of the Master Plan. It proposes a clear operating model with a dedicated ISDW, formalized roles in the BBS organogram, and permanent governance bodies. It also sets out comprehensive operations, maintenance and sustainability arrangements, including standard operating procedures, service management processes, and recurrent budget requirements. The Plan includes a phased Exit and Transition Strategy to ensure that, by the end of KOICA's direct support, BBS has the minimum viable capacity to operate and further develop the ISDW using domestic resources. In addition, ISDW-related costs will be integrated into the Government budget and the Medium-Term Budget Framework. Finally, the Master Plan calls for continued, targeted cooperation with regional and international partners to support innovation and knowledge exchange.

The ISDW initiative will be financed through a combination of sources. First, KOICA will provide support in several areas. This will include funding for specialized technical assistance to establish the ISDW, contributions to infrastructure and software where mutually agreed, and support for training and capacity-building activities. Second, the Government of Bangladesh (GoB) will finance the initiative through revenue budgets. The budget, for the CBSSP Project, will cover infrastructure costs such as renovation or relocation of the existing data center, as well as software and implementation services. It will also support pilot activities for big data and advanced analytics. The revenue budget will finance staff costs and the ongoing operational expenses of the ISDW and analytics platform.

The Key Directions Confirmed in this Master Plan for Moving Forward are:

- BBS will establish and operate a central ISDW as a core national statistical asset, serving multiple domains and stakeholders.
- The ISDW will be standards-based, interoperable and secure, integrating data from censuses, surveys, administrative sources, geospatial data and selected new data sources.
- Implementation will follow a phased roadmap, beginning with foundations, progressing to core ISDW functions and data coverage, and then expanding into advanced analytics and optimization.
- BBS will set up a dedicated ISDW Unit, supported by governance bodies, and invest in sustained capacity building.
- Long-term sustainability and national ownership will be ensured through integration of ISDW roles and costs into GoB structures and budgets, supported by an exit and transition strategy for KOICA's support.

Realizing this ISDW vision will require continued commitment from BBS, SID, line ministries, partners and users of statistics. This Master Plan provides a shared reference point and roadmap to guide those efforts. With sustained leadership, adequate resources and a focus on learning and adaptation, the ISDW can make a lasting contribution to evidence-based decision-making in Bangladesh. The National Statistical System will operate with improved coordination, reduced duplication and stronger adherence to standards, reinforcing the role of BBS as a central hub.

In Summary, this Master Plan sets out a coherent, realistic and forward-looking roadmap for transforming BBS's data infrastructure and capabilities through an Integrated Statistical Data Warehouse. Implemented successfully, it will strengthen the National Statistical System, enhance the quality and usefulness of official statistics, and support the Government of the People's Republic of Bangladesh in making more informed, timely and effective decisions.

PART I: STRATEGIC CONTEXT AND OVERVIEW

1. Introduction

1.1 Background on BBS and the National Statistical System
1.2 Overview of the KOICA-BBS Cooperation
1.3 Purpose and Scope of the Master Plan
1.4 Methodology for Developing the Master Plan
1.5 Structure of the Master Plan Document

2. Strategic Context And Alignment

2.1 Alignment with National Plans and Policies
2.2 Alignment with the National Statistical Strategy
2.3 Alignment with the ICT Plan of BBS
2.4 Alignment with e-Government Master Plan
2.5 Alignment with International Standards and Frameworks
2.6 Linkages with World Bank-financed SCEMP Initiative

3. Vision, Guiding Principles and Strategic Objectives

3.1 Vision Statement for the ISDW
3.2 Guiding Principles
3.3 Strategic Objectives
3.4 Key Performance Indicators (KPIs)

1. INTRODUCTION

1.1 Background on BBS and the National Statistical System

Bangladesh Bureau of Statistics (BBS) is the National Statistics Office (NSO) of Bangladesh and the central authority responsible for collecting, compiling, analyzing and disseminating official statistics. Under the Statistics Act 2013[1] and related government regulations, BBS provides the statistical evidence base required for national planning, budget formulation, poverty reduction strategies and monitoring of national and international commitments, including the Sustainable Goals (SDGs[2]).

The Bangladesh Bureau of Statistics (BBS) operates under the administrative supervision of the Statistics and Informatics Division (SID) of the Ministry of Planning. SID provides overall policy direction, coordination and administrative support to BBS, including approval of plans, budgets and major reforms. This institutional arrangement ensures that the operation of the Integrated Statistical Data Warehouse (ISDW) and related initiatives are aligned with national priorities and are backed by appropriate governance, resourcing and oversight from the Government of Bangladesh.

The National Statistical System (NSS) of Bangladesh is the overall framework through which official statistics of the country are produced, coordinated and used for policy and planning. At the center of the NSS is the BBS, is legally mandated by the Statistics Act 2013 to plan and conduct censuses and surveys, compile national accounts and price statistics, and produce social, economic, demographic and agricultural statistics for the country.

The NSS also includes other ministries, departments and agencies that generate administrative data (for example, education, health, agriculture, finance), but BBS provides technical and administrative guidance to ensure standard methods, classifications and quality across the system. In recent years, the NSS of Bangladesh has been guided by the National Strategy for the Development of Statistics (NSDS[3]), which aims to strengthen coordination, improve data quality and timeliness, and align national statistics with international standards and SDG requirements.

Over the years, BBS has built a rich portfolio of population censuses, agricultural and economic censuses, household surveys, establishment surveys and administrative data compilations. These activities are implemented through a combination of head office directorates and a nationwide field organization, in coordination with the Statistics and Informatics Division (SID) and other ministries, divisions and agencies that form the wider National Statistical System (NSS).

[1] https://bbs.gov.bd/site/page/04f74c90-0897-4511-b249-3bf348d5052a/
[2] https://sdgs.un.org/goals
[3] https://sid.portal.gov.bd

Despite these achievements, the underlying data environment remains highly fragmented. Many datasets are stored in stand-alone systems, using different formats, classifications and coding schemes. Metadata are often incomplete or scattered across documents and databases. Data sharing between BBS units and with other government agencies is largely manual and ad hoc. As a result, producing integrated, timely and high-quality statistics is increasingly difficult in the face of growing demand for disaggregated indicators, geospatially enabled statistics and evidence for complex policy questions.

In this context, establishing an Integrated Statistical Data Warehouse (ISDW), complemented by a small-scale big data and advanced analytics platform, is a strategic priority for modernizing the NSS. The ISDW will provide a common, standards-based infrastructure for storing, integrating, managing and using data from multiple sources, thereby strengthening the ability of BBS to fulfil its mandate as the central hub of official statistics in Bangladesh.

1.2 Overview of the KOICA-BBS Cooperation

The cooperation between the Korea International Cooperation Agency (KOICA) and BBS is framed within a broader effort to enhance the statistical capacity of Bangladesh through the design and implementation of modern, platform-based solutions. With direct financial and technical assistance (grant) from the Korea International Cooperation Agency (KOICA), BBS is establishing an Integrated Statistical Data Warehouse (ISDW) under the project titled: “Capacity Building of Statistics Service based on Platform Project” (2024-2028). Under this partnership, KOICA is providing knowledge transfer and selective support to help BBS design and implement an Integrated Statistical Data Warehouse, along with the necessary governance, processes and human capacity. Specific objectives of the project:

a) To establish an Integrated Statistical Data Warehouse and software tools that can enhance statistics services through micro and metadata, data mart, data analysis, and dissemination with data governance and quality process.
b) To support the equipment and system environment that the Data Warehouse operates and maintains securely with system migration and infrastructure improvements.
c) To enhance the capacity of BBS and statistics partners by providing standardized operation plans and training.
d) To set up a small-scale Big Data platform for handling heterogeneous data from different sources.

The KOICA-BBS initiative builds upon Korea’s experience in developing advanced national statistical and e-government systems, and adapts relevant lessons to the institutional, legal and technological context of Bangladesh. It aims to:

- Support BBS in developing the conceptual and technical design of the ISDW and the associated analytics environment;
- Introduce good practices in data governance, metadata management, interoperability and security;

- Strengthen the ICT and statistical capacities of BBS staff to manage and operate the new platforms sustainably; and
- Promote the integration and more effective use of administrative, survey, census and emerging big data sources for official statistics.

Within this cooperation, the Master Plan for the Integrated Statistical Data Warehouse and small-scale big data platform is a cornerstone deliverable. It provides the strategic and technical roadmap that will guide subsequent detailed design, procurement, implementation and institutionalization activities under the KOICA-BBS CBSSP project and related government initiatives.

1.3 Purpose and Scope of the Master Plan

The primary purpose of this Master Plan is to present a comprehensive and practical roadmap for establishing and operationalizing an Integrated Statistical Data Warehouse and associated analytics capabilities within BBS. It is intended as a reference document for decision-makers, technical teams and partners engaged in the modernization of the National Statistical System.

More specifically, the Master Plan seeks to:

- Define the vision, objectives and expected outcomes of the ISDW;
- Describe the current state of BBS data, systems, processes and governance arrangements, and identify key gaps and challenges;
- Specify the target (to-be) architecture, including conceptual, logical and high-level physical design of the ISDW and analytics environment;
- Set out a data governance and management framework covering roles, policies, standards and procedures;
- Establish requirements and high-level design for data security, privacy, business continuity and compliance;
- Propose an implementation strategy and phased roadmap with clear milestones, responsibilities and dependencies; and
- Outline a communication, capacity building and sustainability strategy, including an exit and transition plan for post-KOICA support.

The scope of the Master Plan is institution-wide. It covers BBS head office, and addresses interactions with key external data providers and users within the broader NSS. The Plan focuses on the strategic and high-level technical dimensions needed to guide implementation, while recognizing that detailed technical specifications and operational procedures will be developed in subsequent stages.

1.4 Methodology for Developing the Master Plan

The Master Plan has been developed through a structured and participatory process that combines international good practices in data warehouse and analytics design with the specific needs and constraints of BBS and the NSS. The methodology comprised the following main elements:

- Desk review: Analysis of relevant national policies and strategies (including statistical and ICT strategies), BBS organizational documents, existing system documentation, previous project reports and international guidelines and standards in official statistics and data management.

- Stakeholder consultations: Structured discussions and interviews with BBS leadership, directorates, technical units and field offices, as well as selected external stakeholders from SID, line ministries, academia and partners, to identify needs, expectations, pain points and priority use cases.

- Current state assessment: Mapping of existing data sources, systems, infrastructure, business processes and governance arrangements, and identification of strengths, weaknesses, opportunities and threats related to data integration, management and use.

- Requirements and options analysis: Formulation of functional and non-functional requirements for the ISDW, examination of alternative architectural and technology options, and identification of preferred approaches in line with national policies and resource constraints.

- Design and validation workshops: Preparation of draft vision, architecture, governance and implementation proposals, followed by technical and management-level workshops to refine and validate the emerging Master Plan components.

- Consolidation and documentation: Integration of findings, decisions and recommendations into a coherent Master Plan structured according to the chapters outlined in Section 1.5, with a view to serving both as a strategic guide and a reference for subsequent technical and procurement documents.

This methodology ensures that the Master Plan is evidence-based, aligned with stakeholder needs, and feasible within the institutional and resource context of BBS and the Government of Bangladesh.

1.5 Structure of the Master Plan Document

This Master Plan is organized into four Parts, supported by detailed annexes, following a logical progression from strategic context to architecture, implementation, and long-term sustainability.

1.5.1 Executive Summary

Provides a concise overview of the rationale, vision, strategic objectives, key design features, implementation roadmap, and expected benefits of the Integrated Statistical Data Warehouse (ISDW).

1.5.2 Part I: Strategic Context and Overview (Sections 1-3)

Section 1 - Introduction

Describes the background of BBS and the National Statistical System, the KOICA-BBS cooperation framework, the purpose and scope of the Master Plan, the methodology used to develop it, and the overall structure of the document.

Section 2 - Strategic Context and Alignment

Positions the ISDW within national plans and policies, the National Strategy for the Development of Statistics (NSDS), the ICT Plan of BBS, international standards and frameworks, and other BBS modernization initiatives, ensuring full strategic alignment.

Section 3 - Vision, Guiding Principles and Strategic Objectives

Sets out the long-term vision for the ISDW, articulates the guiding principles for design and implementation, defines strategic objectives, and introduces key performance indicators (KPIs) to monitor progress.

1.5.3 Part II: AS-IS Assessment and User Needs (Sections 4-5)

Section 4 - Institutional and Stakeholder Landscape

Explains the role and mandate of BBS as the National Statistics Office, maps key internal and external stakeholders (including ministries, partners, academia and the private sector), summarizes their needs and expectations, and outlines the proposed governance structure for the ISDW (committees and working groups).

Section 5 - Current State Assessment (AS-IS Analysis) and User Needs

Reviews the legal and policy framework for data and statistics, the current status of ICT resources, existing data sources and statistical production systems, and presents a SWOT analysis of the current environment. It then consolidates user needs and requirements by key user groups, including requirements for performance, scalability, availability, reliability and disaster recovery.

1.5.4 Part III: TO-BE Architecture, Governance, Security and Implementation Roadmap (Sections 6-9)

Section 6 - Target Architecture of the ISDW (TO-BE)

Defines architectural principles and design considerations, presents the conceptual and logical architecture of the ISDW, outlines migration and data security plans, identifies the preferred technology stack and standards, and describes institutional innovations required for effective DW operations.

Section 7 - Integration and Interoperability Design

Details how the ISDW will integrate with existing BBS systems and databases, line ministries and external data providers; specifies data exchange mechanisms (file-based, APIs, SDMX, etc.); and explains how structured, semi-structured and unstructured data will be handled, in line with interoperability standards and reference models.

Section 8 - Data Governance Framework

Sets out the purpose and structure of the ISDW data governance framework, including governance bodies, roles and responsibilities. It covers metadata management (using standards such as SDMX), master data management (e.g. geocodes, ISIC, ISCO), awareness-raising for data governance, data security, privacy and compliance, as well as provisions for advanced analytics and business intelligence within the governed environment.

Section 9 - Implementation Strategy, Roadmap and Communication

Describes the implementation approach and principles, presents the phased implementation plan, clarifies roles and responsibilities of BBS, SID, KOICA and other partners, and sets out the communication and stakeholder engagement plan to support change management.

1.5.5 Part IV: Sustainability, Transition, M&E (Sections 10-11)

Section 10 - Exit Plan and Transition Strategy (Post-KOICA Support)

Defines the objectives of the exit and transition strategy, the governance and institutional arrangements for post-project operation, the transition roadmap, core tasks operation and maintenance (O&M) cost projections, and the monitoring and evaluation framework including reporting arrangements and risk management (process and risk register).

Section 11 - Conclusion and Way Forward

Summarizes key messages, confirms the strategic direction, and sets out immediate next steps for BBS, SID, KOICA and other partners to operationalize the Master Plan.

A set of Annexes provides supplementary detail, including glossaries, DW system Functionalities, HW architecture and equipment, and sample SOPs.

2. STRATEGIC CONTEXT AND ALIGNMENT

The establishment of an Integrated Statistical Data Warehouse (ISDW) and a small-scale big data analytics platform under the "Capacity Building of Statistics Service based on Platform (National Statistics Data Warehouse and Big Data Analysis Platform) Project" - a KOICA-supported initiative launched in July 2024. It is a core component of the Government of Bangladesh's broader agenda to strengthen evidence-based policymaking, accelerate digital transformation and modernize the National Statistical System (NSS).
This section describes how the ISDW initiative aligns with national strategies, the National Statistical Strategy, international standards for official statistics, and other on-going modernization efforts within BBS.

2.1 ALIGNMENT WITH NATIONAL PLANS AND POLICIES

The Government of Bangladesh has placed strong emphasis on the use of quality statistics and data-driven governance in successive national planning documents, including the national perspective and five-year plans[4], sectoral plans and e-government and ICT strategies. These documents collectively underscore the need for timely, reliable and disaggregated data to support macroeconomic management, social sector planning, poverty reduction, climate resilience, disaster risk management and monitoring of the Sustainable Goals (SDGs).

Within this policy environment, BBS is recognized as the primary provider of official statistics and a key enabler of evidence-based decision-making. However, fragmented data systems, limited interoperability and manual data processing constrain the ability of BBS to meet growing demands for granular, integrated and geospatially-enabled data. The ISDW directly addresses these constraints by:

- Providing a unified, standards-based repository for priority census, survey, administrative and other data sources required for monitoring national priorities;
- Enabling more frequent and timely production of indicators, including thematic and cross-cutting indicators (e.g. gender, youth, locality) that are essential for inclusive; and
- Supporting integration of administrative and emerging data sources into the statistical production process, in line with the government's broader digital and e-governance programmes.

By strengthening BBS's core data infrastructure, the ISDW contributes to the implementation of national plans and sectoral strategies, and helps create a coherent foundation on which line ministries and agencies can build their own data systems and analytical capacities.

[4] https://gedkp.gov.bd/wp-content/uploads/2021/08/8th-Five-Year-Plan-English-Full.pdf

2.2 Alignment with the National Statistical Strategy (NSDS)

The National Strategy for the Development of Statistics (NSDS) provides the overarching framework for the medium- to long-term of the National Statistical System. It emphasizes institutional strengthening, improvement of statistical infrastructure, adoption of international standards, greater coordination within the NSS and enhanced use of statistics by government and society.

The ISDW and associated analytics platform directly support several core NSDS priorities, including:

- **Modernization of statistical infrastructure :** The ISDW introduces a modern, layered data architecture and common data services that underpin survey, census and administrative data processing across BBS.
- **Standardization and harmonization :** Through common code lists, classification systems (e.g. ISIC[5] , ISCO[6]), and metadata standards, the platform operationalizes NSDS commitments to Standardization and comparability of statistics.
- **Integration of data sources :** The ISDW enables systematic integration of multiple data domains (e.g. population, labour, agriculture, environment, business) and of administrative and big data sources, in line with NSDS ambitions to broaden the evidential base of official statistics.
- **Institutional and human capacity :** The KOICA-BBS CBSSP project explicitly includes capacity-building components for data management, governance, ICT operations and advanced analytics, thereby helping to implement NSDS capacity priorities in a practical, platform-centered way.

By framing the ISDW as key NSDS implementation instruments, the Master Plan ensures coherence between infrastructure investments and the broader reform trajectory of the NSS.

2.3 Alignment with the ICT Plan of BBS

Furthermore, ISDW is explicitly aligned with Volume VII: ICT Plan of BBS under the NSDS Implementation Support Project. The ICT Plan sets out a vision for BBS to become a world-class provider of authentic, relevant and timely statistics through an integrated, professional and efficient national statistical service, underpinned by a unified enterprise-wide ICT environment based on Enterprise Architecture principles. The ISDW is positioned in this Master Plan as a core corporate platform that operationalizes these ICT Plan objectives by providing a centralized integration and storage layer, shared metadata and quality frameworks, and modern analytical and dissemination tools, while leveraging existing and planned data center and government cloud infrastructure identified in the ICT Plan.

[5] https://unstats.un.org/unsd/classifications/Econ/ISIC
[6] https://ilostat.ilo.org/methods/concepts-and-definitions/classification-occupation/

2.4 Alignment with e-Government Master Plan

The Integrated Statistical Data Warehouse (ISDW) is closely linked to the Bangladesh e-Government Master Plan as a sector-specific implementation of its broader e-government vision[7]. While the e-Government Master Plan sets out the national architecture, shared platforms, interoperability standards and security principles for digital public services, the ISDW translates these into the statistics domain by providing a unified, standards-based platform for official data. It leverages government-wide infrastructure such as national data centers, secure government networks and enterprise service layers, and aligns with e-government interoperability frameworks for data exchange with line ministries and agencies. In turn, the ISDW supplies high-quality, harmonized and timely statistics to e-government portals, management dashboards and decision-support systems, reinforcing evidence-based policy-making and transparent public reporting. Together, the ISDW and the e-Government Master Plan create a mutually reinforcing ecosystem in which government data are securely collected once, shared across institutions and reused many times for planning, monitoring and service delivery.

2.5 Alignment with International Standards and Frameworks

The initiative is also firmly grounded in international principles, standards and frameworks governing official statistics and statistical production. In particular, the ISDW and its governance arrangements are designed to be consistent with:

- The **United Nations Fundamental Principles of Official Statistics**, especially with regard to professional independence, impartiality, data quality, confidentiality and transparency[8];
- The **Generic Statistical Business Process Model (GSBPM)**[9], which provides a process-oriented framework for end-to-end statistical production. The ISDW will support multiple GSBPM phases, from data collection and processing to analysis, dissemination and archiving, through reusable data and metadata services;
- The **SIMS (Single Integrated Metadata Structure)**[10], which provides a unified framework for managing core statistical metadata such as concepts, classifications and quality information. The ISDW will apply SIMS to ensure consistent metadata across production processes and to enhance the quality, comparability and transparency of official statistics;
- The **SDMX (Statistical Data and Metadata exchange)**[11], which will guide the design of data structures and data exchange mechanisms; and
- Relevant guidance from international and regional bodies (e.g. UN Statistics Division) on the use of administrative data, big data and modern data architectures in official statistics.

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[7] https://ictd.gov.bd
[8] https://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx
[9] https://unece.org/statistics/modernstats/gsbpm
[10] https://ec.europa.eu/eurostat/web/quality/metadata/sims
[11] https://sdmx.org/

Aligning the ISDW with these international frameworks brings several advantages. It promotes comparability of statistics across countries, facilitates international reporting (including SDGs and other indicators), and ensures that BBS can participate effectively in global data initiatives. It also helps future-proof the platform by ensuring that data models, metadata structures and exchange mechanisms follow widely accepted standards that are continuously maintained by international communities.

2.6 Linkages with World Bank-financed SCEMP Initiative

The IT-related activities planned under the World Bank–financed SCEMP project[12] are closely linked and complementary to the KOICA-supported initiatives described in this Master Plan. The disaster recovery site and renovation of the BBS LAN will provide the resilient infrastructure backbone required for the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analysis platform to operate reliably, ensuring business continuity for all KOICA-supported systems. The establishment of a full-fledged big data platform and a modern GIS Lab under SCEMP will extend and scale up the prototype big data and geospatial capabilities initiated with KOICA support, enabling integration of new data sources (satellite, mobile, administrative, sensor data, etc.) into the ISDW environment. At the same time, improvements in web-based services will create a stronger delivery channel for KOICA-supported outputs such as online statistical dissemination, microdata access services and self-service analytics tools. The planned Cyber Security Unit will reinforce the data security and privacy framework underpinning both SCEMP and KOICA systems, aligning with the Master Plan's proposed data governance and security policies. Finally, the GIS Lab and Cyber Security Unit (covering administrative data, APIs, apps and hardware) will serve as an innovation hub that can continuously build on KOICA-developed standards, architectures and pilot solutions, ensuring long-term sustainability, localization and evolution of the ISDW and big data platforms beyond the life of both projects.

The ISDW Master Plan is part of a broader transformation agenda within BBS, comprising initiatives to improve ICT infrastructure, enhance survey and census methodologies, strengthen microdata access, mainstream geospatial information and develop human resources.

By clearly articulating these linkages, the Master Plan seeks to avoid duplication of effort, maximize synergies between projects, and ensure that the ISDW and big data platform become the central integrating backbone for BBS's modernization efforts rather than a stand-alone system.

[12] https://unstats.un.org/unsd/classifications/Econ/ISIC

3. VISION, GUIDING PRINCIPLES AND STRATEGIC OBJECTIVES

3.1 Vision Statement for the ISDW

The vision of this Master Plan is:
"To establish an integrated, secure and standards-based integrated statistical data warehouse within BBS that enables timely, high-quality and user-oriented official statistics to support evidence-based policy formulation, planning and monitoring in Bangladesh."

This vision reflects the mandate of BBS as the National Statistics Office of Bangladesh and its role in supporting the Government of the People's Republic of Bangladesh in implementing national plans, including the Perspective Plan, the current Five-Year Plan, sector master plans and other strategic frameworks. The ISDW and associated analytics capabilities are conceived as core public sector infrastructure that will underpin the production and use of official statistics across government.

3.2 Guiding Principles

Implementation of the ISDW and small-scale big data analytics platform will be guided by a set of principles consistent with Government of Bangladesh (GoB) policies and international standards for official statistics:

1) Mandate-driven and user-oriented
2) Quality, integrity and professionalism
3) Standards-based and interoperable
4) Integrated, reusable and "collect once, use many times"
5) Confidentiality, security and responsible data use
6) Phased, realistic and value-for-money implementation
7) Capacity and institutionalization

3.3 Strategic Objectives

In line with the above vision and guiding principles, the Master Plan sets out the following strategic objectives for the period covered by the KOICA-BBS CBSSP project and beyond:

1) Strengthen the statistical data infrastructure of BBS

- Establish a central Integrated Statistical Data Warehouse that consolidates priority census, survey, administrative and other relevant data sources in a secure and well-managed environment.
- Introduce a layered data architecture (staging, integration, warehouse and data marts) that supports efficient processing, storage and retrieval of statistical data.

2) **Improve coherence, comparability and quality of official statistics**
   - Implement common classifications, code lists and metadata standards across major statistical programmes to enhance coherence and comparability over time and between domains.
   - Embed data quality management practices and tools within the ISDW to support validation, consistency checks and documentation of revisions.

3) **Enhance access to and use of statistics for policy, planning and research**
   - Provide user-friendly analytical and business intelligence tools for key users in BBS, SID and line ministries to generate and visualize indicators aligned with national plans and international reporting requirements.
   - Facilitate controlled access to microdata and detailed datasets for research and advanced analysis, in coordination with BBS's microdata access mechanisms and subject to confidentiality safeguards.

