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GovTech Bhutan

BHUTAN NATIONAL DATA GOVERNANCE BASELINE REPORT

AUGUST 2024

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Department of Economic and Social Affairs

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Government Technology (GovTech) Agency, Royal Government of Bhutan

The Government Technology (GovTech) Agency of the Royal Government of Bhutan was established to harness the power of technology to revolutionize the way the government operates. GovTech Agency intends to establish a technologically advanced nation, with empowered citizens, and a thriving digital economy. Its mission is to establish a technologically effective and efficient government; transform public services, while keeping citizens at the core; and create a safe and thriving digital economy.

About this Bhutan National Data Governance Baseline Study

This study aims to establish a baseline for Bhutan's data governance within the context of digital transformation. The results are intended to guide relevant government agencies, particularly GovTech Agency, and other stakeholders in developing a data governance policy and strategy for the country. Commissioned by UN DESA in partnership with GovTech Agency, the baseline study was conducted from February to May 2024. It employed desk reviews, interviews with 30 key informants, and an online survey of 54 data focal points, incorporating international best practices and stakeholder feedback to evaluate Bhutan's current data governance landscape.

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List of abbreviations

AI	Artificial Intelligence
API	Application Program Interface
BSS	Bhutan Statistical System
BtCIRT	Bhutan Cyber Incident Response Team
D4D	Data governance Global Data Barometer
DAMA	The Data Management Association
DBMS	Database Management Systems
DCEI	Digital Citizen Engagement Index
DIN	Data Inventory
DMBOK	Data Management Body of Knowledge
DMF	Data Management Framework
DQAF	Data Quality Assurance Framework
EGDI	e-Government Development Index
EMIS	Education Management Information System
EPI	e-Participation Index
GCI	Global Cybersecurity Index
GDDS	General Data Dissemination System
GovTech	Government Technology Agency
GSBPM	Generic Statistical Business Process Model
GTEI	GovTech Enablers Index
GTMI	GovTech Maturity Index
HCI	Human Capital Index
ICT	Information and communication technology
IMF	International Monetary Fund
ISO	International Organisation for Standardisation

KII	Key informant interviews
MIS	Management Information Systems
MoESD	Ministry of Education and Skills Development
NSB	National Statistics Bureau
NSDS	National Strategy for the Development of Statistics
ODIN	Open Data Inventory
OECD	The Organisation for Economic Cooperation and Development
OGD	Open government data
RGoB	Royal Government of Bhutan
RMA	Royal Monetary Authority of Bhutan
SAARC	South Asian Association for Regional Cooperation
SDG	Sustainable Development Goal
SDMX	Statistical Data and Metadata Exchange
UN DESA	United Nations Department of Economic and Social Affairs
UNCTAD	The United Nations Conference on Trade and Development
WDR	World Development Report

Executive summary

The importance of data in the public sector cannot be overstated, as it has become integral to government operations, decision-making, and citizen service delivery. However, challenges in data governance persist due to unclear management strategies and inconsistencies in policies and practices. Technological advancements have led to the generation of vast amounts of data, which, when analysed using AI and ML technologies, can provide valuable insights. Yet, risks such as security, privacy, and ethical concerns accompany this digital revolution. Bhutan recognizes the importance of data governance and has amended its policies accordingly, prioritising data security and quality through initiatives like the Single Source of Truth and the Bhutan Statistics Quality Assurance Framework. The UN DESA project on data governance further supports developing nations in addressing these challenges and enhancing institutional capabilities. This study aims to provide a baseline of Bhutan's data governance practices, aligning with international frameworks, to inform policy development and strategy implementation for effective data management and utilisation.

Data and its importance for development

The foundational understanding of data and its pivotal importance for development is crucial for evidence-based policymaking. The report defines data as information related to individuals, entities, and systems, spanning various forms and lifecycles. It adopts the UN e-Government Survey 2020 classification, which includes public, government, census, administrative, open government, big data, geospatial, and real-time data types. This classification reflects the diverse sources and methods of data collection, from traditional census-taking to modern digital tools like satellite imaging and facial recognition. Furthermore, the narrative emphasizes the need to raise awareness about the data's significance among both the general populace and public officials. It underscores how data, when effectively harnessed, can contribute to program administration, service delivery enhancement, efficient resource allocation, evidence-based policymaking, and empowerment across various sectors, thereby fostering development.

Data governance system

The intricacies of data management and governance highlight their significance in modern governance frameworks. It distinguishes data management from governance, where management focuses on implementation while governance provides guidance and supervision. Drawing from DAMA International (2017), data management involves strategies aimed at optimising the value of data assets throughout their lifecycle, while data governance ensures that data is managed in line with established policies and industry standards. Leveraging insights from the UN e-Government Survey (2020), effective data governance is depicted as contingent upon four pillars: policies and regulations, national data strategy and leadership, a data ecosystem, and investment in data technologies. This study employs this framework to develop Bhutan's data governance baseline, emphasising the importance of inclusivity and detailing four pillars and six elements crucial for a robust governance system.

On e-government development and digital transformation in Bhutan

Globally, data governance has garnered significant attention, surpassing other digital transformation policy areas like taxation and foreign direct investment. Various international assessments, such as the UN e-Government Survey, GovTech Maturity Index (GTMI), Global Cybersecurity Index (GCI), and Government AI Readiness Index, evaluate countries on their digital transformation and data governance efforts. Bhutan, classified as a High EGDI country with a score of 0.552, ranks 115th globally and performs modestly within

the South Asian Association for Regional Cooperation (SAARC) region. On the GTMI, Bhutan scores 0.595, above the global average, but lags in digital citizen engagement. Its GCI score of 18.34 places it third lowest in the SAARC region, highlighting cybersecurity challenges. For AI readiness, Bhutan scores 36.88, ranking mid-range among SAARC nations but below India, Bangladesh, Pakistan, and Sri Lanka, indicating room for improvement in AI infrastructure and digital literacy.

Overall national data governance in Bhutan

Bhutan's performance in data governance, as measured by the Statistical Performance Indicators (SPI) and the Open Data Inventory (ODIN), reveals significant areas for improvement. Bhutan's SPI score is the second lowest in the SAARC region, outperforming only Afghanistan, with notable deficiencies in data services, sources, and infrastructure. Similarly, Bhutan ranks third in SAARC for ODIN but is globally positioned at 109th, indicating limited openness and accessibility of statistical data. Despite a coverage score of 48.2, Bhutan's openness score is 42.1, highlighting the need for enhanced data accessibility, format standardisation, metadata availability, and user terms. Strengthening data collection methods and improving statistical capabilities could enhance Bhutan's overall data governance performance.

Pillar 1: Policy

Bhutan's data governance is supported by a robust legal and policy framework, which is fundamental for effective data management across public and private sectors. This framework includes significant laws and policies such as the Information, Communications, and Media (ICM) Act 2018, the e-Governance Policy 2019, and the National Digital Identity (NDI) Act 2023, alongside various sector-specific regulations. Despite these measures, significant gaps and challenges persist, including insufficient clarity on data processing definitions and inconsistent cross-border data flow regulations. Moreover, data governance is often entangled with IT governance, which can hinder adaptability to evolving data needs and privacy concerns. Bhutan's efforts also include initiatives like the Bhutan Interactive Data Portal to promote data accessibility and transparency. However, achieving comprehensive and cohesive data governance requires addressing these legal and policy inconsistencies and enhancing coordination among diverse regulatory documents and sectoral guidelines.

Pillar 2: Institutions

The institutional framework for data governance in Bhutan, informed by international practices, includes various roles such as policymakers, data stewards, analysts, and data scientists, each requiring specific skill sets. Despite the creation of entities like GovTech Agency and the Bhutan Statistical System (BSS) to centralize and manage data, gaps remain in defining roles and ensuring coordination among stakeholders. Survey results show that only 14% of respondents confirmed the existence of dedicated data governance units, with 27% indicating none, and 25% uncertain.

Pillar 3: Processes

Only 9% reported fully established data governance processes, with 41% lacking structured processes. Bhutan's efforts in adhering to international standards, such as the IMF’s Enhanced General Data Dissemination System (e-GDDS), are ongoing but need further development, particularly in data classification, security, and interoperability.

Pillar 4: People

Effective data governance in Bhutan faces significant challenges due to inadequate infrastructure, human resources, and budgets. While only 9% of respondents confirmed the full engagement of skilled individuals

in data governance, 39% reported partial engagement, and 34% noted a complete absence of designated personnel. The diversity of roles involved in data governance, ranging from statistical officers to engineers, underscores the need for specialised skills and training. However, 69.6% of staff lack data management training, with an average proficiency score of 5.4 out of 10. Key informants highlighted the scarcity of human resources, with some agencies having only one person responsible for data tasks, often without specialised training, and broader issues in the recruitment and retention of skilled staff.

Element 1: Data standardisation and classification

Bhutan's data governance faces significant challenges in data standardisation and classification, with only 14.3% of organisations having explicit policies and 16.1% with designated units for these tasks. Only 12.5% have trained personnel for data standardisation, and just 14.3% have defined work processes. While 14.3% of respondents affirm ongoing efforts to harmonize data standards, over half report partial implementation of data quality checks, and 33.9% are uncertain about data reliability. The Data Management Guide 2023 recommends classifying data by sensitivity, but there is no consistent legal framework for data classification, leading to fragmented and unclear practices. Bhutan has made progress using international standards for data standardisation and classification, but coordination between ministries remains a challenge due to varied data standardisation and classification practices.

Element 2: Data sharing, exchange, and interoperability

Bhutan's data sharing, exchange, and interoperability practices reveal significant gaps, with only 17.9% of organisations having policy statements, 19.6% with responsible units for managing these aspects, and merely 12.5% of personnel being trained for these tasks. Despite some progress in data security and established agreements for external data exchange, strategies for prioritising datasets for open data initiatives are lacking, and many organisations face challenges in managing data interoperability. Efforts to enhance data sharing include the implementation of the National Summary Data Page (NSDP) and the Bhutan Statistical Database System (BSDS), which aim to consolidate and streamline data processes, and the Bhutan Interactive Data Portal, which provides access to over 1,000 statistical indicators to foster a data-driven culture.

Element 3: Data security (and protection)

The study reveals significant challenges in data security management across departments and organisations in Bhutan. A small percentage have established clear policies (21.4%), designated units (25%), or trained personnel for data security (16.1%), with many reporting only partial implementation. Key data security measures, such as data classification (16%), backup protocols (23%), and regular awareness programs (9%), are underutilised. Bhutan has made progress in cybersecurity with the establishment of the Bhutan Computer Incident Response Team (BtCIRT), but vulnerabilities remain, particularly in legal and technical areas. The government acknowledges these challenges, with common risks including unlicensed software, exposure to viruses, and data loss, which was reported by a quarter of respondents in the last three years. These findings highlight the need for improved data governance and robust cybersecurity measures in the country.