4) **Promote integration and use of administrative and emerging data sources**
   - Develop standard mechanisms and agreements for integrating selected administrative data from line ministries and agencies into the ISDW, in line with GoB data-sharing policies.
   - Pilot the use of selected big data and non-traditional sources (e.g. earth observation, mobility, other digital data) in a small-scale analytics environment to complement traditional survey and census data.

5) **Institutionalize data governance, security and compliance**
   - Establish a formal data governance structure (council/committee, focal points and data stewards) with clear roles and responsibilities across BBS.
   - Implement data security, privacy and business continuity arrangements consistent with national laws, GoB ICT/security guidelines and good international practice.

6) **Develop human capacities required to operate and sustain the ISDW**
   - Build the technical, analytical and managerial skills of BBS staff required for data engineering, database administration, metadata and quality management, data governance, information security and advanced analytics.
   - Integrate ISDW-related roles and competencies into BBS's organizational structure, job descriptions and performance management systems.

3.4 Key Performance Indicators (KPIs)

To support results-based management and monitoring of progress, a set of key performance indicators (KPIs) will be used to track the achievement of the strategic objectives. Indicative KPIs and target outcomes include, but are not limited to, the following:

1) **ISDW establishment and coverage**
   - Number of priority statistical programmes (censuses, flagship surveys, key administrative data domains) integrated into the ISDW by year.
   - Proportion of new major statistical outputs that use the ISDW as the primary data source.

2) Standards and metadata implementation

- Proportion of integrated datasets that comply with agreed classifications and code lists (e.g. geographic codes, ISIC).
- Proportion of integrated datasets with complete core metadata documented in accordance with agreed standards (e.g. DDI/SDMX).

3) Data quality and timeliness

- Average reduction in time between data collection completion and release of key indicators for selected programmes using the ISDW.
- Number of documented data quality checks and validations implemented within the ISDW processing chain.

4) Use of statistics and analytics for decision-making

- Number of operational dashboards and analytical products developed and regularly used by BBS and key ministries based on ISDW data.
- Number of policy or planning documents that explicitly reference statistics generated using the ISDW.

5) Data governance, security and compliance

- Establishment and functioning of data governance bodies (e.g. number of meetings held, decisions taken, policies approved).

6) Human resource and institutionalization

- Number of BBS staff trained (by category) in core ISDW-related skills, and percentage applying these skills in their regular work.
- Number of ISDW-related positions formally created and filled within BBS's approved organogram.

These KPIs will be refined and operationalized in consultation with BBS management, SID, KOICA and other stakeholders, and will serve as the basis for monitoring implementation progress and assessing the contribution of the ISDW to the strengthening of the National Statistical System.

Part II: **AS-IS Assessment and User Needs**

4. INSTITUTIONAL AND STAKEHOLDER LANDSCAPE

4.1 Role and Mandate of BBS as the National Statistics Office
4.2 Key Internal Stakeholders (Wings of BBS)
4.3 External Stakeholders (Ministries, DPS, Academia, Private Sector)
4.4 Stakeholder Needs and Expectations

5. CURRENT STATE ASSESSMENT (AS-IS ANALYSIS)

5.1 Legal and Policy Framework for Data and Statistics
5.2 Current Status of ICT Resources
5.3 Existing Data Sources and Statistical Production Systems
5.4 SWOT Analysis of the Current Environment
5.5 Summary of Improvement Directions
5.6 User Needs and Requirements

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4. INSTITUTIONAL AND STAKEHOLDER LANDSCAPE

This section describes the institutional setting within which the Integrated Statistical Data Warehouse (ISDW) will be established. It outlines the role and mandate of the Bangladesh Bureau of Statistics (BBS) as the National Statistics Office (NSO), identifies key internal and external stakeholders, summarizes their needs and expectations, and presents a proposed governance structure for the ISDW initiative.

4.1 Role and Mandate of BBS as the National Statistics Office

Bangladesh Bureau of Statistics (BBS) is the national agency responsible for the collection, compilation, analysis and dissemination of official statistics, in accordance with the Bangladesh Statistics Act, 2013 and other relevant laws, rules and regulations of the Government of the People's Republic of Bangladesh. BBS functions under the administrative control of the Statistics and Informatics Division (SID) of the Ministry of Planning.

In support of national frameworks such as the Perspective Plan of Bangladesh 2021-2041[13], the Five-Year Plans and various sectoral plans, BBS provides data and statistical indicators required for formulation, implementation and monitoring of national policies and programmes. It also produces and reports official statistics and indicators to meet international obligations, including the 2030 Agenda for Sustainable and other regional and global commitments.

BBS performs its mandate through a comprehensive programme of population and housing censuses, economic and agricultural censuses, household surveys, establishment surveys and compilation of statistics from administrative records. These activities are implemented by specialized subject-matter and technical wings at the head office, and supported by a nationwide field organization comprising divisional, regional and Upazila-level offices.

The establishment of an ISDW is therefore not a new function, but an enhancement of BBS's existing mandate: it will provide a unified, modern and standards-based infrastructure to better support the production and dissemination of statistics demanded by the Government, partners, academia, private sector and citizens.

4.2 Key Internal Stakeholders (Wings of BBS)

The ISDW will serve and depend upon multiple internal wings within BBS. While the detailed organogram may evolve, the following internal stakeholders are of particular relevance:

[Table 1] Key Responsibilities by Wings

Wing Name (Headquarters)	**Key Responsibilities**	**Staffing** (Current Staff)
Census Wing	Population and Housing Census, Slum Census, etc. Literacy Assessment Survey, Rural Credit Survey, etc. Preparation and updating of the National Population Register (NPR)	18 (61)

[13] https://plancomm.gov.bd/sites/default/files/files/plancomm.portal.gov.bd/files/10509d1f_aa05_4f93_9215_f81fcd233167/2020-08-31-16-08-8f1650eb12f9c273466583c165a315a4.pdf

Wing Name (Headquarters)	Key Responsibilities	Staffing (Current Staff)
Industry and Labor Wing	Economic Census, Preparation and updates of the Business Register, etc. Survey of Manufacturing Industries, Hotel and Restaurant Survey, etc. Labor Force Survey, Child Labor Survey, ICT Survey, etc.	88 (39)
Agriculture Wing	Agricultural Census (crops, fisheries, and livestock) Estimation of production volume and area for 6 major crops and 140 minor crops, etc.	18 (61)
Demography and Health Wing	Sample Vital Registration System (SVRS), MICS, Health and Nutrition Survey, Health and Mobility Status Survey and the Child Well-being Survey, Gender Statistics, Violence Against Women Survey and the Time Use Survey, etc.	72 (39)
National Accounting Wing	GDP estimation based on the System of National Accounts (SNA): Publication of macroeconomic indicators such as GDP growth rate, per capita income, and sectoral contributions, Consumer Price Index (CPI), other indices, etc. conduct surveys and studies,	90 (57)
Computer Wing	Computerization of statistical data, management of IT systems and resources Database operation and maintenance, maintenance of geographic codes and web portals	206 (78)
FA & MIS Wing	Institutional of BBS, restructuring of personnel Personnel management for employees, budget and financial management, audit functions, etc.	149 (97)
Statistical Staff Training Institute	Providing statistical training for BBS staff and public officials Training on the latest statistical techniques and data analysis tools	35 (16)

These wings design and implement statistical programmes, manage sector-specific datasets and are primary users and providers of data to the ISDW. Each of these wings and units has distinct responsibilities but shares a common interest in having reliable, timely and integrated data. Their active participation in defining requirements, contributing data, applying standards and using the ISDW will be critical to the success and sustainability of the Master Plan.

4.3 External Stakeholders

Beyond BBS, the ISDW will form part of the broader National Statistical System (NSS) and interact with a wide range of external stakeholders, including:

- Statistics and Informatics Division (SID), Ministry of Planning
- Line ministries, divisions and agencies
- Other central government institutions
- Partners and international organizations
- Academia, research institutions and think tanks
- Private sector, media and civil society

These stakeholders have differing capacities and responsibilities, but all benefit from a more integrated, accessible and reliable statistical information infrastructure centered on BBS and the ISDW.

4.4 Stakeholder Needs and Expectations

Consultations and prior experience indicate that stakeholders have a number of common needs and expectations regarding the ISDW, including:

1) For internal BBS users

- Easier access to historical and current datasets across subject-matter domains, with consistent classifications and documentation.
- Reduced duplication of data collection and processing efforts, and improved coordination between wings on common frames, master data and metadata.
- Tools that support efficient data validation, analysis, visualization and dissemination, aligned with BBS's statistical release calendar.

2) For SID, Planning Commission and line ministries

- Timely, disaggregated and coherent statistics aligned with the Perspective Plan of Bangladesh 2021-2041 and sector strategies.
- Integrated datasets and indicators that support cross-cutting policy analysis (e.g. poverty and inequality, employment, climate vulnerability, urbanization).
- Clear data-sharing frameworks and mechanisms that facilitate secure exchange of administrative data and statistics between BBS and sector ministries.

3) For partners and international organizations

- Reliable and well-documented statistics and metadata suitable for international reporting and comparison.
- Evidence that investments in statistical capacity are embedded in sustainable, government-owned systems and institutional arrangements.

4) For academia, researchers and other advanced users

- Controlled access to anonymized microdata and detailed datasets for research, with clear procedures and appropriate safeguards.
- Access to documentation, codebooks, methodological notes and metadata to ensure correct interpretation of data.

5) For the wider public

- Transparent and user-friendly access to key statistics and indicators through official publications, data portals and other dissemination channels.

The Master Plan is designed to address these needs in a balanced and realistic manner, recognizing resource constraints and the need to proceed in phases while maintaining a high level of quality, security and compliance with GoB policies.

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5. CURRENT STATE ASSESSMENT (AS-IS ANALYSIS)

This section summarizes the current institutional, legal, technical and procedural environment in which the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analytics platform will be established. It draws on the desk review, stakeholder consultations and the initial SWOT analysis prepared as part of the project concept, and provides the baseline against which the "to-be" architecture and implementation roadmap have been developed.

The Bangladesh Bureau of Statistics (BBS) is pursuing a strategic transformation to modernize and advance the national statistical system. Building a Data Warehouse (DW) system is essential to achieving this goal. Currently, legal and institutional reforms, organizational restructuring, and technological infrastructure upgrades are recognized as prerequisites for transitioning to a data-driven statistical production system. This report aims to systematically analyze various aspects of BBS, including its statistical production environment, ICT organization, business processes, information-related laws and regulations, ICT resources and infrastructure, and human capacity. It seeks to derive specific requirements for establishing a ISDW system and provide foundational data for future master plan and phased implementation planning.

5.1 Legal and Policy Framework for Data and Statistics

The mandate for official statistics in Bangladesh is provided primarily by the Bangladesh Statistics Act, 2013, which designates BBS as the central agency for the collection, compilation, analysis and dissemination of statistics, and sets out provisions on confidentiality, obligations of respondents and cooperation by other organizations. The Act provides a sound legal basis for establishing and operating an integrated statistical data warehouse, including provisions that enable BBS to obtain data from public and private entities for statistical purposes, subject to safeguards.

In addition to the Statistics Act, the broader policy environment is shaped by:

- National frameworks such as the Perspective Plan of Bangladesh 2021-2041 and the Five-Year Plans, which emphasize evidence-based policymaking and monitoring of results;
- GoB policies and strategies on e-Government and ICT, which encourage the use of shared platforms, interoperability and secure digital data management; and
- Sectoral policies and strategies which rely on timely and disaggregated statistics produced by BBS and sector ministries.

While the formal mandate of BBS and the policy emphasis on data-driven governance are strong, detailed secondary regulations, guidelines and operational procedures for data sharing, data integration, metadata, security and privacy are at varying stages of. This Master Plan therefore treats the ISDW as both a technical infrastructure and a catalyst for operationalizing existing legal and policy provisions through practical data governance instruments.

5.2 Current Status of ICT Resources

The current ICT environment of BBS is aging and fragmented, and must be comprehensively upgraded to support the planned Data Warehouse (DW) system and a modern national statistical infrastructure. A large share of servers and storage devices have reached end-of-service life, use multiple operating systems and disparate configurations, and needed to be replaced with integrated, high-performance hardware and a cloud-based architecture. Network and security equipment are also insufficient, relying mainly on a firewall with weak access rules, no VLAN-based segmentation, and no IDS/IPS, leaving critical systems vulnerable. Backup arrangements are particularly risky, with no redundant backup servers, continued reliance on old magnetic tape, and no systematic asset management for obsolete equipment. In contrast, the main survey systems (Population, Economic and Agricultural Censuses) have recently been upgraded, using VMware Cloud[14] and Kubernetes[15] with HPE reference architecture[16] and ORACLE EXADATA as the database platform[17]. Overall, strengthening servers and storage, network and security controls, and backup systems is essential to provide a secure, scalable and resilient foundation for the DW and other core BBS systems.

5.3 Existing Data Sources and Statistical Production Systems

BBS currently manages a rich portfolio of statistical activities, including:

- Population and Housing Censuses;
- Economic Censuses;
- Agricultural Censuses;
- Large-scale household surveys (e.g. on HIES, LFS, SVRS, MICS etc.);
- Establishment and enterprise surveys (e.g. on SMI, WRTS, HRS, CPS etc.); and
- Compilations from administrative records received from line ministries and agencies.

These activities are carried out by different subject-matter wings and projects, using a combination of paper-based and electronic data collection methods, and processed through diverse systems and tools. Over time, this has led to a landscape characterized by:

- Multiple stand-alone databases and applications, often developed project-by-project;
- Heterogeneous formats, software and coding schemes, including different versions of classifications and reference codes; and
- Limited systematic documentation and metadata, making it difficult to reuse data across programmes and over time.

[14] https://www.vmware.com
[15] https://kubernetes.io
[16] https://www.hpe.com
[17] https://www.oracle.com/engineered-systems/exadata/

The initial concept notes for the Master Plan explicitly recognized “fragmented data systems, siloed datasets and manual processes” as key constraints on BBS’s ability to deliver timely and integrated statistics.

Some subject-matter areas have introduced more modern systems, including electronic data capture and database-driven processing, but these remain largely programme-specific and are not yet supported by a unified data integration layer or corporate data warehouse.

5.4 SWOT Analysis of the Current Environment

As part of the initial concept work, a concise SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was prepared. The SWOT analysis for assessing Bangladesh's statistical environment is an effective method that can consider both internal factors (strengths and weaknesses) and external factors (opportunities and threats) of the National Statistical System (NSS). Since the Bangladesh Bureau of Statistics (BBS) holds the authority for all statistical production under the Bangladesh Statistics Act, the SWOT analysis was also conducted targeting the BBS. This Master Plan builds on that analysis and elaborates it in light of additional consultations.

1) Strengths

- Strong legal mandate and institutional role of BBS for official statistics, backed by the Bangladesh Statistics Act, 2013.
- Established data collection procedures for censuses and surveys, supported by a large and experienced statistical workforce and a nationwide field organization.
- Growing recognition among policy-makers of the importance of high-quality statistics for implementing national plans and international commitments.
- Leadership Role of NSS: BBS holds the authority to compile all major statistics in Bangladesh. It also coordinates and collaborates with other statistical agencies, regarding statistical production tasks.
- Leadership in Key Statistics Production: BBS maintains a traditional statistical production system for key statistics through its headquarters, regional headquarters, district offices, and Upazila (sub-district) offices. The BBS has already introduced CAPI and GIS-based data collection in sample surveys and census as part of the digital ecosystem and the journey towards e-Government.

2) Weaknesses

- Fragmented data systems and siloed datasets, resulting from project-specific solutions and limited enterprise-level integration.
- Weak ICT infrastructure and security relative to the requirements of a modern, integrated data warehouse and analytics platform.

- Low data integration capacity across programmes, including limited use of common master data and classifications.
- Limited use of metadata and data standards, resulting in inefficiencies and difficulties in reusing and combining data from different sources.
- Lack of personnel and infrastructure: Insufficient personnel, financial resources, and infrastructure to regularly generate, update, provide, and monitor large datasets.
- Constraints on high-quality statistical production: BBS's current capacity, particularly low ICT infrastructure, lack of specialized personnel, and insufficient cooperation among statistical agencies, limits the timely collection, processing, and distribution of high-quality data.
- Lack of specialized technical capacity: Microdata is not provided in the public domain or on official websites, and information on updates is also not provided. BBS lacks the technical capacity and data laboratories to generate specialized datasets for natural science, medical, and engineering research.

3) Opportunities

- International support, notably from KOICA through the “Capacity Building of Statistics Service based on Platform Project”, and from other partners for statistical and ICT modernization.
- Global shift toward data-driven governance, providing strong justification for investments in statistical infrastructure and capacity.
- Policy focus on e-Government and interoperability, which creates a favorable environment for integrating administrative data and aligning with national ICT strategies.
- Legal institutional framework established: The 2013 Statistics Act provides ample opportunity for improvement in the quality, scope, and use of core statistics. Individuals and institutions are obligated to provide data for BBS surveys.

4) Threats

- Risk of duplication and fragmentation if multiple data platforms or systems are developed in parallel without coordination, either within BBS or across the wider government.
- Staff resistance to technological change and perceived shifts in roles and responsibilities, which may slow adoption of the ISDW and new ways of working.
- Inadequate budget for ongoing maintenance and upgrades, which could undermine the sustainability of the ISDW and big data platform after initial project support.
- Lack of data services and maintenance infrastructure: Insufficient preparation for the introduction of artificial intelligence (AI) technology based on big data in the medium to long term.

This SWOT analysis confirms that while BBS has a strong foundation in terms of mandate, experience and core statistical programmes, significant institutional and technical gaps remain. The ISDW Master Plan is designed to leverage the strengths and opportunities while systematically addressing weaknesses and mitigating threats through its architecture, governance arrangements, implementation roadmap and sustainability strategy.

5.5 Summary of Improvement Directions

1) Information Technology Policy:
Information technology policies linked to national strategies, including BBS's Data Warehouse (DW) system, must ensure alignment with "e-Bangladesh Master Plan", "ICT Policy 2018", and "NSDS". The DW system should be positioned as a strategic implementation task for strengthening national statistics, rather than being viewed as a purely technological development project. These policies must also be aligned with ICT initiatives under the National Statistical Agenda (NSDA) and be integrated into BBS's mid- to long-term strategies.

2) Information Technology Laws and Systems:
There are legal constraints on data integration and utilization due to limitations in the current Statistics Act (2013). It is necessary to reflect the latest legal systems, such as the Personal Information Protection Act (2023) and the Cybersecurity Act (2023), in the design and operation of the DW system. An integrated legal and institutional framework for DW system operation must be urgently established, along with any required legislative supplements.

3) Information Technology Organization and ICT Personnel:
Sustainable operation of the DW system is hindered by a shortage of ICT personnel and a project-centric organizational structure. Specialized personnel for data analysis and integration need to be cultivated to support ongoing DW operations. A new organization focused on data planning and management should be established, and a central data governance system must be put in place.

4) Statistical Production and Services:
Integration and quality management are limited by siloed statistical production structures and non-standardized data formats. A metadata-based data standardization and integrated data management system needs to be introduced. International standards should be applied to improve the quality of statistical data. A statistical production system based on an integrated platform needs to be established to standardize and unify the entire production process from collection to processing, analysis, and distribution. In addition, user-centric data services and visualization capabilities must be strengthened.

5) Data Management:
Statistical data are managed in a decentralized manner, with unclear ownership and no established quality inspection system. Data standardization,an integrated metadata system, and a centralized statistical data management system are required. There is an urgent need to revise classification systems and statistical terminology to enhance data reusability and quality.

6) ICT Resources:

Infrastructure-wide vulnerabilities exist, including aging servers and storage, insufficient security equipment, and inadequate backup systems. Security systems need to be strengthened through virtualization infrastructure, network redundancy, and the implementation of IDS/IPS. An integrated infrastructure modernization and management strategy must be established to ensure uninterrupted statistical operations.

5.6 User Needs and Requirements

This section consolidates the needs expressed by key user groups, illustrates priority use cases for the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analytics platform, and sets out the main functional and non-functional requirements. The requirements are intended to guide detailed design, procurement and implementation planning in subsequent phases.

5.6.1 Key User Groups (Internal and External)

The ISDW will serve a range of users within BBS and across the wider National Statistical System. For the purposes of this Master Plan, the main user groups are:

1) Internal BBS users

- BBS Management (DG, Directors, Senior Officials): Require integrated, up-to-date statistical information and dashboards to guide strategic decisions, allocate resources and monitor performance of statistical programmes.
- Subject-matter Wings: Need access to historical and current datasets (including microdata) from their own and other domains to design surveys, produce indicators, undertake analysis and prepare publications.
- Data Processing, IT and Technical Units: Require tools to ingest, transform, integrate, secure and monitor data flows; manage databases and infrastructure; and support end-users.
- Training and HR Units: Need information on staff roles, capacities and usage of the ISDW to plan and monitor capacity.

2) National policy and planning users

- Statistics and Informatics Division (SID) and Planning Commission (including GED): Need coherent, timely and disaggregated statistics across sectors to support preparation and monitoring of the Perspective Plan of Bangladesh 2021-2041 and other national strategies.
- Line Ministries and Agencies: Require sector-specific indicators and integrated datasets to inform sector master plans, Annual Development Programme (ADP) proposals and monitoring frameworks.

3) Research, academic and analytical users

- Universities, Research Institutes and Think Tanks: Need controlled access to anonymized microdata and well-documented datasets for empirical research, impact evaluation and policy analysis.

4) Partners and international organizations

- Use BBS statistics for programme design and monitoring, and require consistent series and metadata for regional and global reporting.

5) Wider public and media

- Require accessible, user-friendly presentations of key statistics and indicators for public information, accountability and advocacy.

While the ISDW is primarily an internal BBS platform, its design must support appropriate interfaces and services for these external user groups, in line with the Statistics Act, GoB policies and data confidentiality requirements.

5.6.2 Performance and Scalability

The ISDW shall:

- Be capable of handling large datasets from multiple sources, with design choices that allow for incremental scaling of storage and processing capacity as data volumes and workloads grow.
- Provide acceptable response times for typical analytical queries and dashboard views under normal load, as defined in service level objectives (SLOs) to be agreed during detailed design.
- Support parallel processing and Optimization (e.g. indexing, partitioning, caching) to maintain performance during peak periods (e.g. after major census/survey releases).

5.6.3 Availability, Reliability and Disaster Recovery

The ISDW shall:

- Be designed for high availability, with minimal planned downtime and resilience against hardware or software failures, in line with BBS and national data center standards.
- Include regular backup and recovery procedures, with defined Recovery Point Objectives (RPO) and Recovery Time Objectives (RTO) appropriate for statistical operations.
- Provide disaster recovery arrangements, including off-site or secondary site capabilities, aligned with GoB policies on critical information infrastructure.
- Incorporate monitoring and alerting for key components (databases, ETL processes, services), enabling proactive management by ICT staff.

Part III: To-be Architecture, Governance, Security And Implementation Roadmap

6. Target Architecture of the ISDW (To-be)

6.1 Architectural Principles and Design Considerations
6.2 Conceptual Architecture
6.3 Migration Plan
6.4 Data Security Plan
6.5 Logical Architecture
6.6 Technology Stack Options and Standards
6.7 Institutional Innovation for ISDW Operations

7. Integration and Interoperability Design

7.1 Integration with Existing BBS Systems and Databases
7.2 Integration with Line Ministries and External Data Providers
7.3 Data Exchange Mechanisms (APIS, SDMX, File-based, etc.)
7.4 Handling Structured, Semi-structured and Unstructured Data
7.5 Interoperability Standards and Reference Models
7.6. Required Budget and Feasibility Analysis

8. Data Governance Framework

8.1 Purpose of the Data Governance Framework
8.2 Governance Structure for the ISDW
8.3 Metadata Management Framework (SDMX)
8.4 Master Data Management (Geocodes, ISIC, ISCO, Etc.)
8.5 Awareness for Data Governance
8.6 Data Security, Privacy and Compliance
8.7 Advanced Analytics, and Business Intelligence

9. Implementation Strategy, Roadmap and Communication

9.1 Implementation Approach and Principles
9.2 Implementation Plan
9.3 Roles and Responsibilities (BBS, SID, KOICA and Other Partners)
9.4 Communication and Stakeholder Engagement Plan

6. TARGET ARCHITECTURE OF THE ISDW (TO-BE)

This section describes the proposed "TO-BE" architecture for the Integrated Statistical Data Warehouse (ISDW) and the small-scale big data analytics platform. The architecture is technology-neutral at this stage. It defines principles, layers and components, while leaving room for the selection of specific products and solutions through Government of Bangladesh (GoB) and KOICA-compliant procurement processes and detailed design exercises.

6.1 Architectural Principles and Design Considerations

The target architecture is guided by the following principles:

1) **Standards-based and interoperable**
   - Use of recognized data and metadata standards (e.g. SDMX), and standard protocols for data exchange (e.g. APIs, web services), to ensure interoperability with existing and future systems within BBS and across government.
2) **Layered and modular**
   - Separation of concerns into distinct layers (data sources, ingestion, staging, integration, warehouse, data marts, analytics, metadata, security) to enable flexibility, manageability and incremental deployment.
3) **Scalable and performance-oriented**
   - Ability to handle growing volumes, varieties and velocities of data through scalable storage, processing and network components, and design features (e.g. partitioning, indexing, caching) that support statistical and analytical workloads.
4) **Secure and resilient**
   - Built-in security controls (access management, encryption, monitoring) and resilience measures (backup, disaster recovery, failover) aligned with GoB security guidelines and BBS's mandate to protect confidentiality.
5) **Reusability and "collect once, use many times"**
   - Services and components designed to be reused by multiple statistical programmes and applications, minimizing duplication and promoting consistent use of core data and metadata.
6) **Incremental and phased**
   - Architecture that can be implemented in phases, starting with foundational elements and priority use cases, then expanding coverage and capabilities over time without major redesign.
7) **Fit-for-purpose and value-for-money**
   - Preference for solutions (active adoption of open-source solution) that balance functionality, total cost of ownership, skills availability and long-term sustainability, in line with GoB ICT and procurement policies.