Element 4: Data privacy (and ethics)

Data privacy practices are similarly deficient, with only 17.9% reporting policy statements and 25% having responsible units. Key measures like data classification protocols and informed consent requirements are also inadequately implemented. The ICM Act 2018, which addresses privacy and data protection, lacks

coherence and clarity, highlighting the need for more robust policies and frameworks to manage data security, privacy, and ethical issues effectively.

Element 5: Data infrastructure

Bhutan's data infrastructure faces significant challenges, including limited policy statements, responsible units, trained personnel, and defined processes, as highlighted by a survey indicating partial implementation or absence of these elements. The Government Data Centre (GDC), established in 2017, represents a key initiative for centralised data management and cybersecurity, supporting Bhutan's ICT integration efforts. However, widespread use of unlicensed software poses security risks, prompting efforts to shift towards licensed applications through centralised procurement. Coordination and connectivity among various government systems remain limited, with around 400 independently developed systems lacking interoperability. The 2019 e-Governance Policy underscores the need for a coherent ICT framework to optimize resource use, reduce redundancy, and ensure efficient public service delivery through shared and reused ICT assets and infrastructure.

Element 6: Data and digital identity

Bhutan has recently introduced its National Digital Identity (NDI) Wallet, a pioneering government-operated digital identity system leveraging blockchain technology. Launched in 2023, it offers individuals and entities a secure digital identity accessible through personal devices, facilitating various transactions, including financial services, employment applications, and government-to-citizen services. Unlike centralised systems, the NDI Wallet employs a decentralised, distributed ledger, enhancing trust by eliminating centralised storage of identity information. However, there are notable deficiencies in the process of issuing verifiable credentials (VC) with the NDI Wallet, with lacking policy guidance, responsible units, trained personnel, and well-defined processes, as indicated by survey data. Addressing these challenges is crucial for ensuring the successful implementation and utilisation of the NDI Wallet, which holds significant potential for driving Bhutan's digital economy and enhancing social security measures.

1. Introduction

1.1. Background and rationale

1. The significance of data in the public sector has expanded, shaping government analysis, operations, academic studies, and real-world use. Data has become indispensable across all government domains, akin to physical assets and human resources. A considerable portion of governmental functions now heavily relies on data, making its integration crucial for efficient operations. Having access to well-managed data is essential to fine-tune the delivery of citizen services according to the requirements of a nation's populace and its unique circumstances.[1]

2. Data governance has become increasingly crucial for organisations and society, yet its value is often limited due to a lack of clear management strategies. There is a growing significance of global data governance because of the rapid expansion of data and the necessity for responsible data handling and protection. While traditionally associated with internal organisational policies, data governance now extends to governmental and institutional bodies. However, the absence of a global consensus and inconsistencies in policies and practices present obstacles to establishing a unified framework.[2]

3. Advancements in computing power enable the analysis of ever-expanding data volumes within shorter timeframes and at reduced costs. The surge in internet use, the prevalence of social platforms, and the widespread implementation of the Internet of Things (IoT) contribute to the generation of massive data quantities. This amalgamated data, sourced from diverse channels, undergoes thorough analysis using machine learning (ML) and artificial intelligence (AI) technologies to glean insights and inform decision-making. Additionally, AI-driven systems continually receive vast datasets to refine their capabilities in machine learning and automated decision-making.

4. While the digital technology and data boom brings about positive advancements, it also introduces numerous risks and challenges. Notable concerns include security, privacy, and ethical considerations, coupled with a significant deficiency in digital and data literacy and institutional capacities. This gap is particularly evident in African countries, least developed countries (LDCs), and small island developing states (SIDS). With the exponential surge in government data and the growing recognition of its vast potential and associated challenges, the call for effective data management and institutions has become increasingly urgent. Governments stand as major producers and consumers of

[1] ADB and AWS Institute, 2022) (UNDESA, 2022)

[2] (The GovLab, 2023)

data in numerous countries, and they play a pivotal role in regulating data.

5. Data exhibits distinct properties. Unlike traditional goods and services, it is non-rivalrous, meaning it can be replicated and integrated into multiple value chains without depletion. With a suitable governance framework, data can be treated as a public good. However, achieving this requires strong and ambitious governance measures that involve active participation from public, private, and UN actors.[3]

6. In Bhutan, recognising the significance of data, the Royal Government of Bhutan has amended the e-Governance Policy 2019 with strong focus on enhancing the quality, interoperability, and sharing of data through the implementation of a Single Source of Truth. Additionally, the Government prioritizes ensuring the security and privacy of collected and shared data. Furthermore, the National Statistics Bureau (NSB), serving as the nodal agency for official statistics, has instituted the Bhutan Statistical System (BSS) and the Bhutan Statistics Quality Assurance Framework (BSQAF) to streamline the production of high-quality administrative and survey data within Bhutan.

7. The United Nations Department of Economic and Social Affairs (UN DESA) has initiated a project concerning data governance. Backed by the UN Peace and Development Fund, the project is titled "Enhancing institutional capabilities for digital data management and collaboration to promote progress towards the Sustainable Development Goals." It aims to assist developing nations in evaluating primary data management and governance hurdles while augmenting the knowledge of government officials and stakeholders regarding robust and secure data management practices. The project aims to tackle existing challenges and deficiencies in digital data management and collaboration by concentrating on bolstering countries' institutional capabilities to employ, administer, and oversee data comprehensively, objectively, and on evidence-based grounds through regional and global collaboration.[4]

1.2. Study objectives

8. This study seeks to provide a baseline of where Bhutan is in terms of its data governance in the context of digital transformation. The findings, on the one hand, are expected to serve as inputs for the relevant agencies in the government, especially NSB, and other stakeholders in the development of a necessary data governance policy and strategy for Bhutan.

[3] (The GovLab, 2023)

[4] (UN DESA, 2024)

9. The study has adopted the research framework established by UNDESA, drawing upon the 2020 edition of the UN e-Government Survey Chapter 6, which focuses on data governance. This framework aligns data governance with three principles of Sustainable Goal 16 (accountability, effectiveness, and inclusiveness) and evaluates it through the perspective of four pillars (policy, institutions, people, and process) and six elements (data classification and standardisation, data sharing, exchange, and interoperability, data security and protection, data privacy and ethics, data infrastructure, and digital identity). By employing this framework, the study enables a thorough and comprehensive examination of the various procedural components necessary for fostering effective, accountable, and inclusive data governance.[5]

1.3. Methodology

10. The study used mixed methods to collect data for its analysis. Those include desk reviews, key informant interviews, and an online survey. The different sources allowed the study to do proper data triangulation and put together an updated and comprehensive reference for readers interested in data governance in Bhutan.

11. The desk review covers key concepts, international practices and relevant reports. Among others, key publications by main development partners such as UN agencies, the World Bank, the International Monetary Fund (IMF), and selected countries were reviewed. The latest reports and documents related to ICT and data in Bhutan were also reviewed. Further, the findings from the key stakeholders' workshop on data governance served as valuable inputs.

12. Key informant interviews (KIIs) were conducted with different ministries and agencies as part of the primary data collection method. The main purpose of this method was to get in-depth information which will be insightful in getting diverse views on the current state and expectations of data governance in Bhutan. Using a semi-structured open-ended questionnaire, efforts were made to extract qualitative and revealing information, by intercepting around 30 individuals from stakeholder institutions as presented in Annex Table 1.

13. An online survey with a data focus was implemented using a well-structured questionnaire. The survey questionnaire underwent review and piloting to ensure data quality and appropriateness before being administered in the actual survey. Additionally, the questionnaire was presented to GovTech Agency for their comments and suggestions. The survey was administered using Google Forms. The questionnaire was simplified to be self-explanatory, with embedded definitions for certain terms. In

[5] (UN DESA, 2020)

case respondents encountered any difficulty, provisions were made for them to contact the national consultant for clarification. To maximize the response rate, an official letter from GovTech Agency was issued. A total of 54 data focal persons from these institutions responded to the survey.

2. Overall conceptual framework and international practices

14. This study relies on international conceptual frameworks to shape its research design and data analysis. These frameworks encompass the definition of data, its various types, diverse facets of data governance, and international approaches to establishing effective data governance within a country. Much of the conceptual framework is derived from the UN e-Government Survey 2020, particularly Chapter 6, supplemented by insights from other relevant publications.[6]

2.1. Data and its importance for development

2.1.1. What is data?

15. The foundational understanding of data encompasses its definition, classifications, and lifecycle. As articulated in the 2021 World Development Report (WDR), data is characterised as "information pertaining to individuals, entities, and systems." It manifests in both quantitative and qualitative forms and can be archived in analogue or digital mediums. The lifecycle of data involves stages such as creation/reception, processing, storage, transmission/sharing, analysis/utilisation, archiving/preservation, and occasionally, deletion. Data's classification as public or private often hinges on its intended use, frequently serving commercial purposes.[7]

16. The public intent data can be grouped into different types. This report adopts the classification outlined in the UN e-Government Survey 2020, which includes commonly recognised government data types such as public data, government data, census and survey data, administrative data, open government data, big data, geospatial data, and real-time data. Some government data are gathered through traditional means like census-taking, national accounts, household and business surveys, and administrative records. However, the advent of digital technology has facilitated the collection of data through new methods and tools, such as satellite imaging for location data, digital identification systems, facial recognition via public cameras, and procurement data sourced from e-government platforms.[8]

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[6] Please see for instance (ADB and AWS Institute, 2022) (World Bank, 2021) (UNCTAD, 2021)

[7] (World Bank, 2021)

[8] (UNDESA, 2020) (World Bank, 2021)

Table 1. Terminology related to government data

Data type	Description
Public data	Includes all data that are available in the public domain, including those created by governments, academia (for example, scientific data), civil society and the private sector.
Government data	Government data, also known as Public Sector Information (PSI), includes any data and information generated or commissioned by Public Sector Bodies (PSBs). These bodies, which encompass entities like parliaments, ministries, courts, and various government authorities, produce, maintain, and update extensive amounts of documents and datasets.
Census and survey data	Data collected through observation for a given population or universe, including demographic data and other survey data on items such as housing, land use, agriculture, and business.
Administrative data	Data collected by government agencies on their operations; includes data on public service transactions in sectors such as health, social services, justice, and education. Administrative data sources are data sets created primarily for administrative purposes by government agencies.
Open government data (OGD)	Open Government Data (OGD) is a philosophy - and increasingly a set of policies - that promotes transparency, accountability and value creation by making government data available to all. Public bodies produce and commission huge quantities of data and information.
Big data	Usually associated with high velocity, volume, and variety; often defined within political and social contexts as "a cluster or assemblage of data-related ideas, resources, and practices, also referred to as an "imprecise description of a rich and complicated set of characteristics, practices, techniques, ethical issues and outcomes all associated with data". Big data analytics can be used for deeper and more complex tasks, such as social media sentiment analysis. According to the 2020 MSQs, 60 out of 138 countries indicate that they have incorporated some type of big data strategy into their digital government development.
Geospatial data	Data and information that have an implicit or explicit association with a geographical location.