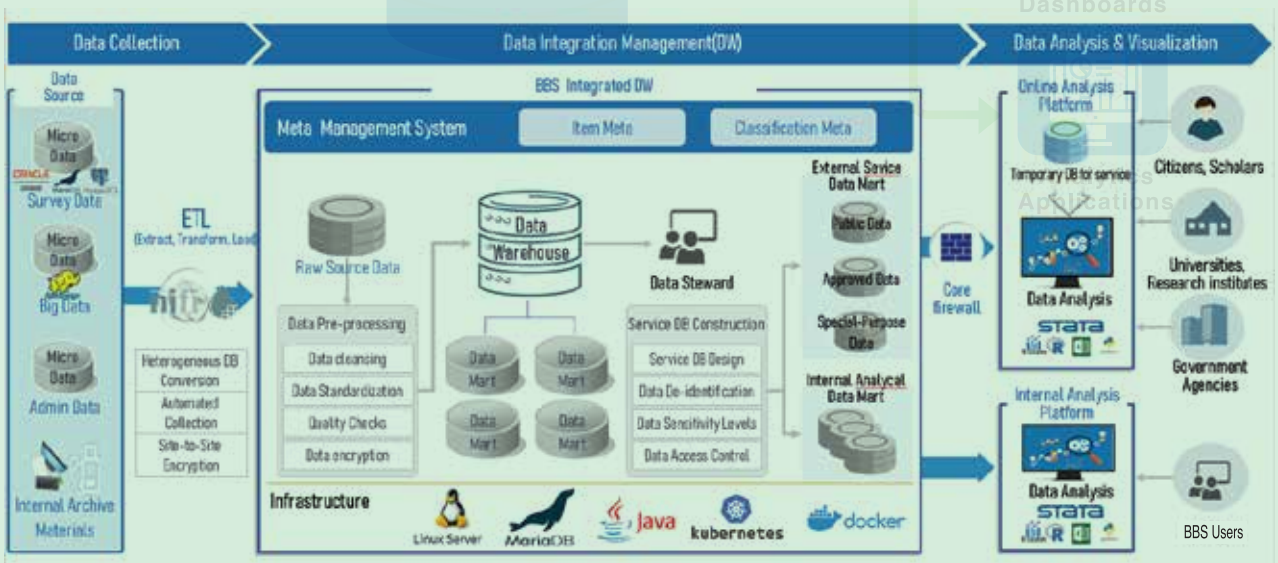
6.2 Conceptual Architecture

At a conceptual level, the ISDW are organized into the following core layers and cross-cutting services:

- Data Source Layer - Censuses, surveys, administrative systems, geospatial data, and selected big data sources.
- Ingestion & Integration Layer - ETL/ELT processes that extract, validate, transform and integrate data from source systems into the warehouse environment.
- Staging and Integration Layer - Temporary and intermediate storage areas where raw data are cleansed, harmonized and prepared for loading into the warehouse.
- Core Data Warehouse Layer - Integrated, subject-oriented and time-variant store of statistical data structured for efficient querying and analysis.
- Data Marts and Analytics Layer - Thematic or function-specific subsets of the warehouse tailored to particular analytical needs (e.g. censuses, poverty, labour, agriculture, SDGs).
- Presentation and Dissemination Layer - Dashboards, reports, data portals, APIs and other interfaces for internal and external users.
- Metadata and Governance Layer - Central repositories and services for metadata, master data, standards, data quality rules and governance policies.
- Security, Monitoring and Management Services - Cross-cutting services providing authentication, authorization, auditing, system monitoring, backup, recovery and operations management.

A conceptual system architecture illustrating these layers and their relationships is provided below and used as a reference throughout design and implementation.

Integrated Statistical Data Warehouse (ISDW) - System Architecture



[Figure 1] ISDW System Architecture

6.2.1 Strategic Directions for Model

The core objective of the DW Platform is to establish a centralized data hub that integrates and standardizes all statistical data held by BBS, thereby securing a robust data utilization framework. Through this, BBS will maximize its capability to produce and utilize high-quality microdata at an international level. To translate these strategic directions into a concrete implementation roadmap, four key system strategies have been defined, as outlined below:

The DW Platform modernizes the entire statistical workflow by organically linking four core systems.

a) **Metadata Management System:**

Establishes an enterprise-wide unified structure to standardize and centrally manage item, classification, and description metadata. By internalizing international standards such as SIMS and SDMX, it automates the full cycle of collection-validation-transformation-loading in a metadata-driven manner, reducing errors and enhancing business continuity.

b) **Statistical Production System:**

Standardizes and automates the entire survey lifecycle-from survey design to data collection, validation, aggregation, and dissemination-based on GSBPM. It ensures consistency by referencing information from the Meta Management System and DW System, while supporting digital survey modes such as CAPI and CASI to enable rapid, field-oriented operations.

c) **DW System:**

Integrates heterogeneous data sources-including administrative data, survey data, and big data-and centralizes data acquisition through ETL automation. It establishes a metadata-based five-stage quality governance framework and safeguards sensitive information through de-identification and a three-tiered security classification (Public-Use, Approved-Use, Special-Purpose), ensuring a balance between usability and security.

d) **Online Analysis System:**

Builds a Remote Analysis System (RAS) that enables secure analysis of DW-based microdata without external extraction. Access channels are separated by security level, and workflows for analysis, approval, and output release are fully automated to enhance both data accessibility and security.

6.2.1.1 Establishing a Metadata Management System

The BBS currently uses statistical data scattered across DB, Excel, STATA, FoxPro, etc., and lacks standards and traceability. This results in differing names and definitions for the same items across departments, which compromises quality and comparability. Data is primarily managed as files on personal PC, which poses high risks of loss and security breaches, while siloed operations exacerbate inefficiency.

For a successful DW, a metadata system that manages definitions, sources, quality, permissions, and history must be established first. Such as metadata management system requires a single, centralized management framework for institutional-level item, classification, and descriptive metadata. It will link metadata with actual data to enforce consistent names and definitions for the same data, thereby ensuring traceability through comprehensive history management.

Automating the entire process of collection, validation, transformation, loading and utilization through a metadata method reduces errors and enhances operational continuity. It also internalizes the SIMS and SDMX international standards, which facilitates internal and external quality management and international comparisons. As a result, standardization, reusability, and interoperability improve, maximizing the utility for internal analysis and external provision. Therefore, a meta management system will be a foundation for the BBS to leap forward as a modern statistical agency that meets international standards.

[Table 2] Metadata Management System Task

Improvement Task	BBS Enterprise-Wide Meta Management System Implementation Plan
Task Description	Integrate and manage data sources, collection cycles, formats, variable definitions, classification codes, etc., collected for organization-wide BBS statistics as metadata Meta data serves as a single source of truth, and is bidirectionally linked to the statistical production system, ETL, DW, and remote analysis/public portal.
Current Status and Issues	Lack of organization-wide data entry inventory due to individual collection/storage by department, resulting in fragmented understanding Human-centric processing leading to inadequate periodicity and consistency, which creates bottlenecks when responsible personnel are absent Quality consistency and connectivity degraded due to file storage on individual PCs and separate quality checks Insufficient legal/MOU foundation, absence of standard terminology/classification and meta-governance
Improvements	Standardize and centralize dispersed departmental collection/loading of data by using metadata (items, classifications, descriptions) for unified management Register and validate metadata first during collection, then automatically link through ETL ➡ DW loading
Benefits	Automation and Error Minimization: Prevents recurring errors with pre-check rules; improves loading success rate/speed Organization-wide Integrated Management: Provides a single view of source, definition, classification, and history ➡ Enhances reuse, comparison, and connectivity Simultaneous Strengthening of Channel Control & Security/Quality: Reduces unauthorized imports and format mismatches, drastically decreasing subsequent processing error rates Complete History/Lineage Assurance: Can easily track and verify "what was collected, by which agency, when, and based on what criteria" International Alignment: Facilitates SIMS/SDMX-based disclosure and exchange, enhancing transparency and trust (expansion of internal and external utilization)

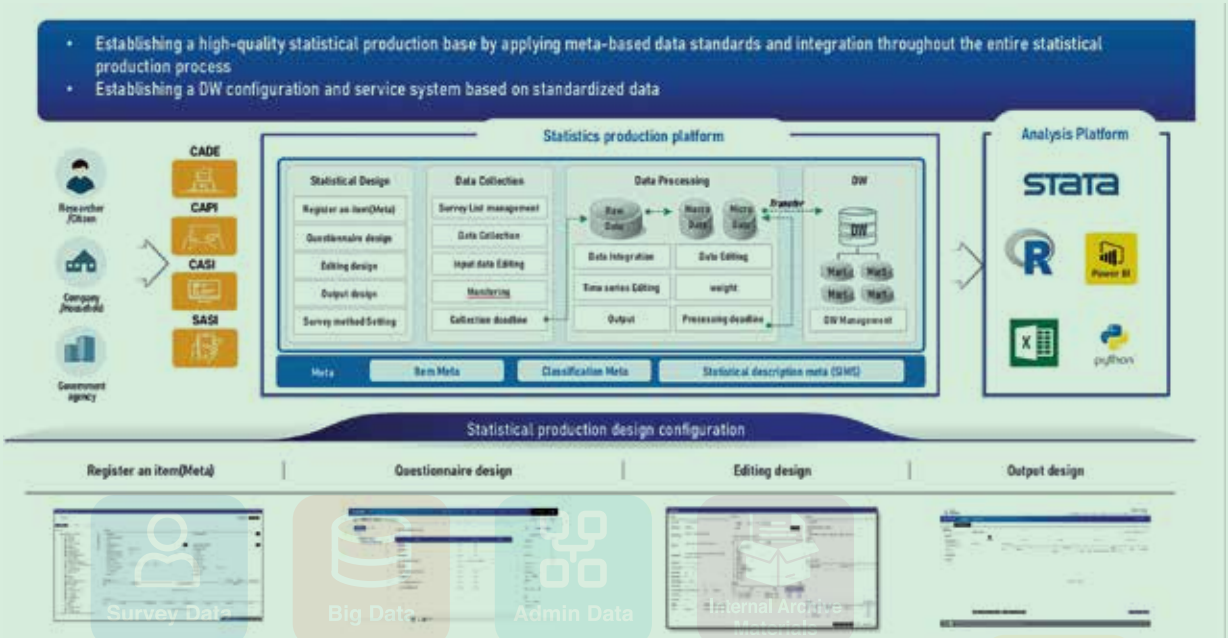
Improvement Task	BBS Enterprise-Wide Meta Management System Implementation Plan
Considerations	Principle of concurrent collection and meta-registration (meta-registration first, data loading later) and mandatory linkage to reference databases (standard terms/ classifications) Control of collection channels through policies/organizations (approval, review, change management) and legal/MOU revisions Recruitment of DB/meta operation personnel (administrators, stewards, architects) and establishment of training systems to ensure sustainability Legacy Migration Strategy: File specification standardization, field mapping, filename/sheet naming rules, versioning need for SIMS implementation and application for statistical descriptive metadata

6.2.1.2 Establishing a Statistical Production System

The statistical production system references metadata from the meta-management system to perform survey form, roster, and sample design, and automatically links the design results to multiple devices (CADE/CAPI/CASI/SASI). During the collection phase, rule-based internal checks preemptively block errors. It also provides the functionality to unify and automate all procedures, ensuring data that has undergone review and aggregation is transferred to the DW according to standard and approval procedures.

The entire process clearly defines work stages by referencing the GSBPM and ensures the structuring of data and metadata, along with international exchange and comparability, through SDMX and SIMS. Operationally, it integrates the management of reference information (common codes, administrative districts), users/permissions, and logs/security policies. It also enhances the user experience through a portal interface offering service requests (SR), with request history, processing logs, and metrics, alongside announcements, guides, and FAQs. Finally, it provides real-time visualization of operational metrics such as collection rates, error rates, and delayed cases for the entire organization's statistical data collection status, and also covers regional offices.

Manual and personalized tasks by department are integrated through system-based automation, standardized survey forms, a single database structure, and rule-based internal checks. This ensures consistency across design, collection, internal checks, and publication, reduces error rates and processing times, and significantly improves time series consistency, reusability, and likability. Furthermore, the meta-based automation and DW-centered structure form a foundation for the BBS to make a leap forward as a modern statistical agency that meet international standards by enhancing the reliability of policy, research, and public services.



[Figure 2] Statistical Production System Architecture

[Table 3] Statistical Production System Task

Improvement Task	Statistical Production System Implementation Plan
Task Description	Establish a digital-based integrated platform for statistical production to secure a foundation for producing reliable statistics and providing stable services
Current Status and Issues	Difficulties in item management due to a lack of metadata linkage; survey forms must be newly constructed each time a survey is conducted. Limitations such as insufficient inter-system linkage, inconsistent data formats, and inadequate standardization Communication with regional offices is difficult, and incorporating revisions takes significant time. Difficulty managing output data at specific points in time due to the individual storage and management of collected data
Improvements	Transition the BBS's existing siloed statistical system to a digital-based integrated platform (DW) Integrate management of the entire statistical production process, including survey design, data collection, internal verification, storage, and publication Establish a statistical production system based on international standards such as SDMX, the GSBPM, and SIMS
Benefits	Consistency in statistical production processes Integration and automation of the entire workflow, from survey design through collection, internal verification, analysis, and publication Prevention of data errors in advance, improved quality, and consistency of time series data Minimization of repetitive tasks through design function reuse and copy functionality

Improvement Task	Statistical Production System Implementation Plan
Considerations	Analyze statistical processes within the BBS and define processes based on the GSBPM Develop technical implementation plans for international standards such as SDMX and SIMS Migrate and standardize existing data User training (for survey/statistics personnel) and securing organizational acceptance (policies, systems, etc.) Preparation of a technical infrastructure environment (network, security, etc.)

6.2.1.3 Establishment of a DW System

Currently, BBS's statistical data are managed in a fragmented manner across various formats such as databases, Excel, STATA, and FoxPro, with insufficient standard definitions and history management for statistics. As a result, the naming and definitions of identical items differ across departments, reducing data quality and comparability. In addition, data are primarily stored on personal PCs, creating significant risks of loss and security breaches, while silo-based operations further aggravate inefficiencies.

The success of the DW System depends on organization-wide data integration, consistent quality assurance, and strict security control. The DW System centrally manages heterogeneous data sources-including administrative data, survey data, and big data-while ensuring data reliability through automated ETL processes and a five-stage quality governance framework (planning-measurement-evaluation-improvement-control). In particular, pseudonymization and anonymization techniques (such as alternative keys and statistical disclosure control) are applied throughout the entire data lifecycle-from collection to loading and utilization-and all datasets are classified into three security tiers (Public-Use, Approved-Use, Special-Purpose) to ensure safe access. All data are integrated in a standardized manner using linkage keys and master tables.

Ultimately, the DW System transforms manual, fragmented processes into a system-driven automated environment, minimizing errors and maximizing the consistency and usability of statistical data. This will strengthen BBS's capacity for evidence-based policymaking, secure business continuity and data security, and serve as a foundational infrastructure enabling BBS to advance into a modern, internationally compliant statistical institution.

[Table 4] DW System Task

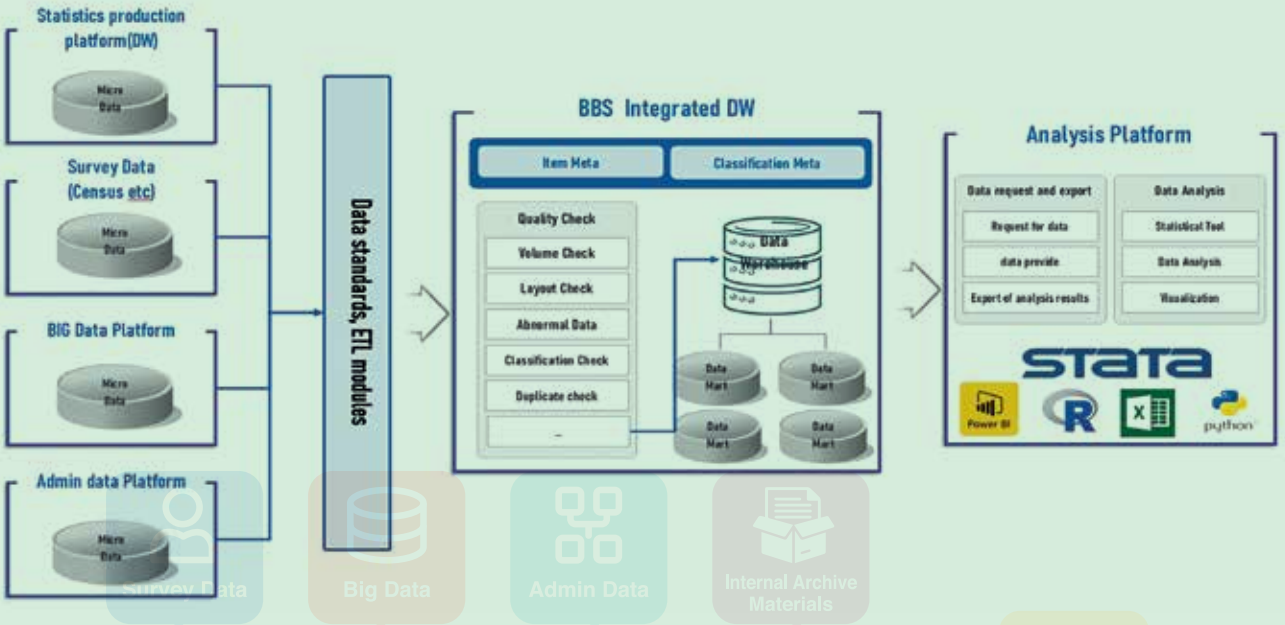
Improvement Task	Establishment of a DW System
Task Description	Establish a centralized integrated DW system to transform the fragmented statistical data held by BBS into a core foundation for national policy-making and decision-making. The system will centrally manage the entire data lifecycle (collection-management-utilization) in a systematic and unified manner
Current Status and Issues	Increasing data fragmentation and deepening departmental silos Lack of metadata management and standardization, leading to reduced data quality and comparability Manual, labor-intensive operations resulting in high error rates and inefficiency Data stored on personal PCs, creating risks of loss and security vulnerabilities Inadequate controls over data release and lifecycle management, limiting usability and governance

Improvement Task	Establishment of a DW System
Improvements	Centralize data acquisition by integrating organization-wide data sources (administrative data, surveys, big data, etc.) and automating ETL processes Establish a metadata-driven five-stage quality governance framework (Planning- Measurement- Evaluation- Improvement- Control) Implement step-by-step exposure control for sensitive information (pseudonymization, classification management) and establish an approval-based data release control system Strengthen lifecycle governance through systematic data preservation and disposal management
Considerations	Establish data integration rules and governance mechanisms with source agencies Develop implementation plans for metadata and quality management aligned with SIMS and SDMX Standardize and migrate existing data to the DW structure Design access control, anonymization, and security classification frameworks Ensure infrastructure scalability and performance (network, servers, storage) Provide user training for data engineers and system operators, and secure organizational acceptance

6.2.1.4 Establishing an Online Analysis System

The BBS has had limitations when it comes to accessing and utilizing statistical microdata due to the insufficient provision of systematic services for accumulated raw statistical data (microdata). Microdata is managed in a decentralized manner across departmental and individual PCs, making it difficult to grasp the overall status and posing a high risk of data loss and security breaches. Furthermore, researchers and policymakers must rely on manual requests and approval procedures to obtain data, resulting in inefficient data utilization and unrealized potential value. Currently, the absence of a centralized integrated system for the secure provision of microdata or a channel with guaranteed security creates fundamental limitations in supporting in-depth data analysis. In short, the absence of an online remote analysis environment for both internal and external BBS users continue to limit access to statistical data and results in inefficient manual processes.

To resolve these issues, it is necessary to establish a secure yet efficient online analysis environment. There is a need for a remote analysis system that will allow users to perform analyses without directly disclosing microdata containing sensitive information, such as personal data, externally. This system should balance data utilization and non-identifiable protection by providing both public-use microdata and approved-use microdata under security controls and managing access scope according to user permissions. Public-use microdata is anonymized data provided to the general public at the level of published statistics. Approved-use microdata supports detailed analysis in restricted environments for research purposes, with additional approval procedures. Thus, the core task is to enhance the usability of the BBS's raw statistical data and enable secure access through the development of such an online remote analysis system.



[Figure 3] DW Architecture

[Table 5] Online Analysis System Development Task

Improvement Task	Plan for the Development of an Online Analysis System for Deriving Statistical Data Insights
Task Description	Build an RAS (VDI/web-based) that enables microdata analysis within the server without external export, along with a user portal (supporting English/regional languages) Separate provision channels into public (anonymous), approved, and special-purpose (data lab) use, and embed controls such as RBAC, 2FA, network segmentation, and encryption Integrate with metadata management systems, data warehouses, statistical production systems, and public portals to standardize and automate the end-to-end workflow from application to approval, analysis and export
Current Status and Issues	Microdata is stored in dispersed locations (departments, personal PCs), making it difficult to grasp current status and causing persistent risks of loss and security breaches. Lack of a centralized, integrated provisioning system and secure channels, and inadequate remote analysis environment, leading to a dependency on manual methods and processing delays Non-standardized, non-automated application, approval and provision procedures, causing operational burdens and a lack of transparency in billing and export management Meta-data inconsistencies, inadequate standardization of terminology/classification and governance, resulting in reduced analysis and reusability Need for improvements in multilingual UIs, accessibility, training/operational personnel, and legal/institutional frameworks (export regulations, billing policies)

Improvement Task	Plan for the Development of an Online Analysis System for Deriving Statistical Data Insights
Improvements	The portal will provide data search/listing, SIMS-based detailed metadata and sample previews, online application and progress status inquiries. The security system will control access via RBAC-based role permissions, session management, 2FA, and anomaly monitoring. The remote analysis environment will pre-load STATA, R, Python, and Excel (BI), ensuring secure analysis through Internet blocking, isolated sessions, and capacity/session time policies. Data will be provided via downloadable public DBs, analysis-only approved DBs, and data lab -exclusive DBs. Consistency in definitions and classifications will be ensured through the DW → de-identification → service DB pipeline and meta-data key linkage. Data export will be permitted only for approved, logged outputs such as summary tables and graphs. This includes usage period management, expiration disposal, history retention, data lab reservation/seat/permission management, and initialization upon usage termination
Benefits	Secure access to microdata without external extraction Improved transparency and accessibility through an online analysis interface Automation of analysis request, approval and output release workflows Enhanced monitoring and auditability through log-based activity tracking Balanced improvement of data utilization and confidentiality protection
Considerations	Establish detailed role-based access control (RBAC) and approval procedures Define anonymization rules and output checking protocols Strengthen infrastructure security with network segmentation and multi-layer defense Ensure real-time system monitoring for detection and response to abnormal usage Develop SOPs and governance mechanisms aligned with legal and policy requirements Provide user training and support to ensure adoption among researchers and internal users

6.3 Migration Plan

To securely and accurately transfer data from existing systems to DW, we establish an automated five-step process utilizing ETL tools (such as Nifi), which includes extracting, purifying, standardizing, and loading DW data. ETL tools leverage open sources like Nifi to build automated extraction, transformation, and loading workflows



- **(Step 1) Demand analysis:** (Identify business goals) Clearly identify the purpose of data utilization, user needs, and data utilization needs, and determine the priority of transfer targets.
- **(Step 2) Data collection and analysis:** (Source data quality analysis) Collect all existing data sources (including Computer Wing 44 types of statistical data) and analyze their structure, format match, and quality level in detail.

- **(Step 3) ETL Design and Build:** (Automated Workflow Design) Design an automated workflow to extract, standardize, refine/transform, and load data into DW, and build ETL tools such as Nifi.
- **(Step 4) DW Implementation:** Apply the star schema model according to the (Create DW Schema) area to create and implement the DW schema, including the Fact table (measures) and the Dimension table (analytical perspective).
- **(Step 5) Test and Operation:** (Verify data accuracy) Test data accuracy and system performance, and deploy it to production after completing the error data refinement process.

6.4 Data Security Plan

Establish a strict standardization and master data management system based on metadata to ensure data consistency and quality. Establish multi-layered security controls to ensure the safety of statistical data, especially sensitive microdata, stored by the DW platform.

- **Access Control:** Implement Role-Based Access Control (RBAC) for data within the DW to granularize user-specific access permissions and thoroughly block unauthorized access. Permissions are differentiated based on the sensitivity of the data (micro vs. aggregation) and the user's role
- **Data Encryption:** Microdata containing sensitive information, such as personally identifiable information (PII), is encrypted at rest when stored in the DB to ensure security when the data is stored. In particular, a separate encryption Key Management System (KMS) is established to securely control the lifecycle of encryption keys from generation, management, and disposal
- **Masking/Anonymization:** When extracting/providing data for the purpose of linkage with external systems and analysis, sensitive information is de-identified (data masking or statistical anonymization) in advance to minimize the risk of information leakage. Masking is considered to be dynamically applied at the time of inquiry (Dynamic Data Masking) to ensure both performance and security.
- **Security Audit and Logging:** Establish a detailed logging system for data access and change history, and conduct regular security audits and monitoring to detect anomalous behavior and maintain records. Maintain audit logs for all ETL/analytics operations to ensure data traceability

6.5 Logical Architecture

The logical architecture describes the main components and data flows within each layer, without committing to specific products or deployment topologies. Various logical layers are described below:

- **Data Source Layer (Censuses, Surveys, Administrative Data, Big Data):** Data may originate in various formats (relational databases, CSV/Excel files, flat files, geospatial formats, etc.) and are brought into the ISDW through controlled ingestion mechanisms.