Real-time data	Constant streams of live data are delivered immediately after collection; such data show the actions of governments and/or people almost instantaneously and are usually deployed with the anticipation of change and the expectation of a rapid response. One example of how such data drives government decisions is the monitoring and analysis of Twitter feeds to understand the movements (or migration) of particular populations within a country in order to anticipate and plan for e-service needs at the subnational level.

Source: (UNDESA, 2020)

2.1.2. Why is data important?

17. Awareness regarding the significance and relevance of data is still limited among the general populace and many public officials. Despite data's pervasive presence in daily life, its profound influence often goes unnoticed. Both government and non-government stakeholders struggle to grasp how data's importance intersects with their daily responsibilities. Therefore, demonstrating the tangible and relatable benefits of data is essential for fostering stakeholder engagement and garnering their support.

18. International literature has presented various frameworks to elucidate the value of data in driving development. According to the 2021 WDR, three pathways delineate how data can contribute to development.[9] As depicted in Figure 1 below, the central pathway involves data generated or received by governments and international organisations to bolster program administration, enhance service delivery, and inform evidence-based policymaking. The top pathway encompasses data produced and utilised by civil society and academia to monitor and analyse the impacts of government programs and policies, as well as by individuals to empower themselves and access tailored public and commercial services. Meanwhile, the bottom pathway represents data generated by private firms.

[9] (World Bank, 2021)

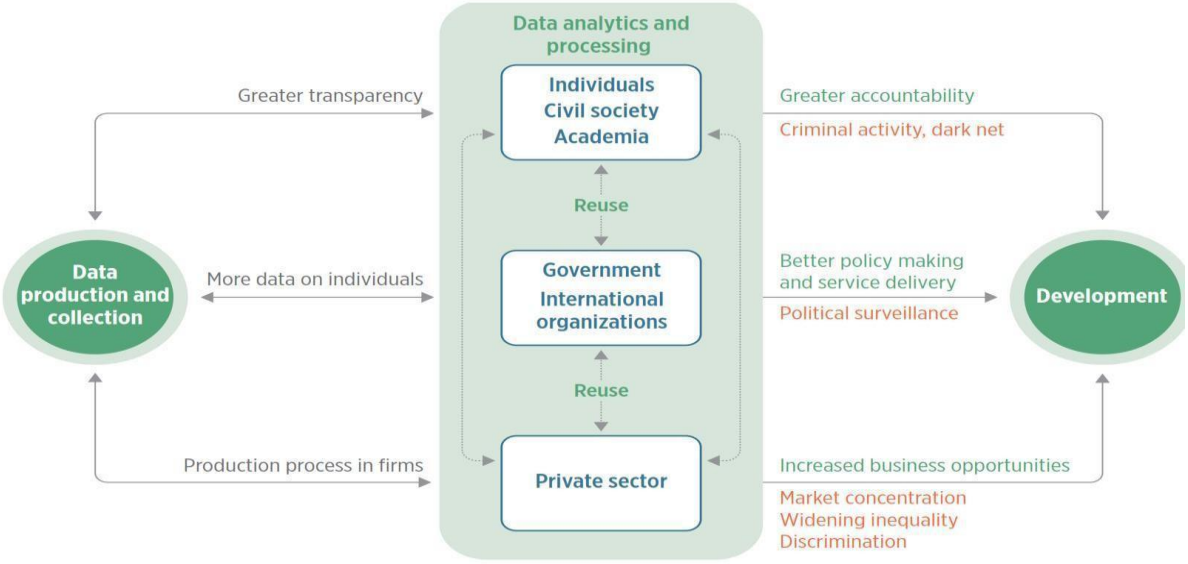


Figure 1 Three pathways along which data can foster development

Source: (World Bank, 2021)

19. Another way to understand the benefits of data for the government is its value addition during the main phases of a policy process. According to the OECD (2019) and the WDR (2021), data can assist governments in three important areas. First, data can help predict trends and allow governments to be prepared for future opportunities and risks. Second, data serves as input for better design and implementation of public policies and service delivery. In this regard, data can help improve access to government services, targeting of scarce resources and reaching marginalised populations and areas. Third, data supports monitoring and evaluation of policy implementation and promotes transparency and accountability thereby empowering citizens.[10]

2.2. Data governance system

20. Various agencies have slightly different definitions of data management and data governance. For example, according to DAMA International (2017), data management encompasses the formulation, implementation, and oversight of strategies, policies, initiatives, and procedures aimed at maximising, controlling, safeguarding, and optimising the value of data and information assets throughout their lifecycle. On the other hand, data governance is depicted as the central component of data management, offering guidance and supervision to guarantee that data is appropriately managed in accordance with established policies and industry standards. It is noted that while data

[10] (OECD, 2019)

governance emphasizes supervision, data management is primarily concerned with implementation.[11]

21. Although there is no universal solution, countries have access to common methodologies when crafting their data governance frameworks. Different resources provide diverse interpretations of these methodologies, all highlighting the importance of establishing a cohesive policy framework, a well-defined institutional structure, capacity building initiatives, and consistent monitoring, evaluation, and adaptation processes. In this section, the focus is on insights gleaned from the UN e-Government Survey (2020)[12], which have been incorporated into this study.