- **Data Ingestion/ETL/ELT Layer:** The ETL layer will support reusable mappings and transformation rules, reducing duplication and ensuring consistency in how similar data are handled across programmes.
- **Staging and Integration Layer:** This layer enables step-wise processing and supports reprocessing if improved transformations or corrections are introduced. It is particularly important when integrating data from multiple administrative sources with differing structures and quality.
- **Core Data Warehouse Layer:** The core warehouse is the authoritative internal source for integrated, harmonized data used in official statistics and analytical products.
- **Data Marts and Analytics Layer:** This layer ensures that heavy or experimental analytical loads do not compromise the stability and performance of the core warehouse.
- **Presentation and Dissemination Layer:** This layer will be closely coordinated with BBS's existing and planned web and microdata dissemination strategies to avoid duplication and ensure consistency.
- **Metadata and Governance Layer:** The Metadata and Governance Layer underpins all other layers by providing common definitions, rules and policies.

6.6 Technology Stack Options and Standards

The specific technology stack will be determined through detailed design and procurement, but the following baseline directions are proposed:

➤ **Database and storage:**

- Use of a robust, enterprise-grade Relational Database Management System (RDBMS) for the core data warehouse, with support for analytical workloads.
- Use of scalable storage (e.g. SAN/NAS or equivalent) managed within BBS's data center and aligned with GoB data center standards.

➤ **ETL/ELT and integration tools**

- Adoption of an ETL/ELT platform (open-source or commercial) capable of handling complex transformations, workflows, scheduling and monitoring.
- Support for metadata-driven design to minimize manual coding and enhance maintainability.

➤ **Analytics and BI tools**

- One or more BI tools for dashboarding and standard reporting, selected for usability by non-technical users and compatibility with GoB ICT policies.
- Support for integration with open-source and commercial statistical tools for advanced analysis.

➤ **Metadata and master data tools**

- Use of tools or modules that support SDMX or other relevant standards for metadata and structures.
- Ability to interoperate with external metadata repositories (e.g. international reporting platforms) if needed.

➤ **Security and identity management**
- Integration with GoB or BBS identity and access management solutions where available (e.g. directory services), using role-based access control (RBAC).
- Adoption of security standards and best practices (e.g. encryption in transit, secure configuration, logging and audit).

➤ **Test and production environments**
- Separate environments for , testing and production to ensure orderly change management and minimize risk to live systems.

In all cases, choices will be guided by compatibility with existing BBS and GoB ICT environments, total cost of ownership, vendor support and staff skills. This environment will be deliberately scaled to match available resources and skills, with a focus on learning and capacity rather than immediate large-scale operationalization.

6.7 Institutional Innovation for DW Operations

The Data Warehouse (DW) platform serves as the core foundational infrastructure to integrate the national statistical system and drive the digital transformation of the Bangladesh Bureau of Statistics (BBS). To ensure its stable operation and maximize data value, it is essential to establish a governance framework that goes beyond ordinary IT operational rules and enables cross-organizational decision-making and accountability.

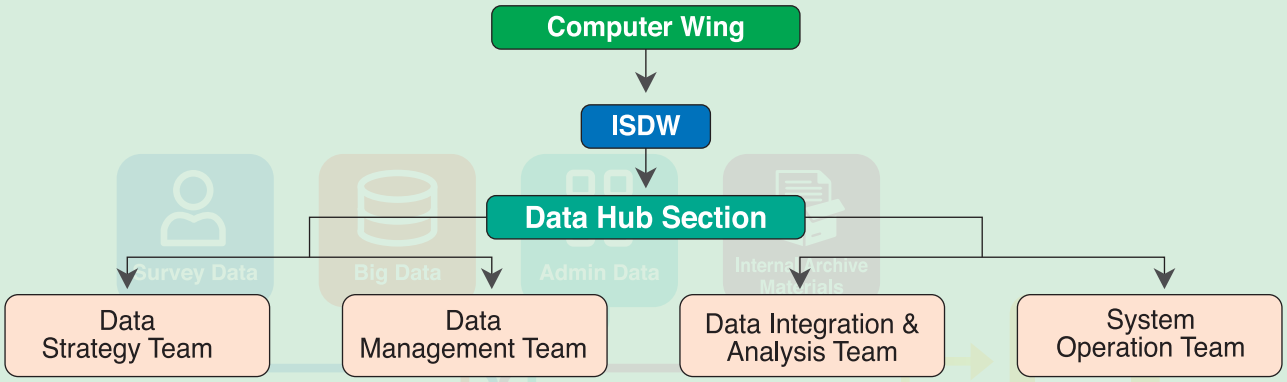
The central objective is to establish integrated operational regulations aligned with the following five pillars, thereby ensuring reliability and efficiency throughout the full cycle of statistical data production, storage, and utilization. Five Core Regulations for DW Platform Operations is provided below:

Category	Purpose
Information Security Regulations	Regulations designed to protect all information assets and statistical data of the Bangladesh Bureau of Statistics (BBS) from internal and external threats.
Personal Data Protection Guidelines	To ensure the safe protection of personal information throughout the entire process of collecting, processing, and providing statistical data, and to guarantee the rights of data subjects.
Statistical Data Governance	To establish and operate principles, organizational structures, policies, and standards for managing the statistical Data Warehouse (DW) of the Bangladesh Bureau of Statistics (BBS).
Data Standardizati on Guidelines	To establish and manage unified standards for data structures, terminology, and metadata across all database systems managed by the Bangladesh Bureau of Statistics (BBS).
Statistical DW System Operation Guidelines	To define the procedures required for the development, management, and operation of the Statistical Data Warehouse (DW).

6.7.1 Establishment of a Data Hub Section and Its Roles

It is proposed to establish a dedicated Data Hub Section under the Computer Wing, which oversees BBS IT functions. This section will act as the central control tower for all data-related strategies, management, and analytical functions across BBS.

The Data Hub Section will consist of four specialized teams: Draft Organizational Structure



- **Data Strategy Team**
  - Establishes and manages the organization-wide data governance framework, covering data strategies, policies, standards, and guidelines.
  - Leads metadata and data standard management while monitoring regulatory and technological trends to ensure compliance and future readiness.
- **Data Management Team**
  - Designs and maintains data models and database structures used in the DW environment.
  - Oversees ETL processes from data collection to transformation and loading, ensuring high-quality and reliable data through systematic quality management and centralized master/reference data administration.
- **Data Integration & Analysis Team**
  - Integrates multiple data sources such as surveys, administrative data, and big data to enhance the value of combined datasets.
  - Supports secure microdata access and applies anonymization techniques to protect confidentiality.
  - Produces new statistical insights and analytical outputs utilizing integrated datasets.
- **System Operation Team**
  - Ensures stable, secure, and efficient operations of the DW and related platforms by monitoring performance, capacity, and system security.
  - Provides technical support and continuously improves the infrastructure to maintain an optimal operating environment.

6.7.2 Human Resource Capacity Building

6.7.2.1 Core Tasks

The capacity-building initiative for achieving autonomous operation of the DW platform focuses on securing professional competencies across the entire value chain-from statistical production to data analytics utilization and DW infrastructure operation.

1) Statistics Sector: This initiative enhances practical competencies across the full spectrum of statistical compilation processes, including survey planning, questionnaire design, data processing, and dissemination. Furthermore, the program aims to develop professional capabilities in national statistical quality management based on GSBPM (Generic Statistical Business Process Model), an international standard for official statistics production.

2) Analysis Sector: This task focuses on securing analytical capabilities to manage large-scale datasets and to conduct complex data processing, big data analytics, machine learning, and statistical modeling. Special emphasis is placed on building competencies in Business Intelligence (BI) tools that support report generation and intuitive data visualization.

3) IT Sector: This initiative reinforces the practical skills of core IT personnel required for stable DW platform operations. It covers skills for DW data loading, transformation, and automated operation; database management capabilities for data modeling, standardization, and ETL process design; and infrastructure administration capabilities for Linux server operation and security threat response.

6.7.2.2 Comparative Review of the BBS Training Plan

The training strategy emphasizes effective knowledge internalization and the establishment of a sustainable talent cycle across the BBS.

1) Knowledge Diffusion through Traning of Trainer (TOT):

- Training in the Statistics and Analytics domains will adopt a TOT approach, transforming participants into internal trainers capable of independently developing training materials and delivering education to peers. This ensures organization-wide dissemination and long-term sustainability of knowledge.

2) Dual Training Approach: Classroom Training + On-the-Job Training (OJT)

- Classroom Training: The Developer & Operator, Database Management, and New Technologies fields will be conducted as classroom training focused on theory and practice by professional instructors.
- On-the-Job Training (OJT): The Server Operation & Security field will be operated through continuous OJT under the guidance of external experts, linked with the supply of PC business equipment, to maximize practical experience.

3) Avoiding Curriculum Duplication and Prioritizing Essential Skills

- To maximize training investment efficiency, programs overlapping with existing BBS training (SSTI and Computer Wing programs) will be excluded. Courses for small-scale data analysis (R, STATA, Excel) and basic statistics theory will also be excluded. Instead, training will focus on essential technologies such as Python, Power BI, and Apache NiFi, which are directly required for DW operations.

6.7.2.3 Training Operation Approach

1) Detailed Curriculum for Statistics and Analytics (TOT Method)

Training in the Statistics and Data Analytics domains will be designed around the core principles of trainer preparation, ensuring that participants grow into competent internal instructors. Trainees will design their own instructional materials, practice delivery techniques, and receive structured feedback to complete the internal trainer qualification process. Proposed Training Curriculum for Statistics and Analysis is provided below:

[Table 6] Educational Content on Statistics and Analytics

Domain	Course Title	Key Learning Contents	Delivery Method
Statistics	National Statistics Practice	End-to-end statistical compilation procedures including survey planning, questionnaire design, data collection and processing, data analysis, and dissemination	TOT (Training of Trainers)
	National Statistical Quality Management	GSBPM-based statistical quality management methodology; preparation of Statistical Information Reports and Quality Diagnosis Reports	
Analytics	Advanced Python Program	Large-scale data processing, machine learning, fundamentals of NumPy/Pandas, and data visualization (Matplotlib, Seaborn)	
	BI Analytics Program	Overview of BI, data modeling, visualization dashboard , storytelling-based visualization techniques, report sharing and access control	

2) Detailed Curriculum for the IT Domain (Classroom Training and OJT)

The IT domain training curriculum is structured around three core pillars-DW system , data management, and infrastructure operations-with a strong focus on practical, hands-on learning. In particular, server operation and security training will be delivered through On-the-Job Training (OJT), linked to the deployment of equipment, to ensure the internalization of practical operational capabilities. Proposed IT Training Curriculum is provided below:

[Table 7] Educational Content on IT Domain

Domain	Course Title	Key Learning Contents	Training Method
Database Management	Introduction to Java Programming	Understanding object-oriented programming principles, Java syntax, and foundational skills for DW application .	Classroom Training
	Java-based Web	Spring Boot and RESTful API design, and deployment of DW data retrieval APIs.	
	Frontend	HTML5/CSS3, JavaScript, React/Vue.js, of statistical data visualization web interfaces.	
	SQL and Database Integration	Advanced SQL, joins/subqueries, optimization of DW integration queries.	
	Data Modeling	Designing DW schemas (Star/Snowflake schemas), normalization/denormalization, modeling based on BBS survey data.	
	Data Standardization & Metadata Management	Standard terminology/code management, metadata registration/search system, establishment of metadata-based governance.	
	Fundamentals and Design of ETL Processes	Data extraction/transformation/loading structure and design principles, batch job design, error handling.	
	Practical ETL Using Apache NiFi	NiFi installation/configuration, processor utilization, of automated DW loading pipelines.	
	Database Backup & Recovery Strategies	Backup policies, log-based recovery, MariaDB backup and disaster recovery simulation.	
Server Operation & Security	Linux Server Administration	Core server operation, user/privilege management, log monitoring, performance tuning.	OJT
	Virtualization & Container Operations	Docker/Kubernetes cluster operations, container deployment in DW environments.	
	Network Administration	TCP/IP, firewalls, IDS/IPS concepts, network operation and security policy configuration.	
	DW Security & Compliance	Data encryption, access control, audit logs, compliance with personal data protection regulations.	
Emerging Technologies	Introduction to AI & Machine Learning	Fundamentals of AI/ML and DW use cases, hands-on ML model using Python.	Classroom Training
	Introduction to Cloud Computing	Comparison of IaaS/PaaS/SaaS, private/hybrid cloud architecture, understanding of latest cloud technologies.	

7. INTEGRATION AND INTEROPERABILITY DESIGN

This section describes how the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analytics platform will interface with existing systems within BBS and with external systems operated by line ministries, agencies and other partners. It also sets out the standards and mechanisms that will be used for data exchange, and the approach to handling different types of data (structured, semi-structured and unstructured).

The design aims to ensure that the ISDW becomes the central integration backbone of BBS, rather than a stand-alone system, and that it can interoperate effectively within the wider Government of the People's Republic of Bangladesh digital ecosystem.

7.1 Integration with Existing BBS Systems and Databases

BBS currently operates a number of systems and databases associated with censuses, surveys and specialized functions:

- Survey and census processing systems (e.g. data entry, editing and tabulation applications).
- Subject-matter databases and spreadsheets maintained by individual wings for specific programmes.
- Price, trade and other ongoing data collection systems.
- GIS and geospatial data repositories.
- Microdata access and documentation tools (where already in place).

7.2 Integration with Line Ministries and External Data Providers

The ISDW will also integrate selected administrative and other data sources held by line ministries, divisions, agencies and, where justified and feasible, other institutions. Such integration is essential to broaden the evidential base of official statistics and to reduce duplication of data collection.

Key elements of the integration approach are:

1) Institutional arrangements and Data Sharing Agreements (DSAs): BBS, under the guidance of SID and in consultation with relevant ministries, will negotiate and formalize Data Sharing Agreements or Memoranda of Understanding (MoUs) with each external data provider.

2) Alignment with GoB interoperability and ICT policies: Integration with external systems will comply with national guidelines on interoperability, e-government and ICT security, including any applicable enterprise architecture or interoperability frameworks.

3) Data exchange mechanisms with external providers: For regular, structured administrative datasets (e.g. registers, routine reporting systems), integration will typically use:

- Secure file transfers (batch), in agreed formats with documented structures and code lists; and/or
- APIs or web services, for more frequent or near real-time exchanges, where the provider's systems support such interfaces.

4) **Gradual expansion and prioritization:** Initial integration will focus on a limited number of high-priority administrative sources linked to key statistical domains (e.g. education, health, social protection, agriculture, business/industry), as agreed in the Implementation Roadmap.

Through these arrangements, the ISDW will support a systematic, policy-backed integration of administrative data into official statistics, in line with national priorities and international good practice.

7.3 Data Exchange Mechanisms (APIs, SDMX, File-Based Exchange)

A combination of data exchange mechanisms will be adopted, selected according to the nature of data, frequency of exchange, and technical capacities on both sides.

1) File-based batch exchange: File-based batch exchange will be the primary mechanism in the early phases and for many existing systems. It will use standardized file formats such as CSV, XML and SDMX-ML, with clearly documented structures and code lists. This approach will be particularly suitable for periodic updates-monthly, quarterly or annual-received from censuses, surveys and many administrative systems.

2) Application Programming Interfaces (APIs): Application Programming Interfaces (APIs) will be introduced where systems require more frequent or on-demand data access. RESTful APIs, or other protocols endorsed as government standards, will be used for this purpose. APIs will serve two main roles: inbound APIs will allow the ISDW to receive data from external systems that push updates, while outbound APIs will enable authorized external systems and applications to retrieve aggregated statistics and indicators from the ISDW. The design of these APIs will follow Government of Bangladesh standards for security, authentication and rate limiting.

3) SDMX-based exchange for statistical data and metadata: For statistical data and metadata, particularly time series indicators used in SDGs and other international reporting, the ISDW will adopt SDMX as the preferred standard for publishing and exchanging data and metadata. SDMX artefacts such as Data Structure Definitions and code lists will be developed in alignment with international templates wherever possible, to facilitate automatic exchange with regional and global platforms.
The ISDW will centralize configuration and monitoring of all these exchange mechanisms, allowing ICT and data management staff to track data flows and troubleshoot when problems occur.

7.4 Handling Structured, Semi-Structured and Unstructured Data

While most traditional statistical data are structured (tables with defined rows and columns), the ISDW and small-scale big data platform must also be able to handle semi-structured and unstructured data relevant to emerging statistical methods.

1) **Structured data**
   - Censuses, surveys and most administrative systems provide structured data that will be stored in relational/analytical structures within the ISDW.
   - These data are the primary focus of the ISDW and will be modelled using standard schemas and master data.

2) **Semi-structured data**
   - Some sources may provide data in semi-structured formats (e.g. JSON, XML, log files).
   - The ETL/ELT processes will include parsing and transformation to extract relevant fields and map them into structured forms suitable for the warehouse, while preserving original content where needed.

3) **Unstructured data**
   - Potential unstructured sources include text (e.g. open-ended survey responses, documents), images (e.g. earth observation imagery) and other media.
   - Such data will primarily be handled within the big data and advanced analytics environment, not the core ISDW, especially during pilot phases.

This differentiated approach ensures that the ISDW remains a clean, structured environment for official statistics, while the big data platform provides flexibility for experimentation with newer data types.

7.5 Interoperability Standards and Reference Models

To ensure interoperability within BBS and with the wider NSS, the following standards and reference models will guide the design and implementation of ISDW integrations:

1) **Statistical standards and models**
   - GSBPM (Generic Statistical Business Process Model) for mapping data flows and identifying where the ISDW supports business processes.
   - SIMS (Single Integrated Metadata Structure) as a standardized framework for metadata on statistical indicators, enabling integrated management of quality attributes, sources, and methodologies
   - SDMX (Statistical Data and Metadata eXchange) for structuring and exchanging time series indicators and associated metadata.

2) Classification and code standards

- National and international classifications (e.g. ISIC, ISCO, national geographic coding schemes) used consistently across datasets and systems.

3) ICT and data standards

- Common data formats and exchange patterns (e.g. CSV, XML, JSON, SDMX-ML) for file-based and API-based integration.

4) Governance and documentation templates

- Standard templates for Data Sharing Agreements, data access requests, data classification, and SOPs, ensuring consistent application across different integration partnerships.
- Common metadata templates for documenting datasets (source, coverage, methodologies, quality, limitations).

5) Reference architecture and patterns

- The ISDW architecture itself will act as a reference model for future system within BBS, encouraging new applications to be built in ways that are compatible with the warehouse (e.g. using shared master data, supporting agreed APIs).
- Where national enterprise architecture or interoperability frameworks exist, the ISDW will be aligned with their principles and patterns.

By applying these standards and reference models consistently, BBS will be able to:

- Improve coherence and comparability of statistics across domains and over time;
- Simplify and stabilize integration with external partners; and
- Facilitate regional and international data exchanges, including automatic reporting to global platforms.

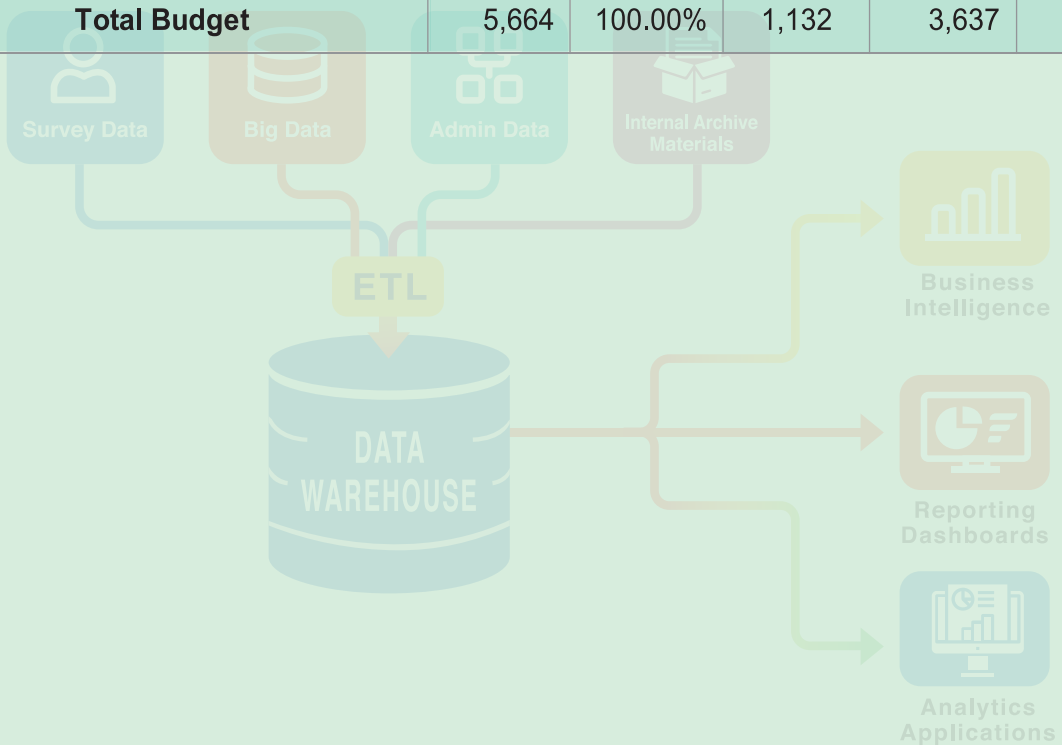
7.6. Required Budget and Feasibility Analysis

The required budget analysis for the ISDW should clearly distinguish between system and equipment costs. Under costs, separate allocations should be estimated for DW Development, SW Development (including middleware, tools, and integration components), and Statistical Database Development, with a subtotal that reflects the full cost of building and configuring the ISDW platform and its core statistical databases. A second major block should cover Equipment-including all necessary H/W, S/W, etc. such as servers, storage, network devices, security appliances, backup systems, and essential platform software licenses -again summarized.

[Table 8] Total Budget Summary

Unit: 1,000 USD

Category		Budget Total	Ratio	Annual Budget		
				2025	2026	2027
DW	SW	3,167	55.91%	658	1,974	535
	Statistical Database	123	2.17%	-	-	123
	Subtotal	3,290	58.08%	658	1,974	658
Equipment	H/W, S/W, etc.	2,374	41.92%	474	1,663	237
Total Budget		5,664	100.00%	1,132	3,637	895



8. DATA GOVERNANCE FRAMEWORK

This section sets out the framework through which BBS will govern, manage and use data within the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analytics platform. It translates the institutional governance arrangements described earlier into concrete policies, roles, responsibilities and processes for data and metadata management. The framework is designed to be practical and consistent with the Bangladesh Statistics Act, 2013, GoB policies and international standards for official statistics.

8.1 Purpose of the Data Governance Framework

The Data Governance Framework have the following overarching purposes:

1) Ensure that data in the ISDW are accurate, consistent, timely and fit for purpose as the foundation of official statistics and analytical products.
2) Protect the confidentiality, integrity and availability of data in line with the Statistics Act, GoB regulations and good international practice.
3) Promote Standardization and interoperability through common classifications, master data and metadata standards.
4) Clarify roles and responsibilities for data stewardship, ownership, quality assurance, access and usage across BBS and key stakeholders.
5) Support efficient and transparent data sharing and access, both within BBS and with external users, through clear rules and procedures.
6) Enable continuous improvement, by embedding feedback mechanisms, monitoring and review of data governance policies and practices.

8.2 Governance Structure for the ISDW

To ensure effective steering, coordination and oversight of the ISDW and big data analytics platform, a dedicated governance structure is proposed, aligned with existing BBS and GoB institutional arrangements. The key elements are as follows:

1) ISDW Technical Committee

- Chaired by the Director General of BBS, with representation from SID, key BBS wings and directorates, and, as appropriate, the KOICA project and other partners.
- Provides strategic guidance, approves major design choices and implementation plans, and oversees alignment with national policies (e.g. Perspective Plan, ICT strategies) and the Bangladesh Statistics Act, 2013.

2) Data Stewards and Focal Points in BBS Wings

- Designated officers within each subject-matter wing and key units act as data stewards and focal points for ISDW-related matters.
- Responsible for ensuring that data from their respective domains are prepared, documented and transmitted to the ISDW in accordance with agreed standards and schedules, and for liaising with the Data Governance Council and Technical Working Groups.

3) Project Management and Secretariat Support

- A dedicated project management team and secretariat, embedded within BBS and working closely with the KOICA project team, supports the functioning of the above bodies.
- Responsible for day-to-day coordination, monitoring of implementation progress, documentation, communication with stakeholders and reporting to BBS and SID.

This governance structure will be further detailed in subsequent sections of the Master Plan (particularly in the Data Governance and Management Framework and the Implementation Strategy and Roadmap), and refined in consultation with BBS management, SID and KOICA. Its design aims to ensure that the ISDW are owned, managed and sustained as core assets of the Government of the People's Republic of Bangladesh, rather than as isolated project outputs.

8.3 Metadata Management Framework

Effective metadata management is essential for understanding, using and reusing data in the ISDW. The framework will include a central metadata repository, the use of international standards and well-defined processes for metadata creation, maintenance, access and use. The central metadata repository will be a structured store containing different categories of metadata. Structural metadata will describe dataset structures, variables, classifications and code lists. Reference metadata will cover methodological descriptions, survey designs, sampling, weighting, as well as editing and imputation procedures. Quality metadata will document coverage, response rates, limitations and revisions. Administrative metadata will record information on ownership, contact points, release dates and access restrictions. International standards will be applied consistently.

Metadata access and use will also be structured. Metadata will be available through internal tools for BBS staff to support planning, analysis and quality management. It will also be presented through public-facing interfaces for users of BBS statistics, such as documentation pages and data portals, with the level of detail adapted to the needs of different audiences.

By institutionalizing structured metadata management, BBS will enhance the transparency, reproducibility and comparability of its statistics, and will better facilitate integration with international reporting systems.

8.4 Master Data Management (Geocodes, ISIC, ISCO, etc.)

Master data are shared reference data used across multiple datasets and systems. Within the ISDW, a Master Data Management (MDM) approach will ensure consistency and stability in key domains. The scope of master data will include national geographic codes and hierarchies such as division, district, city corporation, Uupazila, Paurashava, Union, Mauza and enumeration areas. It will also cover economic and occupational classifications, for example ISIC, ISCO and their national adaptations. In addition, it will include other reference lists used across programmes, such as institutional sectors, education levels, urban and rural definitions and poverty thresholds.

Governance of master data will be overseen by the Data Governance Council, which will approve changes to master data, such as new geocodes or updates to classification versions, based on proposals from the responsible wings. All changes will be documented with effective dates and links to relevant laws or administrative decisions, for example the creation of new administrative units. Versioning and history of master data will be carefully managed. Changes such as boundary adjustments or reclassifications will be tracked over time, enabling analyses that require historical consistency, including the mapping of old codes to new ones.

8.5 Awareness for Data Governance

Implementing this Data Governance Framework, BBS will establish a clear, robust and sustainable foundation for managing data within the ISDW, thereby enhancing the credibility, usefulness and protection of official statistics in Bangladesh. To this end:

- Guidance materials (manuals, FAQs, guides, etc.) will be produced and made available through intranet and other channels.
- Awareness campaigns (briefings, seminars, internal newsletters) will reinforce key messages on confidentiality, data quality, standards and responsible data use.
- Performance management will gradually incorporate data governance responsibilities into job descriptions, performance appraisal and recognition systems.

8.6 Data Security, Privacy and Compliance

This section sets out the technical and organizational measures that will be adopted to safeguard data within the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analytics platform. It is grounded in the Bangladesh Statistics Act, 2013, relevant policies of the Government of the People's Republic of Bangladesh on ICT and information security, and recognized international good practices. By implementing these security, privacy and compliance measures, BBS will ensure that the ISDW and big data analytics platform fully respect the trust placed in it by respondents, data providers and users, while enabling modern, integrated and efficient statistical production.

8.6.1 Security Objectives and Principles

The objective is to ensure that the confidentiality, integrity and availability (CIA) of data are protected throughout their lifecycle, while enabling legitimate use of data for official statistics and analysis. The security framework for the ISDW will be guided by the following objectives and principles:

1) **Confidentiality:** Protect individual-level and sensitive data from unauthorized access, disclosure or misuse, in line with the Statistics Act and applicable regulations.
2) **Integrity:** Prevent unauthorized modification or destruction of data, and ensure that data remain accurate, complete and reliable from ingestion to dissemination.
3) **Availability:** Ensure that authorized users and systems can access data and services when needed to support statistical operations and decision-making.
4) **Compliance and auditability:** Align with GoB security policies, and maintain logs and audit trails to demonstrate compliance and support investigations when necessary.

8.6.2 Data Privacy and Protection Measures

Given BBS's responsibility to protect respondents' information, specific measures will be implemented to ensure privacy and statistical confidentiality:

1) **De-identification of unit-level data:** Removal or masking of direct identifiers (e.g. names, national ID numbers, exact addresses, phone numbers) from datasets loaded into analytical or dissemination layers. Retention of such identifiers only where strictly necessary, and only in controlled areas (e.g. staging, highly restricted internal systems).
2) **Anonymization and disclosure control:** Use of statistical disclosure control techniques (e.g. aggregation, cell suppression, noise addition, top-coding) for tabular outputs to ensure that individual units cannot be identified. Anonymization of microdata prior to any external access, following BBS guidelines and international best practices.
3) **Controlled microdata access environments :** Provision of secure environments (e.g. on-site Microdata Analysis Lab, secure remote access solutions if adopted) where authorized researchers can access anonymized microdata under strict conditions. Prohibition of copying or removing raw microdata from controlled environments, with outputs subject to disclosure checks before release.
4) **Legal and ethical compliance :** All uses of data within the ISDW will comply with the Statistics Act, 2013 and any applicable personal data protection laws, ethical guidelines and agreements with data providers.

8.6.3 Compliance with National Laws, Regulations and Standards

The ISDW security and privacy framework will be aligned with:

- The Bangladesh Statistics Act, 2013, especially provisions on confidentiality and use of data solely for statistical purposes.
- GoB regulations, circulars and guidelines on information security, e-Government, ICT infrastructure and critical information systems.
- Relevant provisions of sectoral laws and regulations that govern specific administrative data sources.
- Internationally recognized security and privacy frameworks (e.g. ISO/IEC 27001[18] series) as references for good practice, to the extent practical and proportionate.

BBS will work closely with SID, the Ministry of Planning and relevant ICT authorities to ensure that ISDW policies and technical controls are consistent with evolving national frameworks.

8.6.4 Business Continuity and Disaster Recovery Arrangements

To ensure availability and resilience, business continuity and disaster recovery (BC/DR) will be integral parts of ISDW design and operations:

1) **Backup and recovery:** Backup and recovery will rely on regular, automated backups of databases, configurations and key application data, which will be stored in secure locations. Restore procedures will be tested periodically to confirm that these backups can be used effectively in the event of data loss.

2) **Disaster recovery site:** A secondary site (for example, a disaster recovery data center) will be used to host replicated or backup systems in line with GoB standards and the Master Plan's infrastructure strategy. Clear procedures will be established for failover and failback between the primary and secondary sites in the event of major incidents. The Disaster recovery site of BBS is planned to establish under SCEMP Project of BBS.

3) **Continuity of operations:** Continuity of operations will be supported through contingency plans for the temporary loss of specific components (such as ETL processes or analytics tools), including manual workarounds where appropriate. Communication plans will also be in place to inform users about incidents, expected recovery times and interim arrangements.

8.7 Advanced Analytics and Business Intelligence

This section describes how the Integrated Statistical Data Warehouse (ISDW) will enable BBS and its stakeholders to analyze, visualize and access data and indicators. It focuses on the analytics and business intelligence (BI) environment, the tools and services to be provided to different types of users, and the integration with BBS's microdata access arrangements.

8.7.1 Aim of the Analytics and Business Intelligence (BI)

The aim for analytics and BI under this Master Plan is to provide secure, user-friendly and standards-based analytics and visualization services that turn the ISDW's integrated data into timely, reliable and accessible information for decision-makers, analysts, researchers and citizens. This means:

- Moving from fragmented, spreadsheet-based analysis towards shared, governed data and tools;
- Enabling BBS staff and government users to interactively explore data and indicators;
- Providing tailored analytical environments for advanced statistical and data science work; and
- Ensuring that outputs are disseminated through trusted, official channels consistent with BBS's mandate and GoB policies.

[18] https://www.iso.org/isoiec-27001-information-security.html

8.7.2 User Segmentation and Analytics Needs

The analytics and BI environment will serve distinct user groups with varying needs and skills:

1) **Strategic decision-makers (BBS management, SID, Planning Commission, senior officials in line ministries):** Strategic decision-makers, including BBS management, SID, the Planning Commission and senior officials in line ministries, will require concise dashboards and summary reports aligned with national priorities such as the Perspective Plan and the SDGs. Their primary focus will be on high-level trends, comparisons and alerts rather than detailed microdata.

2) **Statisticians and analysts in BBS and line ministries:** Statisticians and analysts in BBS and line ministries will need interactive tools that allow them to drill down into indicators, cross-tabulate variables and generate custom tables, charts and maps. They will also require access to microdata or detailed unit-level datasets, subject to applicable policies, to support modelling, methodological work and advanced analysis.

3) **Technical experts and data scientists:** Technical experts and data scientists will need flexible environments in which they can develop and run statistical and machine learning models. Their work will depend on access to ISDW data, external reference data and pilot big data sources.

4) **Researchers and academia:** Researchers and academia will require controlled access to anonymized microdata and detailed documentation to support robust empirical research. They will often need to combine BBS data with their own datasets, under strict conditions that safeguard confidentiality and data integrity.

5) **General public, media and civil society:** The general public, media and civil society will need simple and understandable presentations of official statistics, including key indicators, infographics and interactive charts and maps.

The analytics and dissemination strategy will provide differentiated interfaces and tools for these segments, while ensuring consistency of underlying data and metadata.

8.7.3 Statistical and Data Science Tools

To support deeper analysis, model and research, the Master Plan envisages a set of statistical and data science tools integrated with the ISDW:

1) **Statistical Software:** Statistical software within BBS will continue to rely on recognized statistical packages such as R, Stata, Python-based tools and other software already in use. These tools will be used for survey weighting, variance estimation and complex sample analysis, as well as for time series and econometric modelling, small-area estimation and other advanced methods.

2) **Analytical workbenches:** Analytical workbenches will be provided as server-based analytical environments, for example browser-based notebooks or RStudio-type servers. In these environments, authorized statisticians and data scientists will be able to access curated ISDW data marts and, where permitted, microdata. They will also be able to develop scripts, models and reproducible workflows, and to share code and results within their teams under controlled conditions.
3) **Integration with ISDW:** Integration with the ISDW will be ensured through standard, secure connections from statistical tools to ISDW data marts, for example via ODBC, JDBC or APIs. These connections will provide read-only access with appropriate query controls. The environment will also support exporting anonymized analysis datasets to controlled facilities such as the Microdata Analysis Lab.
4) **Advanced analytics and machine learning:** In the small-scale big data environment, advanced users will be able to experiment with machine learning, text analysis and image-based methods where relevant, for example for classification of establishments or analysis of satellite imagery. Selected and validated outputs from these activities, such as improved sampling frames or derived indicators, may be integrated into the ISDW following appropriate review and approval.

These tools will be introduced gradually, matched to available skills and training programmes, and governed by the data governance and security frameworks.

8.7.4 Integration with Microdata Access Mechanisms

The ISDW will work in close coordination with BBS's microdata access mechanisms, including on-site Microdata Analysis Lab. By implementing this Advanced Analytics, BI and Dissemination framework, BBS will move towards a modern, integrated and user-centric statistical information service, turning the ISDW into powerful tools for evidence-based policy, research and public information:

1) **Data provisioning to the Microdata Analysis Lab:** The ISDW will be the primary source of curated, anonymized microdata for the Microdata Analysis Lab: Datasets selected for research access will be extracted from ISDW staging or warehouse layers.
2) **Controlled environments:** Microdata will be accessed by researchers in controlled environments, with security and access controls (e.g. no direct internet access, restricted export of outputs). The ISDW will not itself provide raw microdata to external users; instead, it will feed the Microdata Analysis Lab or equivalent controlled facilities.
3) **Metadata and documentation:** Metadata for microdata-accessible datasets (e.g. questionnaires, codebooks, sampling designs) will be maintained in the ISDW's metadata repository and made available through the Microdata Analysis Lab interfaces.

This integration ensures that microdata access is consistent, secure and efficient, while leveraging the ISDW as the authoritative internal source of curated datasets.

9. IMPLEMENTATION STRATEGY AND ROADMAP

This section layout the vision, architecture and governance arrangements described in preceding sections into a practical implementation strategy and a phased roadmap. It sets out the main phases, core activities, indicative milestones, roles and responsibilities, high-level procurement considerations and key dependencies.

The intention is to guide detailed annual work plans and project documents, while remaining flexible enough to accommodate learning and evolving priorities.

9.1 Implementation Approach and Principles

Implementation of the Integrated Statistical Data Warehouse (ISDW) will follow a phased, incremental and learning-oriented approach, guided by the following principles:

1) **Start small, demonstrate value, then scale up**
   - Begin with a limited set of high-priority datasets, use cases and dashboards that can show early, visible benefits to BBS leadership and key stakeholders.
   - Use lessons from early phases to refine architecture, processes and governance before expanding.

2) **Parallel of technology, processes and people**
   - Avoid treating the ISDW as a purely technical project; align infrastructure and software investments with process redesign, data governance implementation and capacity building.

3) **Strong BBS ownership with targeted external support**
   - Ensure that BBS leads on decision-making, design choices and operations, with KOICA and other partners providing technical assistance, transfer of know-how and initial investment support.

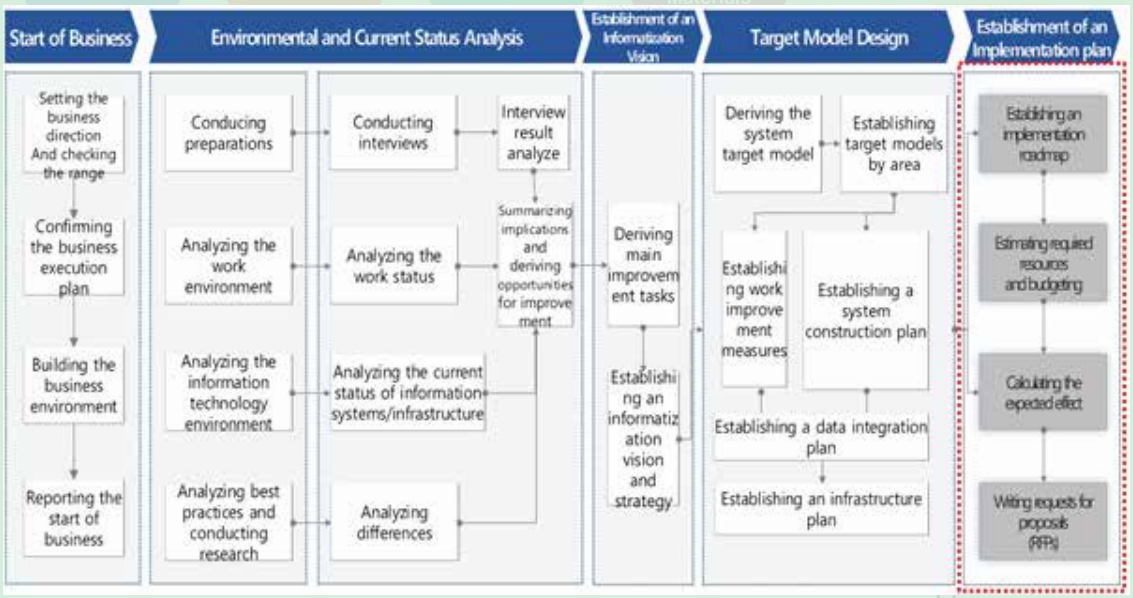
4) **Alignment with GoB planning and budgeting cycles**
   - Synchronize major milestones with Government budget cycles and project approval processes, to secure necessary recurrent and capital resources.

5) **Risk-aware and adaptable**
   - Continuously monitor risks (technical, institutional, financial) and adapt sequencing or scope as needed, while protecting core objectives and standards.

9.2 Implementation Plan

The implementation plan begins with a systematic assessment of existing statistical operations, their environment, and current status. This identifies challenges and opportunities, pinpoints key inefficiencies and redundancies across the data collection, processing, and dissemination processes, and establishes an implementation plan to implement the improvement tasks derived during the target model establishment phase. To this end, the implementation plan section synthesizes the environmental analysis and current status assessment with the requirements defined in the target model design. The plan is developed through an implementation roadmap, resource requirement estimation, and expected effect calculation, and uses this to prepare the Request for Proposal (RFP).

The implementation phase involves: 1) defining implementation tasks, 2) determining priorities and scheduling, 3) deriving required budgets and expected effects, and 4) supporting the preparation of the Request for Proposal (RFP).

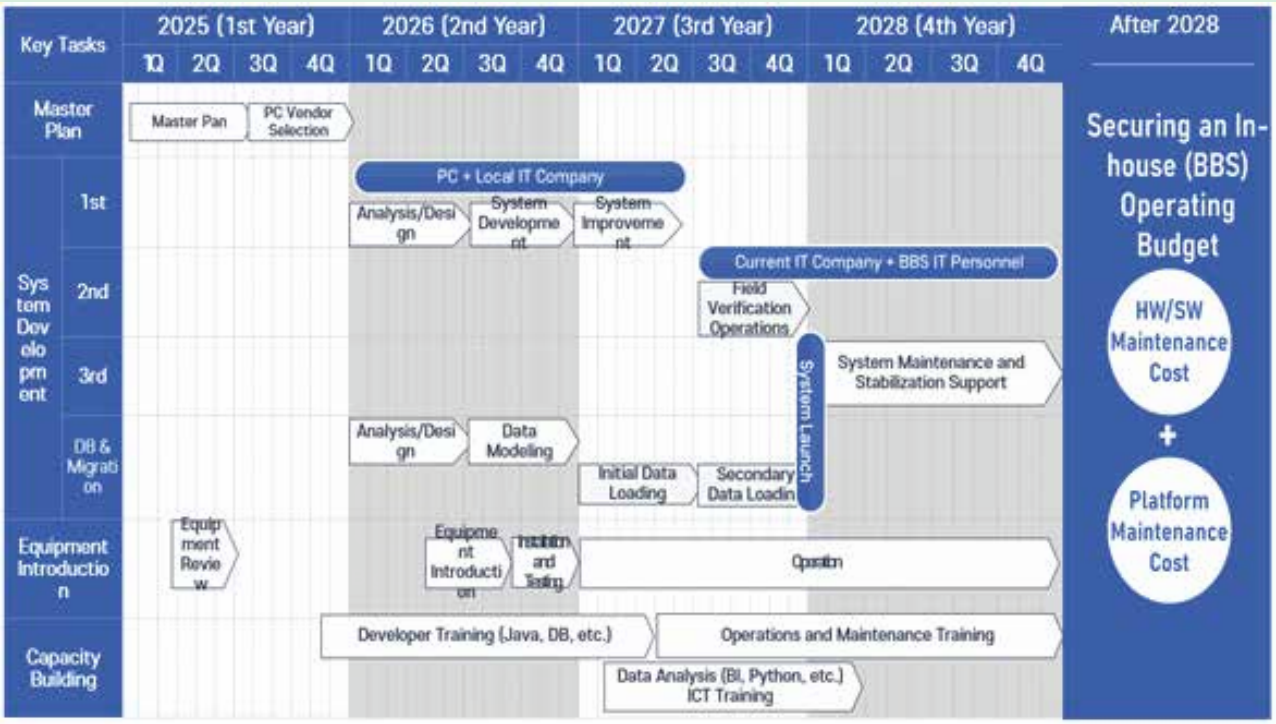


[Figure 4] Implementation Plan Framework

9.2.1 Implementation Roadmap

The development project will allocate three years for the successful platform establishment and stabilization.

- Statistical Data Warehouse Platform Development: 18 months
- Pilot testing: 6 months
- Followed by 12 months for system stabilization
- Procurement and installation of IT equipment
- Equipment operation/maintenance and stabilization support



[Figure 5] Implementation Roadmap

9.2.2 Phase-by-Phase Implementation Schedule

1) **Initiation and Preparation Phase (Q1 2025 ~ Q4 2025)**
   - PC Vendor Selection (Platform Development Project, Equipment Supply and Installation)
   - Hold project kickoff meeting and define scope
   - Establish detailed task plans and commence Project Management Consultancy (PMC) operations
   - Establish IT equipment procurement plan and place orders
   - Specify system and DB development scope and requirements
   - Conduct analysis and design for system and database development

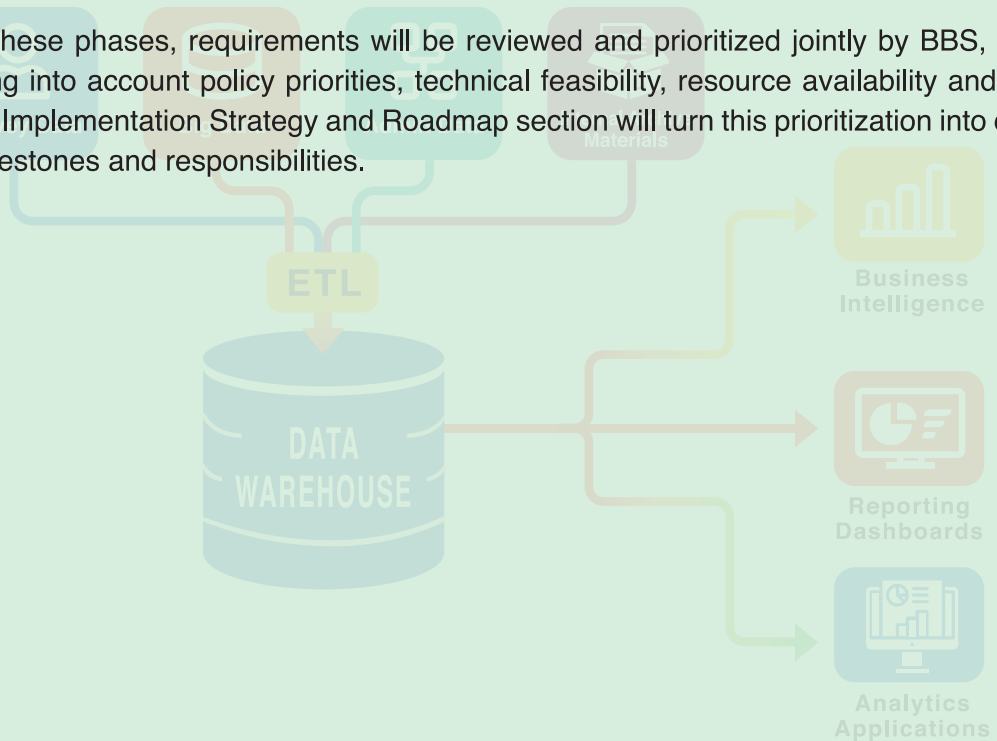
2) **Statistical Data Warehouse Platform Establishment Phase** (Q1 2026 ~ Q2 2027)
   - Development of core data warehouse platform functions
   - Procurement and Installation of IT equipment

3) **Pilot Test Phase (Q3 2027 ~ Q4 2027)**
   - Actual data loading and analysis testing
   - Error correction and optimization
   - Training for operators and administrators

4) **Maintenance and Stabilization Support Phase for BBS Self-Sufficient Operation (Q1 2028 ~ Q4 2028)**
   - Establishment of a BBS-led system operation framework
   - Support securing operational budget to ensure system sustainability
   - System launch and operational transition
   - Support for stable operation in the actual service environment
   - Implement system monitoring, incident response, and operational support
   - Supporting the establishment and stabilization of a maintenance framework
   - Continuous training to enhance human resources

9.2.3 Implementation Timeline

Throughout these phases, requirements will be reviewed and prioritized jointly by BBS, SID and KOICA, taking into account policy priorities, technical feasibility, resource availability and lessons learned. The Implementation Strategy and Roadmap section will turn this prioritization into concrete activities, milestones and responsibilities.



Project Period: November 2025- December 2028

Project Period: November 2024 - December 2028

Planned | Completed | On-going

Main Tasks			2024	2025				2026				2027				2028			
			Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PMC selection		Planned																	
		Actual																	
System Development / ICT Infra / Audit PC selection		Planned																	
		Actual																	
Master Plan	Analysis / To-Be requirement study	Planned																	
		Actual																	
	BPR (Business Process Reengineering) and ISP (Information Strategy Planning) for BBS	Planned																	
		Actual																	
	Implementation plan	Planned																	
		Actual																	
	Report and Approval	Planned																	
		Actual																	
Statistical Data Warehouse Platform	Analysis, Design and ETL	Planned																	
		Actual																	
	Data Migration	Planned																	
		Actual																	
	Training and Technology transfer	Planned																	
		Actual																	
	Testing	Planned																	
		Actual																	
	Application (Pilot test and Implementation)	Planned																	
		Actual																	
	Operation support	Planned																	
		Actual																	
	Service open	Planned																	
		Actual																	
Equipment	Procuring	Planned																	
		Actual																	
	Install & Test	Planned																	
		Actual																	
	Training	Planned																	
		Actual																	
Capacity Building	Invitational Training	Planned																	
		Actual																	
	Training staffs on site	Planned																	
		Actual																	
Dispatch of Experts	Project Manager / Project Action Officer	Planned																	
		Actual																	
	Experts in Master Plan	Planned																	
		Actual																	
	Experts in DW/Application	Planned																	
		Actual																	
	Experts in Equipment	Planned																	
		Actual																	
	Experts in Supporting of System Operation	Planned																	
		Actual																	
	Experts in Audit	Planned																	
		Actual																	
Workshop	Kick-off, mid-term and final	Planned																	
		Actual																	

[Figure 6] Implementation Timeline

9.3 Roles and Responsibilities (BBS, SID, KOICA and Other Partners)

Implementation will be a joint effort, with distinct but complementary roles:

1) **BBS (lead implementing agency)**
- The DG, BBS will provide overall leadership, direction and decision-making.
- Chair Technical Committee; designate Data Stewards and technical teams.
- Lead on business requirements, prioritization of datasets and use cases, and integration with statistical operations.

2) **SID, Ministry of Planning**
- Provide policy guidance and oversight; ensure alignment with national statistical and ICT policies.
- Support resource mobilization and integration of ISDW investments into national planning and budgeting processes.