2.2.1. UN e-Government Survey (2020): Towards effective data governance

22. The dynamic relationship between policies, institutions, people, processes, and enabling technologies is what drives data governance. According to the UN e-Government Survey (2020), an effective national data governance framework for e-government should be underpinned by four pillars: policies and regulations, a national data strategy and leadership, a data ecosystem, and investments in data technologies. With appropriate data governance, decisions based on available data do not place the government or the public at risk.

23. This study makes use of the framework for data governance that the 2020 UN e-Government Survey provides. According to the report, data governance refers to a homogeneous set of principles and practices that guide the formal management of data assets within all public institutions. The data governance is anchored in the principles of Sustainable Development Goal 16: accountability, effectiveness, and inclusiveness. This framework is analysed through four key pillars—policy, institutions, people, and processes—and six specific elements, as illustrated in Figure 2. This approach ensures a thorough and integrated examination of the various components that together support effective, accountable, and inclusive data governance.

[11] (DAMA International, 2017)

[12] (UNDESA, 2020)

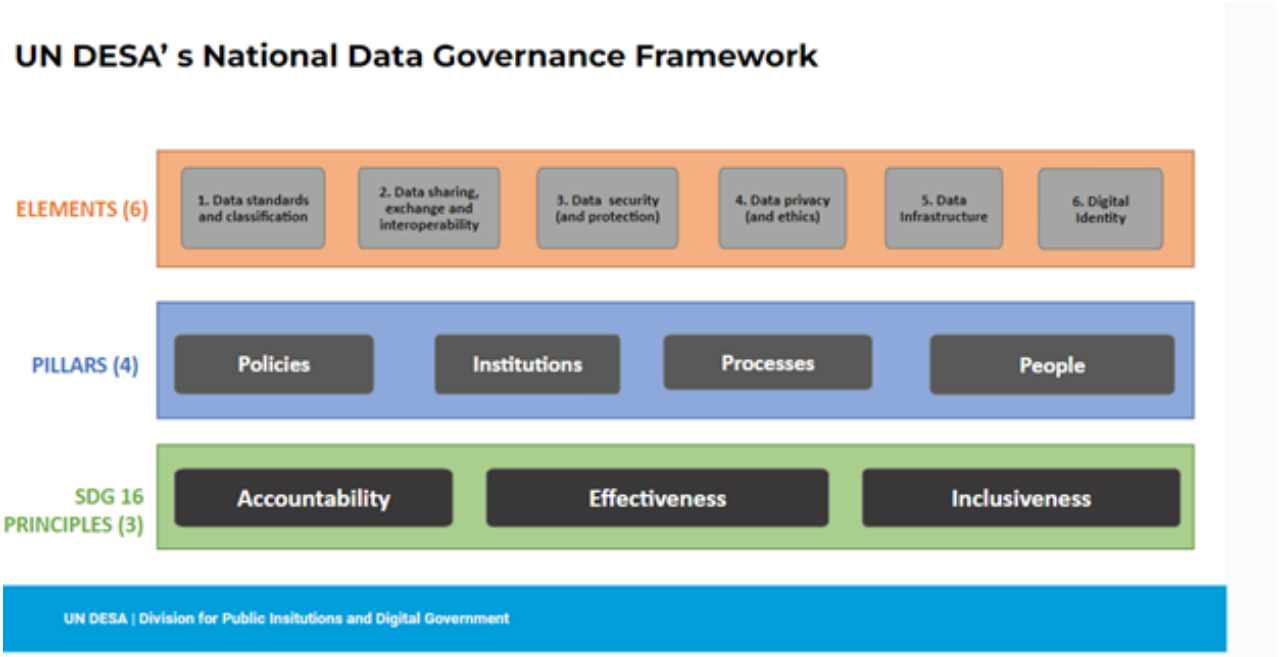


Figure 2 National data governance framework by UN DESA

Source: (UNDESA)

24. The principles and elements serve as a guide to developing a data governance system (Table 2). They need to be operationalised using various strategies, some of which are directly relevant to data governance, and some are indirectly relevant. The direct ones, for instance, include data sharing, public disclosure of information, and data disaggregation. The indirect ones include transparent financial management and control, budgetary transparency, and participatory budgeting.[13]

Table 2. Commonly used strategies to operationalize the principles in data governance

Essential elements and related principles	Direct relation to data governance, strategies or policies	Indirect relation to data governance, strategies or policies
Effectiveness: Competence, sound policymaking, collaboration	- Data sharing - Investment in e-government - Strengthening national statistical systems - Monitoring and evaluation systems	- Strategic planning and foresight - Results-based management - Performance management - Financial management and control - Risk management frameworks - Science-policy interface - Network-based governance
Accountability: Integrity,	- Proactive disclosure of information - Open government data	- Budget transparency - Independent audit

[13] (UN DESA, 2020)

transparency, independent oversight	- Registries of beneficial ownership - Lobby registries	
Inclusiveness: Leaving no one behind, non-discrimination, participation, subsidiarity, intergenerational equity	- Data disaggregation - Universal birth registration	- Accessibility standards - Participatory budgeting - Multilevel governance - Strengthening urban governance - Long-term territorial planning and spatial development

Source: (UNDESA, 2020)

25. The framework outlined in the e-Government Survey underscores the criticality of inclusivity within data governance. Primarily, inclusive data governance serves as a cornerstone in fostering e-participation, delineated as the utilisation of information and communication technologies (ICT) to involve citizens in public decision-making processes, administrative functions, and service provisions.[14] Secondly, data emerges as one of the pivotal components among the triad requisite for e-governments to guarantee universal access, alongside design and delivery.[15]

26. In this study, four pillars and six elements are focused on to produce the baseline for Bhutan's data governance system. The four pillars include 1) policies, 2) institutions, 3) processes, and 4) people. The six elements cover 1) data standardisation and classification; 2) data sharing, exchange and interoperability; 3) data security and protection; 4) data privacy and ethics; 5) data infrastructure; and 6) digital identity. Table 3 provides more details.

Table 3. The four pillars and six elements of data governance

Key points	Descriptions
The four pillars of data governance	
Policies	A set of laws and policies that provide principles and management intent into fundamental rules governing the creation, acquisition, integrity, security, quality, and use of data and information
Institutions	Institutional and organisational arrangements which define the roles, responsibilities, and coordination among key stakeholders
Processes	Processes and steps by which specific tasks of data management are performed in accordance with key principles in the broader data

[14] (UNDESA, 2020)

[15] (UNDESA, 2020)

	governance
People	Human and financial resources needed to support the implementation of the data governance and management tasks
The six elements of data governance	
Data classification and standardisation	Data classification is a process of classifying data according to their sensitivity, whereas data standardisation is about ensuring uniform identification, collection, relating, validation, and sharing of data. They are crucial to breaking down data silos, creating interoperability, and ensuring data integrity.[16]
Data sharing, exchange and interoperability	Managing the movement and consolidation of data within and between applications and organisations in accordance with the regulatory framework.
Data security (and protection)	The planning, development, and execution of security policies and procedures to provide proper authentication, authorisation, access, and auditing of data and information assets.
Data privacy (and ethics)	Procuring, storing, managing, interpreting, analysing, and disposing of data with careful attention to the protection of individual and business entities' data privacy and in line with ethical principles.
Data infrastructure	Various components, including hardware, software, networking, and services needed to enable data consumption, storage, and sharing.
D**igital identity**	A safe, secure, and convenient way to prove who you are online for work, for education, for personal use, and when accessing government online services.

Source: (UNDESA, 2020) (D4D, 2022) (Digital Transformation Agency (Australian Government), 2023)

3. Bhutan's data governance – International comparison

27. Globally, data governance has gained increasing attention as compared to other policy areas of digital transformation. According to the Digital Policy Alert, a platform that tracks various policy changes relating to digital transformation and trade, data governance has received the most reform attention when compared to other policy areas such as taxation, foreign direct investment, subsidies, and industrial policies (Figure 3).

[16] (UNDESA, 2020)

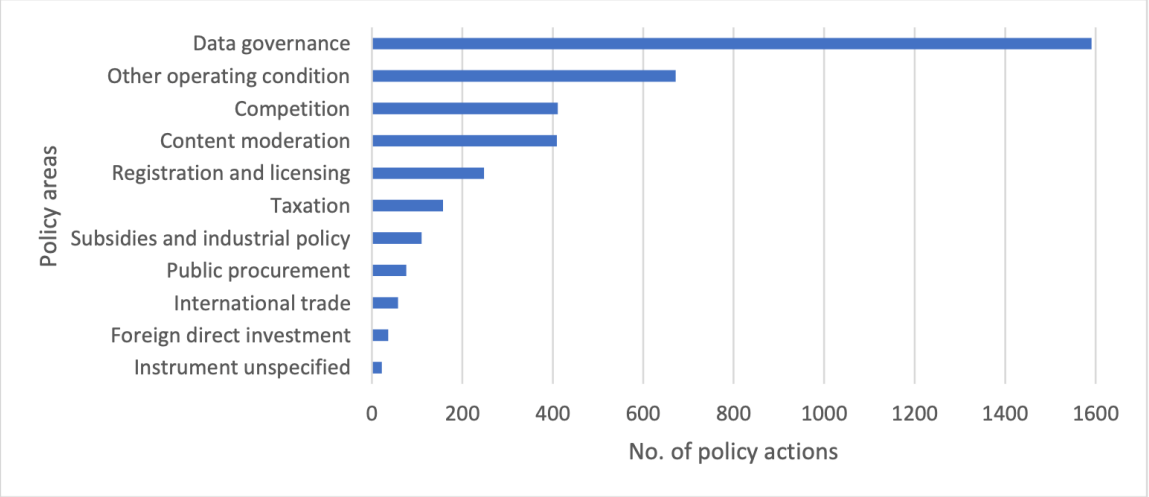


Figure 3 Global policy actions taken with regards to digitalisation

Source: (Digital Policy Alert (GPA), 2023)

28. Several international assessments and rankings have been implemented on e-government and data governance at the global level. Table 4 provides a list of those initiatives. This section presents the findings from those global tools to inform the baseline study by showing Bhutan's key scores and ranking as compared to other countries in the SAARC region and beyond. It starts with those relating to e-government (as digitalisation is the main driver of data governance) before focusing on data governance per se.