3) **KOICA (technical cooperation partner)**
- Provide technical assistance, capacity building and knowledge transfer on data warehousing, governance and analytics.
- Support of detailed designs, procurement specifications and quality assurance of implementation.

4) **Contracted vendors/implementers**
- Supply and configure hardware, software and services according to agreed specifications and GoB procurement rules.
- Provide initial support, training and documentation, with clear provisions for knowledge transfer to BBS staff.

By following this Implementation Strategy and Roadmap, BBS, SID and KOICA will be able to turn the Master Plan into a sequence of concrete, manageable steps, leading from initial setup to full institutionalization of the ISDW as core components of Bangladesh's National Statistical System.

9.4 Communication and Stakeholder Engagement Plan

The establishment of the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analytics platform represents a major organizational change for BBS and the wider National Statistical System (NSS). It affects how data are collected, stored, shared, analysed and disseminated, and introduces new roles, tools and processes. By implementing this communication and capacity framework, BBS will help ensure that the ISDW and big data analytics platform are understood, accepted, and effectively used across the organization and the broader National Statistical System, turning technical investments into real improvements in statistical services and evidence-based decision-making.

9.4.1 Target Audiences and Key Messages

1) **Internal BBS staff (headquarters and field offices)**
   - **Messages:** Purpose and benefits of the ISDW, what is changing (and what is not), new roles (Data Stewards, ISDW unit), opportunities for skills , where to get support.

2) **SID and Ministry of Planning**
   - **Messages:** How the ISDW supports national planning and monitoring (e.g. Perspective Plan, SDGs), improved availability and quality of indicators, resource and governance implications.

3) **Line ministries and agencies**
   - **Messages:** Benefits of structured data sharing (reduced duplication, consistent indicators), role as key data providers and users, Data Sharing Agreements, expectations on data quality and timeliness.

4) **Partners and international agencies**
   - **Messages:** Contribution of ISDW to improved statistics for programme design and monitoring, opportunities for alignment and co-financing of statistical and ICT support.

5) **Academia, researchers and think tanks**
   - **Messages:** Improved microdata access, better documentation, clearer procedures and timelines for data access, potential collaboration on methods and advanced analytics.

6) **General public and media**
   - **Messages:** BBS modernization efforts, enhanced statistical services (more timely, disaggregated and accessible data), safeguards for privacy and confidentiality.

9.4.2 Channels and Tools

The ISDW communication plan will use a mix of:

- Internal circulars, office orders and emails;
- Briefing sessions, town-hall style meetings and seminars within BBS and with SID/line ministries;
- Short information notes, FAQs and infographics explaining the ISDW and how it affects daily work;
- Content on the BBS website and, where appropriate, social media posts or press releases for public-facing aspects;
- Presentations in coordination fora (e.g. sector working groups, SDGs Committees).

Part IV: Sustainability, Transition and M&E

10. Exit Plan and Transition Strategy (Post-KOICA Support)

10.1 Objectives of the Exit and Transition Strategy
10.2 Governance & Institutional Arrangements for Transition
10.3 Transition Strategy Roadmap
10.4 Core Tasks for Sustainability (Pillars for Sustainability)
10.5 Financing Plan (KOICA, GOB and Other Sources)
10.6 Ten-year O&M Cost Projection (with 8% inflation applied)
10.7 Monitoring and Evaluation Framework
10.8 M&E Reporting Arrangements
10.9 Risk Management Process
10.10 Risk Register (Likelihood, Impact, Mitigation)

11. Conclusion and Way Forward

11.1 Conclusion
11.2 Way Forward

Section - 10

10. EXIT AND TRANSITION STRATEGY (POST-KOICA SUPPORT)

This section describes how BBS will transition from project-supported implementation to fully domestically led and financed operation of the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analytics platform. It aims to ensure that, by the end of KOICA's direct support, BBS has the institutional, technical and financial capacity to sustain and further develop the ISDW as a core element of the National Statistical System. The Bangladesh Bureau of Statistics (BBS) and KOICA are concluding a USD 9.6 million project to build the Integrated Statistical Data Warehouse (ISDW) by December 2027. From January 2029 onward, KOICA's technical and financial support will cease. This Exit Plan outlines how BBS will ensure the ISDW's sustainable operation, maintenance, and continuous improvement over the next 5 to 10 years. It covers governance structures, human resource strategies, technical maintenance, financial arrangements, risk mitigation, and monitoring mechanisms. The plan is designed to be operational, cost effective, and aligned with BBS's mandate to deliver high quality statistics to inform national policy.

10.1 Objectives of the Exit and Transition Strategy

The Exit and Transition Strategy have four main objectives:

1. Continuity of operations: Ensure that ISDW and analytics services continue without disruption when KOICA-funded activities wind down.
2. Full national ownership: Consolidate BBS's leadership and control over ISDW architecture, data assets, processes and priorities.
3. Retained and embedded capacity: Prevent loss of skills and knowledge by embedding expertise within permanent BBS structures and staff.
4. Planned evolution beyond the project: Position the ISDW to continue evolving in response to new policy needs, technologies and data sources.

10.2 Governance & Institutional Arrangements for Transition

Governance and institutional arrangements refer to the rules, frameworks, and organizations that define how decisions are made and implemented, and how resources are managed.

- Technical Committee: BBS DG chairs; members from SID, Ministry of Finance, ICT Division, PC and BCC; quarterly review of ISDW performance.
- ISDW Unit of Computer Wing: Full time coordination office; responsible for executing the Exit Plan, liaising with stakeholders, and managing budgets.

10.3 Transition Strategy Roadmap

To establish a successful self-sustaining operational framework for BBS, a three-phase roadmap is pursued: Stable Transition, Organization-wide Expansion, Self-Sustaining Advancement.

1) Phase 1 (2026-2027): Stable Transition and Pilot Operation

Core Objectives: Prevent operational gaps, stabilize the initial operational framework, and establish internal accountability.
Conduct pilot operations of the DW, metadata, and online analytical systems to test real operating environments.

- Prepare drafts of operational regulations and security guidelines, apply them to selected pilot departments and refine based on feedback.
- Finalize the organizational structure of the Data Hub Section and deploy the initial core staff.
- Transfer 100% of all deliverables, code, and documents developed by the PMC/PC.
- Conduct internal certification exams after OJT for operational personnel, officially grant system operator qualifications.

2) Phase 2 (2028): Organization-wide Expansion and Institutionalization

Core Objective: Establish the DW system as an official, standardized business process across all BBS departments.

- Expand the institutional and operational frameworks established in Phase 1 to all statistical departments.
- Mandate compliance with DW regulations, introduce semi-annual audits on data quality and security.
- Assign a Data Steward to each department to strengthen departmental accountability.
- Internalize technical support through the Help Desk, minimize dependence on external maintenance.
- Fully institutionalize a system where internal trainers lead all DW-related training.

3) Phase 3 (2029 onward): Self-sufficient Operation and Advancement

Core Objective: Achieve self-sufficient operation, expand into a nationwide data hub, and secure international credibility.

- Establish DW operational regulations as permanent standing regulations of BBS.
- Introduce KPI-based maturity assessments (e.g., data error rates, security incident prevention rates).
- Reflect required budgets in the mid-term financial plan based on hardware and software replacement cycles (e.g., every 5 years).
- Promote data linkage with other ministries such as the Ministry of Finance and the Central Bank to expand BBS into a national data hub.
- Obtain international certifications (ISMS, ISO 27001, SDMX) and pursue international cooperation projects.

10.4 Core Tasks for Sustainability (Pillars for Sustainability)

To achieve successful independent operation of BBS, tasks in the following four key areas must be systematically implemented.

1) Establishing an Institutional Foundation

- Legislate DW Operating Regulations: Document DW operations, personal information protection, security policies, and data standardization regulations as official internal BBS regulations. Where necessary, link them to higher-level statutes (e.g., Statistics Act) to ensure legal enforceability.
- Operating a Data Governance Committee: Establish and regularly operate a governance committee involving relevant department heads to make key decisions related to DW operations (e.g., data standard changes, new data integration).
- Data Steward System: Designate a Data Steward in every department to clearly define the responsibilities and roles of operational departments regarding data quality, metadata registration, and compliance with standards.

2) Organizational Integration

- Establishment and Functional Enhancement of the 'Data Hub Section': Establish a dedicated 'Data Hub Section' under the Computer Wing to oversee data strategy, metadata, quality, governance, and DW operations, developing it into a control tower that manages all data-related tasks for BBS.
- Complete Technology and Knowledge Transfer: Fully transfer all manuals, design documents, source code, and operational know-how created by project execution companies (PMC/PC) to BBS as knowledge assets, accumulating them in the internal knowledge management system.
- Operation of BBS's In-House Technical Support System (Help Desk): A system will be established where the BBS internal Help Desk performs the initial response and resolution for system failures, minimizing external dependency.

3) Establishing a Foundation for Financial Self-Sufficiency

- Establish an EOSL response roadmap and reflect it in the budget: Identify the end-of-service-life (EOSL) dates for the hardware and software components of the system and establish a roadmap for equipment replacement aligned with the replacement cycle. Based on this roadmap, secure stable funding by reflecting the necessary replacement budget in BBS's five-year medium-term financial plan.
- Expand open-source-based technologies: When introducing new systems or enhancing functionality, prioritize open-source technologies that avoid vendor lock-in to reduce long-term licensing costs.

4) Establishing a Sustainable Training System

- Operate a Training of Trainer Program: Select promising internal BBS employees and train them as expert instructors. Establish a system where these trainers continuously provide DW-related training to new and existing employees within BBS.
- Institutionalizing Regular Training Programs: Standardize regular training programs, such as an annual organization-wide training for all employees and quarterly departmental in-depth workshops, to elevate and standardize the data capabilities across the entire organization.
- Accumulation of Standard Manuals and Training Materials: Continuously develop and accumulate standardized training materials, such as system operation manuals, SOPs, and instructional videos, to prevent knowledge gaps during personnel turnover.

10.5 Financing Plan (KOICA, GoB and Other Sources)

The ISDW initiative will be financed through a combination of sources.

- First, KOICA will provide support in several areas. This will include funding for specialized technical assistance to establish the ISDW, contributions to infrastructure and software where mutually agreed, and support for training and capacity-building activities.
- Second, the Government of Bangladesh (GoB) will finance the initiative through both development and maintenance budgets. The budget, for the CBSSP Project, will cover infrastructure costs such as renovation or relocation of the existing data center, as well as software and implementation services. It will also support pilot activities for big data and advanced analytics. The maintenance budget will finance staff costs and the ongoing operational expenses of the ISDW and analytics platform.
- Third, other partners, where applicable, may provide complementary support for specific components of the initiative. This may include sector-specific data integration work, SDG-related analytical activities, and enhancements to microdata access for users and researchers.

10.6 Ten-Year O&M Cost Projection (with 8% inflation applied)

[Table 9] Estimated Cost for Ten-Year Maintenance

Year	Maximum (USD)	Minimum (USD)	Recommended (USD)
2029	649,080	39,132	92,136
2030	701,006	42,263	99,507
2031	757,087	45,644	107,467
2032	817,654	49,295	116,065
2033	883,066	53,239	125,350
2034	953,711	57,498	135,378
2035	1,030,008	62,098	146,208
2036	1,112,409	67,065	157,905
2037	1,201,402	72,431	170,537
2038	1,297,514	78,225	184,180
Total (2029 -2038)	9,402,938	566,888	1,334,734

10.7 Monitoring and Evaluation Framework

This section describes the framework for monitoring and evaluating from the implementation and use of the ISDW and small-scale big data analytics platform. By implementing this Monitoring and Evaluation framework, BBS and its partners will be able to track progress, demonstrate results, learn from experience and continuously improve the ISDW and big data analytics platform, ensuring that the investment turns into lasting gains for the National Statistical System and for evidence-based policy-making in Bangladesh. The M&E framework is intended to:

- Track progress against planned outputs and outcomes;
- Provide evidence for decision-making and course correction;
- Demonstrate results and value for money to BBS, SID, KOICA and other stakeholders;
- Capture lessons and good practices to inform future statistical modernization efforts.

10.8 M&E Reporting Arrangements

Reporting arrangements: Internal progress reports (e.g. Bi-annual or annual) prepared by the project management unit/ISDW team, shared with BBS management and SID. The report may highlight on the following issues:

- ISDW establishment and coverage
- Data quality, standards and governance
- Use of ISDW outputs for decision-making
- Microdata access and research use
- Capacity and institutionalization
- System performance and reliability

Findings from the Report will be discussed at high level (BBS, SID, KOICA and other partners), and management responses will be prepared to outline how recommendations will be taken forward.

10.9 Risk Management Process

The establishment of the Integrated Statistical Data Warehouse (ISDW) and small-scale big data analytics platform is a complex, multi-year initiative involving institutional, technical, financial and organizational changes. Effective risk management is therefore essential to safeguard investments, protect data assets and ensure that the objectives of this Master Plan are achieved. The risk management process will generally follow these steps:

1. Risk identification - through workshops, expert input, review of similar projects and ongoing monitoring.
2. Risk analysis and evaluation - assessing likelihood and impact, and prioritizing risks requiring mitigation.
3. Risk response planning - defining mitigation measures, owners and timelines.
4. Risk monitoring and review - tracking risks, reassessing them periodically and adjusting responses as needed.
5. Communication and escalation - clear channels for reporting significant risks to management and governance bodies.

A risk register will be maintained by the project management unit/ISDW team and reviewed at regular intervals by the Steering Committee and Data Governance Council.

10.10 Risk Register (Likelihood, Impact, Mitigation)

A risk register will be maintained by the project management unit/ISDW coordination team and reviewed at regular intervals. A risk register will be maintained as a living document, including at minimum:

- A unique risk ID;
- A short description of the risk;
- The category (strategic, organizational, technical, etc.);
- Likelihood rating (e.g. low/medium/high);
- Impact rating (e.g. low/medium/high);
- Overall risk rating (e.g. using a simple matrix);
- Mitigation measures (prevention and response);
- Risk owner (unit or role responsible);
- Status (open, being mitigated, closed).

The risk register will be periodically updated and summarized in project progress reports and Committee meetings.

11. Conclusion and Way Forward

11.1 Conclusion

The establishment of an Integrated Statistical Data Warehouse (ISDW) marks a major step in the modernization of BBS and the National Statistical System. This Master Plan has outlined the strategic rationale, current state, target architecture, governance and security frameworks, implementation roadmap, sustainability arrangements and resource needs for this initiative. Together, these elements provide a coherent and realistic path for transforming how official statistics are managed and used in Bangladesh.

In conclusion, this Master Plan sets out a clear and actionable pathway for transforming BBS into a truly integrated, data-driven national statistical institution, capable of meeting the increasingly complex information needs of government, partners, researchers and citizens. By establishing the ISDW and analytics platform, strengthening data governance and security, and investing in people, processes and partnerships, BBS is laying the foundations for a modern National Statistical System that can deliver timely, high-quality and trusted statistics across all priority domains.

11.2 Way Forward

The key directions confirmed in this Master Plan for moving forward are:

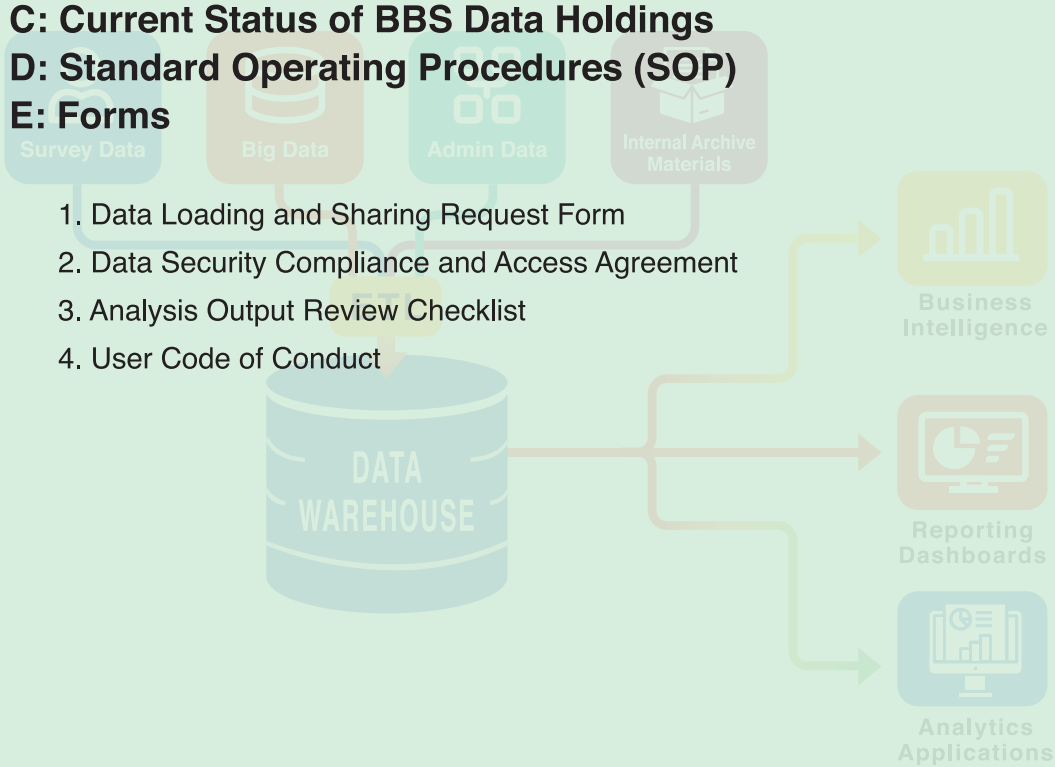
- BBS will establish and operate a central ISDW as a core national statistical asset, serving multiple domains and stakeholders.
- The ISDW will be standards-based, interoperable and secure, integrating data from censuses, surveys, administrative sources, geospatial data and selected new data sources.
- Implementation will follow a phased roadmap, beginning with foundations and quick wins, progressing to core ISDW functions and data coverage, and then expanding into advanced analytics and optimization.
- BBS will set up a dedicated ISDW/Analytics Unit, supported by Data Stewards and governance bodies, and invest in sustained capacity building.
- Long-term sustainability and national ownership will be ensured through integration of ISDW roles and costs into GoB structures and budgets, supported by an exit and transition strategy for KOICA's support.

After Completion of the activities of the ISDW, The National Statistical System will operate with improved coordination, reduced duplication and stronger adherence to standards, reinforcing the role of BBS as a central hub.

Annexes

A: Key Functionalities of the DW Platform
B: Hardware Architecture
C: Current Status of BBS Data Holdings
D: Standard Operating Procedures (SOP)
E: Forms

1. Data Loading and Sharing Request Form
2. Data Security Compliance and Access Agreement
3. Analysis Output Review Checklist
4. User Code of Conduct



Annex A

Key Functionalities of the DW Platform

1. Metadata Management System

- (Objectives) Centralize and standardize item, classification, and description (quality/methodology) metadata across the entire organization. Maximize statistical quality, efficiency, and utilization through the principle of metadata pre-registration followed by data loading, and bidirectional linkage with the DW, statistical production, quality control, and remote analysis.
- (Direction 1) Standardize and unify item/classification/descriptive metadata across the entire organization, and embed change history, versioning, and utilization tracking.
- (Direction 2) Implement metadata-driven automation: Apply metadata-based pre-checks, schema validation, and permission/security controls throughout the entire collection, verification, transformation, and loading process.
- (Direction 3) Enhance quality reporting, international exchanges, and comparability by embedding international standard compliance.
- The key features are summarized in the table below.

Key Function	Sub-Function	Expanded Description
Standard Word Management	Standard Word Management	Register, modify, delete, and search standardized terminology, including Excel batch upload to maintain governance and consistency across systems.
	Similarity & Conflict Management	Detect similar or duplicate terms and manage resolution to ensure semantic clarity.
	Approval Process Management	Review and approve standard word proposals before activation, ensuring institutional validity.
	Usage Tracking & Impact Analysis	Monitor where terms are applied in surveys, tables, or metadata to support change management.
Statistical Item Management	Item Group Management	Organize items into hierarchical groups for easy discovery and governance.
	Standard-based Item Management	Ensure unified definitions and formats based on standard words.
	Classification Code Management	Assign and manage national/international classification codes linked to items.
	Usage & History Management	Log when/where i tems are used and record updates for traceability.

Key Function	Sub-Function	Expanded Description
Master Item Management	Master Reference Item Management	Maintain authoritative reference items for harmonized surveys.
Survey Item Mapping	Survey Item Management	Adopt and adjust items for each survey while preserving metadata linkage.
	DB Column Mapping Management	Manage mapping between items and physical DB attributes.
Classification Metadata Management	Classification Code & Structure Management	Maintain code definitions, relationships, and timeseries changes.
Metadata Browsing	Browsing & Filtering Management	Provide hierarchical/list views, search filters, and data export.
SIMS (Description Metadata)	SIMS Management	Manage survey objectives, processes, quality notes, and PDF reports for transparency.

2. Statistical Production System

- (Objectives) Standardize and automate the entire process of survey design, data collection, internal verification, aggregation, and publication on a digital foundation to enhance operational efficiency and statistical quality. Maximize reusability, traceability, and interoperability through integration with the DW and metadata management system.
- (Direction 1) Process Standardization and Unification: Precisely define GSBPM-based stages (design–processing–analysis–publication) through workflows, forms, and code systems. Unify systems using standardized survey forms and a single DB schema.
- (Direction 2) Internalization of Rule-Based Quality and Automation: Utilize item masters and validation rules for automatic validation (format/domain/references) from design to input. Minimize repetitive tasks through internal validation/aggregation logic templates and version control.
- (Direction 3) Strengthening of International Alignment and Interoperability: Support SDMX structure/exchange and SIMS descriptive metadata generation to ensure international comparability. Enhance usability through bidirectional linkage with the DW, remote analysis, and public portals.
- The key features are summarized in the table below.

Key Function	Sub-Function	Expanded Description
Data Collection Management	Web/Mobile Input Management	Unified capture of microdata online or offline with later synchronization.
	Multi -Mode Collection Management	Support for CADE/CAPI/CASI workflows, Excel-based fallback, ensuring coverage in low-connectivity areas.
	Error Prevention Management	Real-time validation for consistency, response logic checks and guidance alerts.
User & Role Management	Organization & User Management	Manage agencies, enumerators, supervisors, and access roles governing data visibility.
	Permission Management	Fine-grained survey-specific access control and device authorization.
	Audit Log Management	Trace all activity for privacy compliance and accountability.
Operational Communication	SR & Notice Management	Integrated work communication and support resolution tracking.
Questionnaire Management	Template/Component Management	Modular design with reusable questions and answer categories.
	Logic/Script Management	Apply skip-patterns, rules, dynamic UI behaviors for efficiency.
Listing & Frame Management	Frame Data & Replacement Rule Management	Ensure sample representativeness via automated substitution rules.
EA Management	EA & Spatial Management	Maintain EA boundaries with GIS-based referencing.
Enumerator Work Management	Workload Assignment Management	Real-time workload optimization and re-balancing.
Monitoing & Quality Control	Progress & KPI Dashboard Management	Monitor key survey performance indicators and risk signals.
Validation Management	Validation Rule Management	Rule library and execution to enhance post-collection data quality.
DW Transfer Management	Secure ETL Management	Automated staging transfer with logs, lineage, and retry capability.
Tabulation Management	Statistical Table Management	Auto/manual table generation for review and dissemination preparation.

3. Data Warehouse (DW) System

- (Objectives) Automate and centralize the statistical data collection process to enhance operational usability and convenience, while establishing a foundation for objectively measuring future data demand.
- (Direction 1) Integrate currently fragmented data assets across the organization into a unified enterprise environment, and implement systematic and standardized data management practices across all domains.
- (Direction 2) Build a comprehensive governance model that ensures secure collection, storage, analysis, and dissemination of data throughout the entire lifecycle, while maximizing safe and effective data usage.
- (Direction 3) Introduce a metadata-driven management approach that enhances data quality, consistency, and traceability, and supports decision-making through a robust governance structure.
- The key features are summarized in the table below.

Key Function	Sub-Function	Expanded Description
Security & Access Management	MFA & Delegated Admin Management	Strong identity control with admin role separation to protect sensitive data.
	Audit Trail Management	Record and analyze user/data interactions comprehensively.
Data Inventory Management	Metadata-linked Inventory Management	Complete visibility on data origin, structure, ownership, and lineage.
Data Acquisition Management	Structured & File Data Ingestion Management	Collect data from statistical & administrative systems, verifying format and integrity.
Data Linking & Standardization	Secure Staging Zone Management	Quarantine zone to detect anomalies before DW load.
	Linking Management	Combine datasets through deterministic/probabilistic techniques.
	Classification Application Management	Auto assign codes (e.g., ISIC) and validate outcomes.

Key Function	Sub-Function	Expanded Description
Privacy Protection	De-Identification Process Management	Tokenization/masking and audit logs ensuring privacy law compliance.
Exposure-level Management	Sensitivity-driven Mart Management	Public/Approved/Secure marts restrict access based on risk profiles.
Data Quality Management	Profiling & SLA Management	Automated data quality scoring, trend alerts, and defect root cause analytics.
Data Provision Management	Secure Extraction & API Management	Provide controlled data to RAS or internal systems under approval workflow.
	Synthetic Data Management	Generate alternative data sets where strict privacy needed.
Preservation, Compliance & Audit	Retention/Disposal Management	Lifecycle automation meeting legal obligations and transparency.
DW Monitoring & Operations	Infra/Query Monitoring Management	Performance, capacity, and reliability analytics for stable operations.

4. Remote Analysis System (RAS)

- (Objectives) Provide DW-based statistical source data to internal and external users via a secure online analysis environment. Streamline and automate the entire process from data request to approval, analysis, and utilization to maximize statistical data usage. Enhance the reliability and efficiency of statistical data services by providing contextual metadata and embedding quality and security controls.

- (Direction 1) Establish a Data Access System with Separate Security Levels: Distinguish provision channels based on data security levels of users via a secure online analysis environment. an RAS, and special-purpose data via a data lab (on-site analysis room). Implement differentiated provision methods based on usage purpose and sensitivity to achieve a balance between data utilization and protection. To this end, principles such as mandatory de-identification, role-based access control (RBAC), and network segregation will be incorporated from the design phase into system development.

- (Direction 2) Ensure Interconnectivity and Integration: The remote analysis system will be designed as a component of the BBS statistics DW platform, and will enable organic interconnection and integration with other systems (metadata management system, statistical production system, DW system, public portal, etc.).
- (Direction 3) Support Stable Operation: Adopt cloud infrastructure and a modular architecture to flexibly respond to increases in user numbers or data volume. Aim for an open design to enable future functional enhancements and integration with other institutions. After system construction, verify performance and security through pilot testing, incorporate improvements, and secure a stable operational foundation.
- The key features are summarized in the table below.

Key Function	Sub-Function	Expanded Description
Portal & Access Management	Membership & Policy Management	Ensure only authorized researchers can access microdata under justification.
Dataset Discovery	Metadata Browsing & Sample Management	Preview structure/variables for informed dataset selection.
Public-use Data Service	Public Data Download Management	Fast access to low risk datasets while maintaining governance.
Approved Data Service	Application & Approval Management	Multi-step review for controlled access to confidential data.
	Data Provision Management	Generate processed datasets and valid access conditions.
Secure Analysis	Virtual Analysis Workspace Management	No data extraction; compute inside secure environment (VDI BI/R/STATA).
Output Review	Statistical Disclosure Control Management	Validate all outputs for privacy risks before release.
Data Lab Secure Analysis	Physical Environment Management	Highest security research space with no external connectivity.
Usage Analytics	Monitoring & Analytics Management	Track dataset utilization to drive service improvements.

Annex B

HW Architecture

1. Overview

The purpose of this infrastructure modernization plan is to address the limitations of the current bare-metal environment—such as low scalability and high operating costs—and establish a flexible foundation that can respond to increasing statistical service demands over the next decade. The main strategy is to adopt a container-based private cloud and expand the use of open-source technologies.

1.1 Key Infrastructure Introduction Tasks

1) Transition to Open-Source and Private Cloud Infrastructure

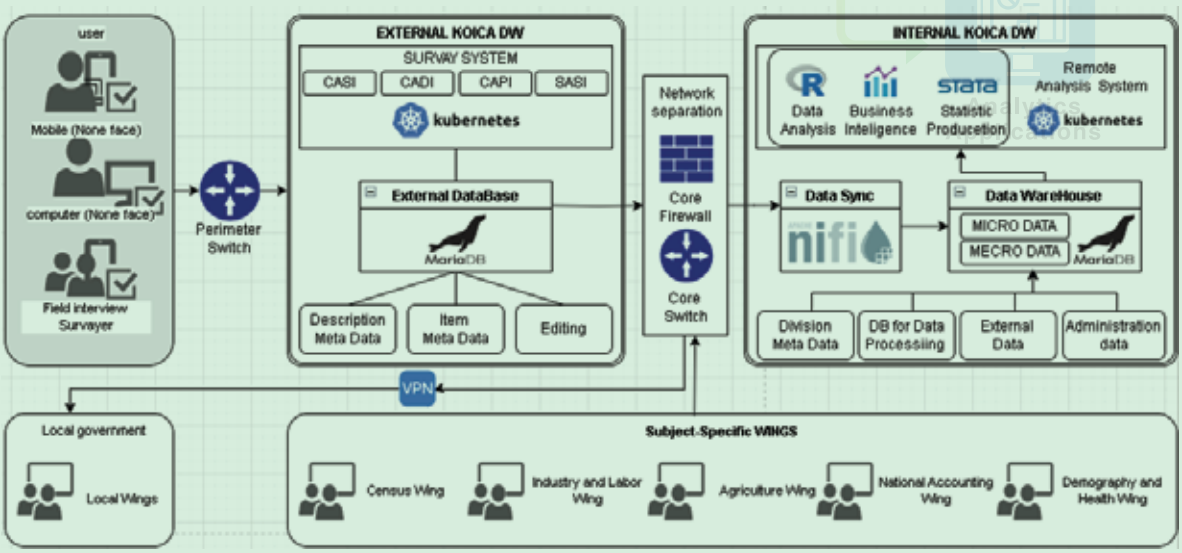
- The current rigid and costly bare-metal/VMware environment will be replaced with a horizontally scalable infrastructure based on Kubernetes and KVM. This ensures rapid resource adjustments depending on survey periods and significantly reduces long-term licensing costs by adopting open-source solutions for the OS, database, and analytics tools.

2) Network Redundancy and Enhanced Security Architecture

- To ensure service stability and prevent leakage of critical statistical data, the internet and internal networks will be physically separated. A multi-layered defense system—including firewalls, IPS, and WAF—will be established, along with DB access control and encryption mechanisms to protect personal data and manage audit trails.

3) Real-Time Monitoring Framework with APM/NMS

- Due to the absence of monitoring tools in the current environment, resource usage is unclear and operational inefficiency continues to grow. The introduction of NMS and APM will enable real-time performance and resource management, while providing essential data for future expansion and resource optimization.



Open-Source-Based Software Architecture

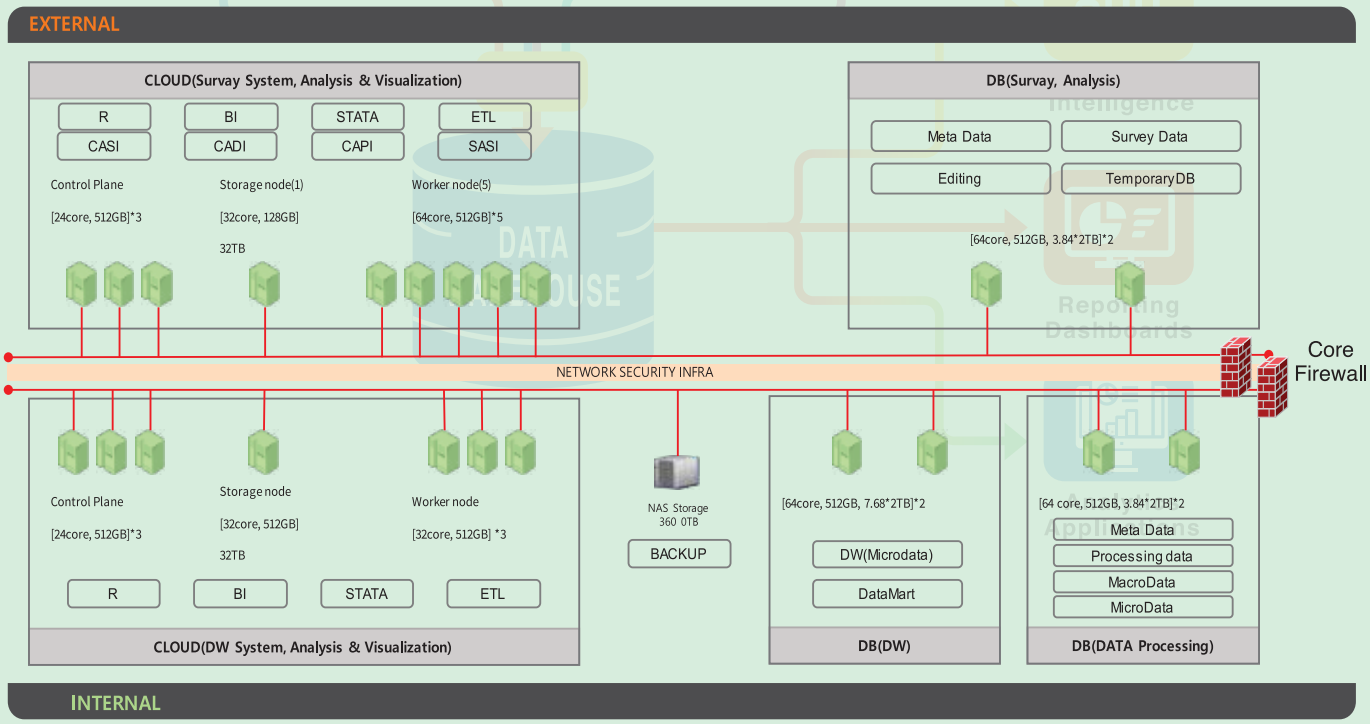
1.2 Implementation Strategy

1) Ensuring Cost Efficiency and Operational Flexibility

- The infrastructure will be designed with cloud-based scalability and operational efficiency to ensure stable operation over the next ten years. This is not merely a technical choice, but a strategic decision to ensure long-term financial sustainability.

2) Capacity Planning Based on Projected User Growth

- Hardware capacity planning is based on projected maximum load in year ten, using current user trends. South Korea's TTA guidelines are applied to ensure the objectivity required for an international ODA project. With an estimated annual growth rate of 27%, the number of cloud users is expected to increase by approximately 11 times over the next decade.



Hardware Architecture

1.3 Hardware and Software List and Specifications

1) Server

Category		CPU			memory	DISK(OS)		DISK(DATA)				NETOWRK		server quantity
		core	quantity	TOT	volume(gb)	type	volume	type	volume(TB)	quantity	TOT	type	quantity	
EXTERNAL CLOUDE	Control Plane	12	2	24	512	ssd	480					10G	2	3
	worker node	32	2	64	512	ssd	480					10G	2	5
	storage node	16	2	32	512	ssd	480	HDD	4	8	32	10G	2	1
INTERNAL CLOUD	Control Plane	12	2	24	512	ssd	480				0	10G	2	3
	worker node	16	2	32	512	ssd	480				0	10G	2	3
	storage node	8	2	16	128	ssd	512	HDD	4	8	32	10G	2	1
Database (Maria DB)	EXTERNAL	32	2	64	512	m.2	800	m.2 SAS	3.8 0.6	2 1	7.6 0.6	10G	2	2
	INTERNAL	32	2	64	512	m.2	800	m.2 SAS	3.8 0.6	2 1	7.6 0.6	10G	2	2
	DW	32	2	64	512	m.2	800	m.2 SAS	7.6 0.6	2 1	15.2 0.6	10G	2	2
BI Solution	AP Server	16	2	32	512	m.2	960	SAS	0.6	1	0.6	10G	2	1
Monitering & log		16	2	32	256	m.2	960	SAS	0.6	1	0.6	10G	2	1
NETWORK STORAGE	BACK UP							HDD	18	20	360	10G	2	1

2) Security

	Category		Database encryption	Quantity
1	Security Equipment	Firewall #1	Throughput 50Gbps or more, 10GF 4 ports or more, dual power supply	2
		Firewall #2	Throughput 50Gbps or more, 10GF 4 ports or more, dual power supply	2
		IPS	Throughput 30Gbps or more, 10GF 4 ports or more, dual power supply	2
		WAF(Web Firewall)	Throughput 16Gbps or more, 10GF 4 ports or more, dual power supply	2

3) Network

	Category		Details	Quantity
1	Network Equipment	Backbone Switch	10G SFP+ 8 ports or more, 1G SFP ports 24 or more, dual power supply	2
		Office Distribution Switch	10G SFP+ 4 ports, 48 ports 1000Base-TX, dual power supply	6
		Server Distiribution Switch	10G SFP 48port, 8 port QSFP	4
		L4 Switch	10G SFP+ 2 ports, 16 Port 1000Base-TX or 1000Base-X (Combo), 8 Port 1000Base-TX, 152 Gbps performance, dual power	4

4) Software

Item Description	SOFTWAERE	Quantity
Monitering	NMS	1
	APM(ManageEngine Applications Manager)	1
Cloud	LINUX(Open Source)	25
	Kubernetes and KVM configuration(Open Source)	16
Online Analysis	Windows professional	40
	R(Open Source)	40
	STATA	40
	Python(Open Source)	40
DB	BI (On-Premises) [3 years]	40
	Data Integration Management Solution	1
	ETL(or Nifi)(Open Source)	1
	Maria DB(Open Source)	6
	Data De-identification Solution	1

5) Etc.

구분	Detail	Quantity
Rack	42U Full Rack, including KVM	2
	Standard Rack	1
UPS	Power capacity sufficient to operate the installed servers for more than 30 minutes in the event of a power outage	1
etc	FireProtection	1
Monitor	Monitor for APM & NMS Monitoring	3

Annex C

Current Status of BBS Data Holdings
(DW System Data Load Targets)

Domain	No	Name of Census/Survey	Year of Census/Survey	Data Type
Agriculture Wing	1	5% Sample of Agriculture Census	2008, 2019	Fox-pro, STATA
	2	Agriculture Census	1996 (Sample Census), 2008, 2019	Text, Fox-pro, STATA, CSV
	3	Agriculture Sample Survey	1996, 2005, 2008, 2019	Fox-pro, Cspro
	4	Major Crops Data (Summary) (Aus, Jute, Aman, Wheat, Boro, Potato) and Details, Field manual	2000, 1998-2001, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, UnitData-08-09	All in Word document & Excel, pdf
	5	Agriculture and Rural Statistics Survey (ARSS)	2017	Text, Dbf
Demography and Health Wing	6	Slum Census	2014	Fox-pro, SPSS
	7	Child Mother Nutrition Survey (CMNS)	1992, 1996, 2000, 2005, 2012	Fox-pro, SPSS
	8	Time use Survey	2013, 2021	Fox-pro
	9	Health and Morbidity Survey	2012, 2014	Fox-pro, Cspro
	10	GATS (Global Adults Tobacco Survey)	2009, 2017	STATA
	11	National Hygiene Survey (NHS)	2018	STATA
	12	National Survey for the Persons with Disability	NSPD-2021	STATA
	13	Survey on Street Children	SSC-2022	STATA
	14	Food Security Survey	2022	STATA
Industry and Labour Wing	15	CSEC	2009	STATA

Domain	No	Name of Census/Survey	Year of Census/Survey	Data Type
National Accounting Wing	16	National Accounting Reports	Education Survey- 2007, Health Survey - 2007	All in Word document
			NPISH Survey – 2007, Quarterly Wage Survey Oct. - Dec. 2009	
Industry and Labour Wing	17	Business Directory (Data and Report)	2009, 2019	Access, Excel,
	18	Business Register(2009)		Word document
	19	Business Register	2013 (Economic Census)	STATA, R
National Accounting Wing	20	Survey of Use of Remittance (SUR)	2013	Fox-pro
	21	Survey on Investment from Remittance (SIR)	2016	Cspro
	22	Survey of Selected Business Services (BSS)	2012	Fox-pro
Demography and Health Wing	23	National Thalassemia Survey	NTS-2024	STATA
	24	Impact of Climate Change on Human Life Survey (ICCHL) Survey	2015, 2021	Cspro
Industry and Labour Wing	25	Economic Census	2001/2003, 2013/2023	Text, Fox-pro, Excel
	26	Census of Manufacturing Industries (CMI)/ Survey of Manufacturing Industries (SMI) (2005-06)	1995-1996, 1997-98, 2000, 2001-2002, 2005, 2012, 2019	Fox-pro, STATA
	27	BSIC Code 2008 rev4 code, BSIC New version, BCPC Code	Industrial code	Fox-pro, Excel
	28	Census of Handloom (National Report)	2003, 2018	Word document
	29	ICT Survey	2022, 2023	STATA
National Accounting Wing	30	Household Income and Expenditure Survey (HIES), HIES-Questionnaire-2005	1981, 1983, 1985, 1988-1989, 1991, 1995-1996, 2000, 2005-2006, 2010, 2016, 2022	Text, Fox-pro, STATA

Domain	No	Name of Census/Survey	Year of Census/Survey	Data Type
Industry and Labour Wing	31	Labour Force Survey (LFS)	1999, 2003(Child), 2003(Labour), 2005-2006, 2010, 2013(Child), 2013(Labour), QLFS-2015-16, 2016-17, CLS-2022, QLFS-2022, QLFS-2023	Fox-pro, STATA
	32	Informal Sector Survey (ISS)	2009-2010	Fox-pro
	33	Technical and Vocational Education and Training (TVET2016)	2016	STATA
	34	Employment Monitoring Welfare Monitoring Survey	2009	All in Word document
	35	Child Labour Survey	CLS-2022	STATA
	36	Literacy Assessment Survey	2011, 2023	STATA
	37	Labour Force Survey	LFS-2022,2023,2024	STATA
Demography and Health Wing	38	Multiple Indicators Cluster Survey (MICS)	1998, 1999, 2000, 2003, 2006, 2009, 2012-13, 2019	Fox-pro, SPSS, STATA
SDG Cell	39	Sample Vital Registration Survey (Data)	2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023	Fox-pro, STATA
Demography and Health Wing	40	Violence Against Women Survey	2011, 2015	Cspro
	41	Rural Credit Survey	2014	STATA, Fox-pro
	42	Rapid MICS	2021	STATA
Census Wing	43	Population & Housing Census (Pop. Cen.)	1991, 2001, 2011, 2022	Fox-pro, STATA, EDI
Industry and Labour Wing	44	Cost of Migration Survey 2020	2020	Data file
Census Wing	45	District Report of 64 Districts	Census- 2022	PDF, Excel
	46	Socio-Economic Demographic Survey (SEDS)	2011, 2022	
Industry and Labour Wing	47	Labour Demand Survey	2025	

Annex D

Standard Operating Procedures (SOPs)

1. Executive Summary

The Data Warehouse (DW) platform of the Bangladesh Bureau of Statistics (BBS) is a core information infrastructure designed to integrate all statistical data produced and managed by the BBS, providing a secure and systematic data service throughout the entire national statistical production lifecycle.

This platform complies with international statistical standards and data governance best practices, aiming to enhance the data utilization capacity of policy-making bodies, researchers, and the public sector. The DW platform collects and stores data from diverse sources, including survey data, administrative records, and external data, in a standardized structure, providing a foundation for secure linkage and analysis. This supports data-driven decision-making, accurate statistical production, and improves the overall reliability of the public data ecosystem. The DW operates in a secure network environment, where data access is controlled only for authorized users, and all analysis outputs are defined to undergo an appropriate review process before public release.

The Standard Operating Procedure (SOP) establishes a governance framework that defines clear roles and responsibilities among the DW platform operating organizations. This standardizes core operating processes, such as data collection, quality control, security, access control, and output review, ensuring transparent management of all operational procedures, including user access applications, eligibility requirements, and terms of use. Furthermore, this SOP provides detailed guidance on the entire operational flow, from application submission to data utilization approval, output review, and dissemination.

The appendix includes the following practical documents and tools:

- Data Loading and Sharing Request Form
- Data Security Compliance and Access Agreement
- Analysis Output Review Checklist
- User Code of Conduct

In summary, this SOP ensures that the DW platform functions as a reliable, secure, and sustainable national data foundation

2. Objectives

The main goal of the BBS DW Platform SOP is to enhance data quality and strengthen the usability and reliability of national statistics by safely and systematically integrating and managing all data produced or collected by the BBS. The aim is to establish a National Single Data Source (One Data Source) that promotes data-driven policy decisions, research innovation, and international cooperation.

In summary, the objectives of this SOP are as follows:

- Integrated Data Platform Operation: To operate a Central DW Platform that integrates, stores, and manages all official statistical data produced under the BBS.
- Data Standardization and Quality Control: To establish a standardized data structure and quality control system to provide and utilize accurate and consistent data.
- Expansion of Data Accessibility and Services: To smoothly provide necessary data to government ministries, researchers, and the public, thereby expanding data accessibility and services.
- Security Enhancement and Governance Establishment: To ensure data confidentiality, integrity, and availability through strict security controls and clear data governance.
- Support for Evidence-Based Decision-Making: To actively support data-driven decision-making and evidence-based policy formulation through the DW.
- Alignment with International Standards and Status Enhancement: To adhere to international statistical standards, strengthening the global status of Bangladesh's statistical system.

3. Scope

This Standard Operating Procedure (SOP) applies to all users, organizations, and system assets related to the operation, management, and utilization of the BBS DW platform.

All activities involving data loading, management, analysis, and service provision through the DW platform must comply with this SOP. All entities participating in these activities bear the duty to maintain data security and quality.

Specifically, this SOP applies to the following:

- **DW Platform Users:** All users granted access to the DW and related data services (e.g., BBS internal staff, government agency personnel, approved researchers, and analysts).
- **DW Operating Personnel:** BBS administrators and technical staff who perform DW system operation, data management, security, and auditing functions.

- System and Data Assets: All hardware, software, data, and metadata assets built and operated within the DW infrastructure.
- Linked Systems and Services: All data exchange, linkage, and API service provision activities between BBS internal or external systems and the DW.

This SOP comprehensively applies to all tasks and procedures performed based on the DW platform. The standards in this SOP shall take precedence unless otherwise specified in separate individual policies or documents.

4. System Structure and Components

The DW platform is designed based on a layered architecture that covers the entire statistical production phase, from data collection to storage, utilization, and dissemination. The components of each layer are organically interlinked to support the modernization of BBS's statistical infrastructure.

4.1 Conceptual Architecture and Layers

The ISDW adopts a standards-based, layered, and modular architecture to ensure flexibility, manageability, scalability, and security.

• **Data Source Layer:** The layer where source data is integrated, including statistical survey data (Population and Housing Census, sample surveys, etc.), administrative records from government ministries, and external data such as Big Data. All divisions within the BBS must register and submit all data they produce or collect, along with metadata, to the DW.

• **Ingestion & Integration Layer:** Data is extracted from source systems via the ETL (Extract-Transform-Load) process, transformed to fit the DW structure, and then loaded into the DW. Data quality verification and standardization procedures are mandatory during the ETL process.

• **Core Data Warehouse Layer:** Acts as the central repository for collected data, storing and managing data structured by subject area. Raw, atomic data, along with refined and processed derived data, are systematically preserved.

• **Data Marts and Analytics Layer:** Stores various forms of data, from large-volume detailed microdata to summary aggregate tables. It supports customized analysis using Data Marts, which are smaller data repositories specialized for subject-specific or departmental needs. This layer links with the BBS statistical analysis platform, OLAP systems, and the Online Analysis System (RAS).

• **Metadata & Governance Layer:** Manages a central metadata repository that contains information not just about the data itself, but also its definition, structure, attributes, source, update frequency, and quality indicators. This layer forms the foundation for all DW operations and technically implements governance policies.

4.2 Four Core Systems of ISDW

The DW platform operates by organically linking four core systems, designed based on the GSBPM (Generic Statistical Business Process Model), to digitize and modernize the statistical workflow.

• **Metadata Management System:** Standardizes and centrally manages item, classification, and descriptive metadata across the enterprise by applying international standards (SIMS, SDMX). This system implements the principle of metadata first registration, followed by data loading, forming the basis for securing data quality and consistency.

• **Statistical Production System:** Standardizes and automates the entire statistical production lifecycle, from questionnaire design to data collection (supporting CAPI/CASI), validation, aggregation, and dissemination, referencing the GSBPM. This ensures production process consistency and minimizes repetitive tasks.

• **DW Integration System:** Integrates heterogeneous data sources, such as survey data, administrative records, and Big Data, and performs centralized data collection through ETL automation. It applies a 5-Level Quality Governance Framework and manages secure data storage and access through a 3-Tier Security Classification.

• **Online Analysis System (RAS):** Establishes a Remote Analysis System (RAS) environment that allows for the analysis of microdata containing sensitive information, such as personal information, without extracting it externally from the server. It strengthens both data usability and confidentiality protection by implementing a user portal, RBAC-based access control, and mandating Disclosure Check for outputs.

The operational stability of the DW platform ultimately depends on the successful implementation of the Metadata Management System. The BBS establishes metadata as the Single Source of Truth for data definition, thereby preventing errors during the DW integration process and maximizing the long-term reusability and comparability of statistical data.

5 Governance and Responsibilities

The operation of the DW platform is ultimately overseen by the Chief Data Officer (CDO) of the BBS. Stability and policy consistency are ensured through a governance framework that defines clear roles and responsibilities among the operating organizations. Reflecting the organizational changes proposed in the Master Plan, the core execution functions of DW operation are concentrated in the Data Hub Section.

5.1 Supreme Oversight and Decision-Making Structure

• **Chief Data Officer (CDO) :** As the highest-ranking responsible person for DW platform operation and data strategy, the CDO presides over the approval of data strategy and key decisions related to governance.

• **ISDW Technical Committee :** This is the supreme decision-making body chaired by the BBS DG (Director General). It provides strategic guidance, including reviewing DW platform performance, approving major design changes, and approving operating policies and budgets. The committee regularly reviews the implementation status of the Data Governance Framework and oversees that DW operations comply with national policies and the Statistics Act 2013.

5.2 Operating Execution Organization: Data Hub Section

The Data Hub Section is established under the BBS Computer Wing, dedicated to the stable operation of the DW platform and value creation from data. It operates, composed of the following four specialized teams:

• **Data Strategy Team:** Responsible for establishing/revising the enterprise-wide Data Governance Framework and SOP, managing data policies and standards, and monitoring legal compliance.

• **Data Management Team:** Ensures data integrity through DW data model design, data quality management (executing the 5-level framework), overseeing the ETL process, and managing master/reference data (MDM).

• **Data Integration and Analysis Team:** Integrates multiple sources (survey, administrative, Big Data), supports secure microdata access, applies anonymization techniques for confidentiality protection, and supports the production of analysis outputs based on integrated data.

• **System Operation Team:** Serves as the technical management responsible for the stable operation and monitoring of the platform infrastructure (DW servers, network, security systems), performance management, incident management, and backup and recovery (BC/DR).

5.3 Data Stewardship and Custodianship

The DW governance framework operates a Data Steward and Data Custodian system to assign

Clear Responsibilities Across the Entire Data Lifecycle:

Role	Unit	Core Responsibilities
Data Steward	Subject-matter Wings	Verifies and takes responsibility for the quality, standard compliance, and completeness of metadata for the datasets they produce. Pre-reviews data change and linkage requests, and leads the DW data loading and submission process.
Data Custodian	Computer Wing (Data Hub Section)	Manages and is responsible for the DW system infrastructure and technical controls (security, access control, backup). Performs technical management for the safe loading and operation of data submitted by Data Stewards in the DW.
User	Internal BBS Staff/External Approved Researchers	Utilizes DW data only within the approved purpose and scope, and fulfills the duty to maintain account security and comply with confidentiality/security regulations specified in the SOP.

This division of roles establishes a dual system where the Data Steward ensures the semantic accuracy of the data, and the Data Custodian ensures the technical integrity of the platform. This clear separation of responsibilities is an essential institutional mechanism for clarifying accountability in case of data quality issues and realizing enterprise-wide data quality management.

6 Data Collection and Standardization

To resolve data silos within the BBS and function as a reliable Single Source of Truth, the DW platform mandates systematic and standardized ETL processing and quality control procedures for all collected data.

6.1 Data Integration and ETL Processing Procedure

Data integrated into the DW originates from various sources, including statistical, administrative, and Big Data. They are transformed to fit the DW structure through a standardized ETL (Extract-Transform-Load) process before being loaded.

- ETL Workflow Automation: Automated workflows are established using ETL tools (e.g., Apache NiFi) to extract, standardize, refine, and transform data from source systems before loading them into the DW. This automation ensures consistency in data structure and format and minimizes errors caused by manual work.

• **5-Step Migration Process :** Data migration from existing systems to the DW follows a 5-step Process: Demand Analysis, Data Collection/Analysis, ETL Design/Construction, DW Implementation, Testing/Operation. In the Data Collection and Analysis step, the structure, format, and quality level of existing data sources (including 44 types of statistical data) are analyzed in detail to determine the DW loading priority.

• **Mandatory Quality Verification:** Data quality verification procedures must be performed on all data before loading into the DW. Through this procedure, data is controlled by the 5-level quality governance framework, and its error correction rate, consistency, and validity are verified.

6.2 Data Standardization and Quality Governance

Strict standardization management based on metadata must be carried out to maximize data reusability, comparability, and quality.

• **Metadata Standard Compliance:** The BBS adopts a metadata structure that complies with international standards such as SIMS and SDMX. All DW data, including comprehensive metadata (definition, source, update frequency, quality indicators), must be registered in the central metadata repository.

• **Metadata First Registration Principle:** Metadata registration must precede data loading. This allows for the application of metadata-based pre-verification rules during the ETL process, minimizing errors.

• **Master Data Management (MDM):** Key reference data (Master Data) is centrally managed to ensure the consistency and comparability of BBS statistics. Management targets include national geographical codes and hierarchies, economic and occupational classifications such as ISIC and ISCO, and other common reference lists.

• **Version Control and History:** Changes to master data (e.g., boundary adjustments for administrative districts, classification revisions) must be approved by the Data Governance Committee. The validity date and history of changes are managed to support the consistency of long-term time series analysis.

• **Quality Management Framework:** The DW system applies a 5-level quality governance framework—consisting of Plan-Measure-Evaluate-Improve-Control—to continuously monitor and improve data quality.

These standardized collection and management procedures form the basis for the BBS to realize the data utilization principle of 'collect once, use many times' and ultimately increase the efficiency of the statistical production process.

7 Access Policy

The BBS DW applies a layered access policy based on sensitivity, legal requirements, and user type to maintain a balance between data openness and the protection of statistical confidentiality.

7.1 Data Security Classification and Access Levels

All data stored in the DW Integration System is classified into 3 security grades-Public-Use, Approved-Use, and Special-Purpose-based on sensitivity, with differentiated access control intensity.

Access Level	Datas Type (Security Level)	Target/Purpose	Access Method and Control
1. Public-Use	Aggregate Statistics, Processed data (no personal information)	General Public/Public Dissemination Purpose	Access and download through public portals, API without separate approval.
2. Approved Use	De-identified microdata (with additional de-identification applied)	External researchers/ Policy analysts	Requires official application and review committee approval. Analysis possible in a secure controlled environment such as the Remote Analysis System (RAS/VDI). External extraction of raw data is prohibited.
3. Special-Purpose	Sensitive data and detailed microdata (maximum level of detail)	Authorized researchers/ In-depth analysis	Access to the Microdata Analysis Lab (Closed Network, On-site Only). Strict identity verification and entry/exit control. Remote access is prohibited under any circumstances. Only analysis outputs are allowed for external removal after review.
4. Internal User Access	All data (differentiated based on work necessity)	BBS internal staff/ Work purposes	RBAC-based principle of least privilege applied. Access to raw data before de-identification requires separate, strict approval.

7.2 Access Application and Approval Procedure

Data access is managed through a transparent and standardized procedure, adhering to the strict requirements of the Microdata Analysis Lab Operating Regulations, especially for access to sensitive data.

• Submission of Standard Application Form: Users for Approved-Use and Special-Purpose data must submit a Data Loading/Sharing Request Form (Form-1), detailing the research purpose, methodology, and required datasets.

• Review Committee Approval: Applications must undergo review by the BBS Data Access Committee or a designated review committee, which evaluates the research's purpose, scope, and contribution to the public good.

• Mandatory Contract and Pledge: Approved users (internal/external) must sign a Non-Disclosure Agreement (NDA, Form-2). This NDA legally specifies the duty to protect data and maintain confidentiality, and it notifies that violation of the regulations will result in the revocation of access rights and legal sanctions.

• Log and History Management: All data access and usage records are logged and utilized for periodic monitoring and security audits to prevent unauthorized access and misuse.

The DW platform's access policy considers both data utilization efficiency and security. Access to the most sensitive data is restricted to a physically secure On-site Analysis Lab, prohibiting remote access. This achieves the highest level of data confidentiality beyond technical controls, demonstrating BBS's faithful fulfillment of its confidentiality protection obligations under the Statistics Act.

8 Security Protocols and Confidentiality Protection

The BBS DW platform implements multi-layered technical and administrative security controls to ensure the Confidentiality, Integrity, and Availability (CIA) of data, prioritizing the protection of statistical confidentiality.

8.1 Legal and Ethical Compliance

DW operation strictly adheres to the following laws and ethical principles:

• Compliance with Legal Obligations: Continuous checks are performed to ensure compliance with relevant laws, including the Statistics Act 2013, Personal Information Protection Act, and Cyber Security Act, as well as government ICT/security guidelines. Any revisions are immediately reflected in the operating procedures.

• Principle of Statistical Confidentiality Protection: Adherence to the Fundamental Principles of Official Statistics of the UN, with data use strictly limited to statistical purposes to protect respondent information.
• Prohibition of Re-identification Attempts: All users (including researchers and internal staff) must pledge through the NDA and User Code of Conduct (Form-4) that attempting re-identification of data respondents or households is strictly prohibited.

8.2 Technical and Physical Security Controls

The DW platform security establishes a multi-layered protaction system, including access control, encryption, and network segmentation.

Security Area	Key Control Measures
Access Control and Authentication	Application of the RBAC (Role-Based Access Control) principle of least privilege. Mandatory use of strong authentication procedures (complex passwords, 2-Factor Authentication). Immediate blocking and action upon unauthorized access attempts.
Data Encryption	Sensitive data and PII are protected by strong encryption techniques both At-Rest (storage) and In-Transit (SSL/TLS). A separate Key Management System (KMS) is established for encryption key management.
Network and Environment Control	DW server network area is isolated and protected by firewalls, Intrusion Detection/Prevention Systems (IDS/IPS), and VLANs. Internet and email access is strictly disabled in secure controlled environments.
Physical Control (Lab)	Facilities for Special-Purpose data access (Microdata Analysis Lab) are equipped with an access control system and surveillance system (CCTV), operating in a closed network environment where wired and wireless communication is blocked.
Removable Storage Device Control	Use of all external storage devices, such as USB drives and external hard disks, is completely prohibited in all controlled environments.

8.3 Statistical Disclosure Control (SDC) and Output Control

In addition to technical controls, the BBS controls the statistical outputs themselves to prevent confidentiality leakage.

- **De-identification and Anonymization:** Microdata provided externally must undergo de-identification measures such as pseudonymization and aggregation. Microdata provided to researchers will have additional anonymization (e.g., variable grouping, top-coding) applied.

- **Mandatory Disclosure Review:** All analysis outputs (tables, graphs, etc.) generated in secure environments (RAS or analysis lab) must undergo a mandatory confidentiality review by the Data Lab In-Charge or the Disclosure Review Committee before external removal.

- **Small Cell Control:** The output review applies a checklist (From-3) that includes criteria for Small Cell Counts Checked (e.g., prohibition of fewer than 5 observations per cell).

- **Prohibited Items for Removal:** No microdata or record-level information whatsoever is strictly prohibited from being printed or removed externally. Only approved aggregate results, graphs, and analysis syntax files are permitted for removal.

These multi-layered security protocols and strict output control ensure that the ISDW system fulfills the statistical agency's legal responsibilities and maintains a high level of security readiness against modern threats. Physical/logical controls, such as the prohibition of external storage device use and internet access restriction, serve as the final line of defense to fundamentally block any attempts to circumvent the mandatory disclosure review procedure.

9 User Services and Support System

The DW platform goes beyond simply storing and managing data; it establishes comprehensive service channels and support systems to provide value to users and strengthen internal capabilities.

9.1 Data Provision and Service Channels

Data accumulated in the DW is utilized through various analysis and service systems.

- **Internal Services:** BBS internal staff utilize the data in their work through linkage with BI tools and OLAP systems. DW data is provided to the Statistical Production System and internal analysis platforms via API or DB connection to support work efficiency.
- **Public Portals and Public Services:** Official statistical results and public data are automatically updated according to the public release schedule via the BBS website and national statistical portals, and are disclosed as machine-readable data through open formats and APIs.

9.2 Helpdesk and Support

A dedicated support person is assigned within the DW operation team to run a helpdesk system that addresses technical issues for internal staff (query errors, etc.) and external applicants' progress status and technical questions. A system is established where the BBS internal helpdesk is responsible for initial response and resolution in case of system failures, minimizing reliance on external maintenance and ensuring service continuity.

- Regular Training: Regular training is conducted at least once a year for internal and external users to enhance system utilization capabilities and promote active use.
- Documentation and Guidance: Various documents and guidelines are provided for internal and external users, including system manuals, a Data Dictionary, metadata guides, and FAQs.

10 Operation and Maintenance Procedures

To ensure the stability and reliability of the DW platform, the BBS establishes and implements comprehensive operation and maintenance procedures, ranging from daily monitoring to incident response, performance improvement, and backup/recovery. These procedures are performed according to predefined schedules and rules, allowing the DW system to maintain high availability, close to 24/7 uninterrupted service.
Key operation and maintenance activities are as follows:

10.1Regular Inspection and Preventive Maintenance

The DW Operation Team (Data Custodian) performs the following activities regularly to minimize failures:

- System Performance Monitoring : Key performance indicators (CPU, memory, response time) of the DW server and database are monitored constantly and periodically. Alarms are triggered upon threshold breaches for immediate action (e.g., index optimization, storage expansion).
- Regular Inspection: Daily, weekly, and monthly/quarterly inspections are conducted for logs, backup status, disk capacity, and security patch application. Critical updates must be verified in a test environment before being applied to the operating environment to minimize the risk of service interruption.
- System Improvement and Upgrade: Regular server specification increases, DB and software upgrades are performed according to data growth and user requirements. An upgrade plan is established and applied after evaluation upon the release of new versions.

10.2 Incident Management and Business Continuity/Disaster Recovery (BC/DR)

- Incident Management: Incidents are handled according to a standardized Incident Management procedure. Critical incidents trigger an immediate reporting system, followed by root cause analysis and the creation of an Incident Report to establish recurrence prevention measures. Security-related incidents comply with external reporting obligations based on relevant laws.

- Service Interruption Management: Prior notification is mandatory for planned interruptions (e.g., regular maintenance), utilizing off-peak hours (night/weekend).
- Backup and Disaster Recovery (BC/DR):
  - A strategy of daily incremental backups and periodic full backups is used. Recovery rehearsals are conducted regularly to confirm the reliability of the backup data.
  - Recovery rehearsals verify that the backup system meets the defined RPO (Recovery Point Objective) and RTO (Recovery Time Objective) targets (e.g., data within 1 day, recovery within 4 hours).

11 Monitoring, Evaluation, and Compliance Policy

Policies are implemented to ensure continuous monitoring, regular evaluation, and strict compliance for all DW operations to enhance transparency and accountability.

11.1 Access and Utilization Monitoring

- Access Log Analysis: All access logs and data usage logs of the DW system are constantly collected and analyzed/reported. This is used to monitor unauthorized access and misuse.
- Anomaly Detection and Audits: Anomalies, such as large-volume downloads or repeated failed logins, are detected in real-time, triggering immediate alerts and reporting. Random Audits of approved user folders are also conducted regularly to verify compliance with regulations.
- Sanctions for Violations: If a violation of confidentiality or protocol is confirmed, the user's access rights are immediately revoked, and legal sanctions are imposed if necessary.

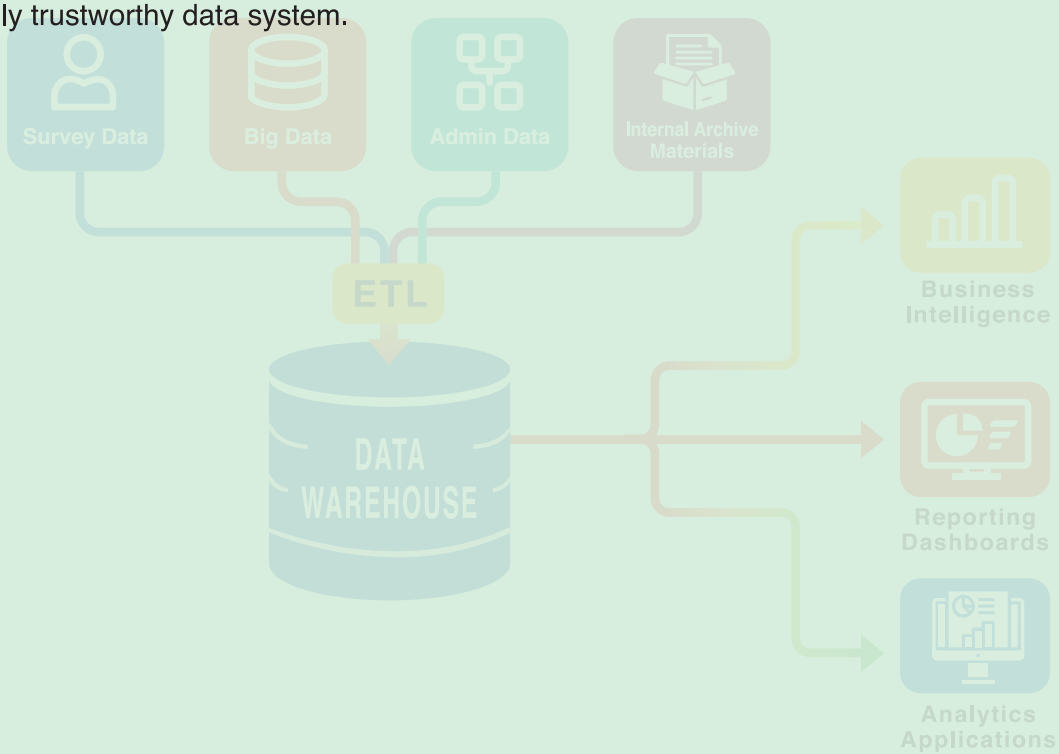
11.2 Governance and Quality Assessment

Policy Area	Key Contents
Data Governance Implementation Review	The Data Governance Committee reviews the implementation status of the DW Governance Framework (SOP and policies) at least once a year and checks the operational performance report. It listens to user feedback, evaluates policy effectiveness, and derives improvements.
Standards and Quality Compliance Audit	The Metadata Management Unit audits the data standard compliance rate, metadata completeness rate, and the adequacy of quality check reports at least once a year. Upon discovery of a violation, the relevant Wings must establish a corrective action plan and re-check to confirm improvement.
Feedback of Monitoring and Evaluation Results	The Plan-Do-Check-Act (PDCA) cycle is implemented based on monitoring and evaluation results to update the DW operation plan. If a serious issue arises, a Root Cause Analysis TF is formed to establish fundamental solutions.

11.3 Strengthening Legal and Ethical Compliance

The BBS continuously strives to comply with relevant laws and ethical regulations. It maintains a system to immediately reflect revisions to relevant laws, such as the Statistics Act 2013 and the Personal Information Protection Act, in the DW operating procedures. Furthermore, it regularly conducts data ethics training for staff and emphasizes responsible data use through data usage agreements with researchers.

This Monitoring-Evaluation-Compliance framework serves as the basis for measuring the DW operation's Key Performance Indicators (KPIs: system uptime, average response time, data quality metrics, backup success rate), supporting the BBS in maintaining a statistically robust internally and externally trustworthy data system.



Form 1. Data Loading and Sharing Request Form

Purpose: To systematically register requests from the Data Steward (for loading data into the DW) or the Approved User (for requesting access/utilization of DW data, e.g., researchers, policy analysts).

Section	Item	Content
i. Requestor Information	Request Type	□ Data Loading (Internal) / □ Data Utilization (External Research/Analysis)
	Affiliation/Organization	
	Department/Position	
	Name	
	Contact/Email	
ii. Request Target & Purpose	Project/Research Title	(Describe the specific research/analysis purpose and contribution to the public good in detail)
	Purpose of Request	
	Utilization Period	Start Date: DD. MM.YYYY. ~ End Date: DD. MM.YYYY.
	Required Dataset Name	(Name of the dataset within the DW Integration System)
	Detailed Data Specification	(Specify required variables, time points, target samples, etc.)
iii. Data Utilization Plan	Utilization Environment	□ Remote Analysis System (RAS/VDI) / □ Micro data Analysis Lab (On-site Analysis)
	Analysis Methodology	(Specify major analysis methods and software to be used)
	Expected Deliverables	(E.g., Report, Academic Paper, Policy Proposal, etc.)
iv. Approval Status (For Operating Team Use)	Review Committee	BBS Data Access Committee
	Review Result	□ Approved / □ Conditionally Approved / □ Denied
	Conditions of Approval	
	Approval Date	DD. MM.YYYY.

I hereby request the loading/utilization of data on the BBS DW Platform as stated above.

Requestor Signature: _____ Date: _____

Form 2. Data Security Compliance and Access Agreement

Purpose: To legally certify that all approved users (including internal staff and external researchers) commit to the duty of statistical confidentiality and compliance with security regulations, and to notify them of sanctions for violations.

Article 1 (Duty of Confidentiality):

1. I hereby vow not to use any data accessed or acquired through the BBS DW platform (including raw data, processed data, and statistical information) for any purpose other than statistical use.

2. I bear the duty to protect the data's Confidentiality, Integrity, and Availability, and vow not to transfer or share access rights to the data with others.

3. I vow to strictly refrain from using or connecting any external storage devices (USB, external hard drives, etc.) within the DW operating environment (RAS or Analysis Lab).

Article 2 (Prohibition of Re-identification and Leakage):

1. I strictly vow not to attempt any re-identification of data respondents or households using the DW platform data.

2. I strictly vow not to print or remove any unapproved raw microdata or record-level information from the premises in any form.

Article 3 (Violation and Sanctions):

1. I fully understand and agree that if I violate the regulations specified in this Agreement and the SOP, the BBS may immediately and permanently revoke my access rights, and I may be subject to civil and criminal legal sanctions under relevant laws (Statistics Act 2013, Personal Information Protection Act, etc.).

I have fully understood and agree to the content above.

Signatory Name: _____ (Signature): _____

Date: _____ (Affiliated Organization): _____

Form 3. Analysis Output Review Checklist

Purpose: A mandatory review procedure to confirm Statistical Disclosure Control (SDC) before analysis outputs are removed externally from the secure DW environment (RAS or Microdata Analysis Lab).

No.	Review Criteria	Result	Notes/Details
A. Output Security			
1	Does the output NOT contain Microdata or record-level information?	□ Y / □ N	
2	Does the output NOT contain directly Personally Identifiable Information (PII)?	□ Y / □ N	
B. Statistical Confidentiality (SDC)			
3	Is the count of observations in every Cell equal to or greater than the Minimum Permissible Cell Size (e.g., 5)? (Compliance with Small Cell Control)	□ Y / □ N	(Minimum Cell Threshold: ____)
4	Is there a risk that the analysis results could indirectly re-identify a specific individual/household/enterprise?	□ Y / □ N	
5	Is there any possibility of data misuse, such as distortion of statistics contained in the results?	□ Y / □ N	
C. Format and Approval			
6	Does the request only include approved file formats (e.g., aggregated results, graphs, analysis syntax)?	□ Y / □ N	
7	Was the output produced within the scope of the finally approved analysis purpose?	□ Y / □ N	

Review Result: The output has passed the disclosure review and is approved for external removal.

Date of Review: _____

Reviewing Officer: _____ (Signature): _____

(Data Lab In-Charge/Reviewer)

Form 4. User Code of Conduct

Purpose: To clearly present the fundamental duties and ethical standards that BBS DW platform users must adhere to, promoting the responsible utilization of data.

1. Data Confidentiality

- I shall protect the confidentiality of all statistical data accessed through the DW system and will not disclose or share the data with unauthorized persons under any circumstances.
- The duty of confidentiality shall continue even after the data utilization purpose has concluded.

2. Compliance and Ethical Use

- I shall strictly comply with all regulations concerning DW operation, including the SOP and the Data Security Compliance and Access Agreement (NDA).
- I shall utilize the data only within the approved purpose and scope, and refrain from any actions outside of statistical purposes (e.g., discrimination against specific individuals or organizations, commercial use).
- I strictly vow not to attempt re-identification of data by any means or methods.

3. System and Account Security

- I bear full responsibility for maintaining the security of my account (ID/Password) and will not allow access by others.
- Any action that compromises system stability or bypasses security controls within the DW environment (e.g., hacking, unauthorized setting changes) is prohibited.
- I shall immediately report any system errors or security vulnerabilities discovered to the DW Operating Team.

4. Cooperation with Output Review

- When removing analysis results externally, I shall actively cooperate with the confidentiality review procedure based on the Analysis Output Review Checklist.

I hereby vow to faithfully adhere to this Code of Conduct for the sound operation of the BBS DW Platform and the secure utilization of national statistical data.

Signatory Name: _____ (Signature): _____

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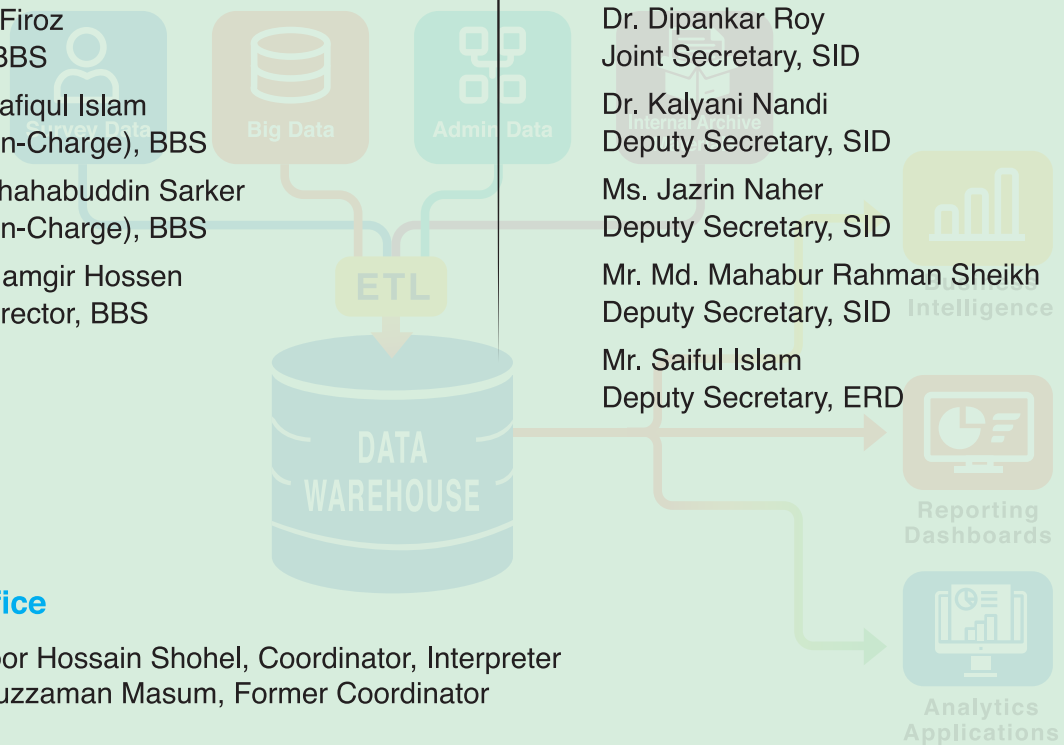
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