Table 4. International ranking on e-government and data governance

Main topics	International ranking	Description and links
e-government and digitalisation	e-Government Survey (UN)	The UN e-Government Survey is the United Nations' assessment of the digital government landscape across all 193 Member States. It is informed by over two decades of longitudinal research, with a ranking of countries based on the United Nations e-Government Development Index (EGDI). https://publicadministration.un.org/egovkb/en-us/Reports/UN-e-Government-Survey-2022
	GovTech Maturity Index (GTMI) (World Bank)	The GovTech Maturity Index (GTMI) measures and identifies gaps in digital transformation by comparing the differences among economies and

		groups of economies, and tracking changes over time in a transparent way. The dataset is updated every two years to reflect developments in the GovTech domain. https://www.worldbank.org/en/programs/govtech/gtmi
	Global Cybersecurity Index (GCI) (ITU)	The Global Cybersecurity Index (GCI) measures the commitment of countries to cybersecurity at a global level along five pillars – (i) Legal Measures, (ii) Technical Measures, (iii) Organisational Measures, (iv) Capacity Development, and (v) Cooperation – and then aggregated into an overall score. https://www.itu.int/en/ITUD/Cybersecurity/Pages/global-cybersecurity-index.aspx
	Government AI Readiness Index (Oxford Insight)	The government AI Readiness Index aims to assess how ready a government is to implement AI in the delivery of public services to their citizens. It looks at multiple dimensions of governmental and technological progress that contribute to AI readiness, including the capacities, frameworks, skills, resources, and infrastructure. https://www.oxfordinsights.com/governmen t-ai readiness-index-2022
Data governance	Global Data Barometer (D4D)	The Global Data Barometer assesses the state of data in 109 countries. Among other tools, an expert survey covered the period from 2019 to 2021 and provided evidence on the governance, capability, availability, and use of data across a variety of sectors. The Barometer breaks down the concept of data for the public good into various components and sub-components, each assessed separately. https://globaldatabarometer.org/

	Statistical Performance Indicators (SPI) (World Bank)	The Statistical Performance Indicators (SPI) framework assesses the maturity and performance of national statistical systems in five key areas, called pillars. The five pillars are data use, data services, data products, data sources, and data infrastructure. https://www.worldbank.org/en/programs/statistical-performance-indicators
	Open Data Inventory (DIN) (Open Data Watch)	The Open Data Inventory (ODIN) assesses the coverage and openness of statistics produced by national statistical systems as published on the official website of the national statistical offices. Coverage refers to the availability of important statistical indicators in 22 categories of social, economic, and environmental statistics. https://odin.opendatawatch.com/report/rankings

3.1. On e-government and digital transformation

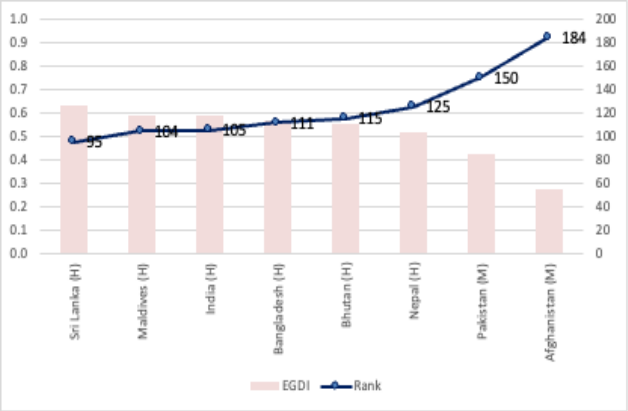
3.1.1. UN e-Government Survey

29. The UN e-Government Survey is conducted every two years, assessing e-Government development across 193 Member States. It uses the e-Government Development Index (EGDI) which has three components: 1) the Online Service Index (OSI), 2) the Telecommunication Infrastructure Index (TII), and 3) Human Capital Index (HCI). The EGDI value is between 0 and 1. The scores are also used to group each country into Very High EGDI (score from 0.75 to 1), High EGDI (from 0.50 to 0.7499), Middle EDGI (from 0.25 to 0.4999), and Low EGDI (from 0.0 to 0.2499).[17]

30. Bhutan attained the status of a High EGDI country in 2022, yet its overall score and ranking remain relatively modest. According to the 2022 e-Government Survey, Sri Lanka leads in the SAARC region with a score of 0.629. Maldives, India, and Bangladesh also demonstrated strong performances, securing their positions within the High EGDI category. Bhutan falls within the High EGDI group, its score of 0.552 surpasses those of Nepal, Pakistan, and Afghanistan, positioning it at the 115th rank globally in 193 member states. Bhutan's score had been on an upward trajectory until 2020 but

[17] (UN DESA, 2022)

experienced a marginal decline in 2022 (Figure 4(b)).



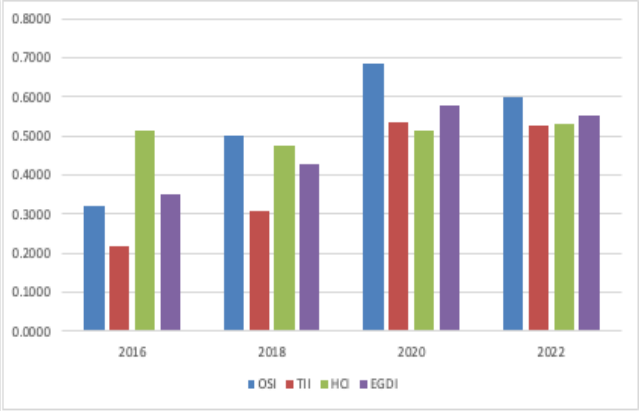


Figure 4(a) EGDI score and ranking for SAARC countries (2022)

Figure 4(b) Bhutan's EGDI by components (2016-2022)

Source: (UNDESA, 2022)

31. The e-Government Survey also evaluates an additional indicator called e-Participation Index (EPI). The EPI assesses how countries utilise e-participation mechanisms compared to global standards. It offers insight into how nations use online platforms to facilitate government-citizen interactions and community engagements. On this indicator, Bhutan's score has consistently improved over the years, albeit in 2022 and it ranks among the top three countries in the SAARC region (Figure 5).

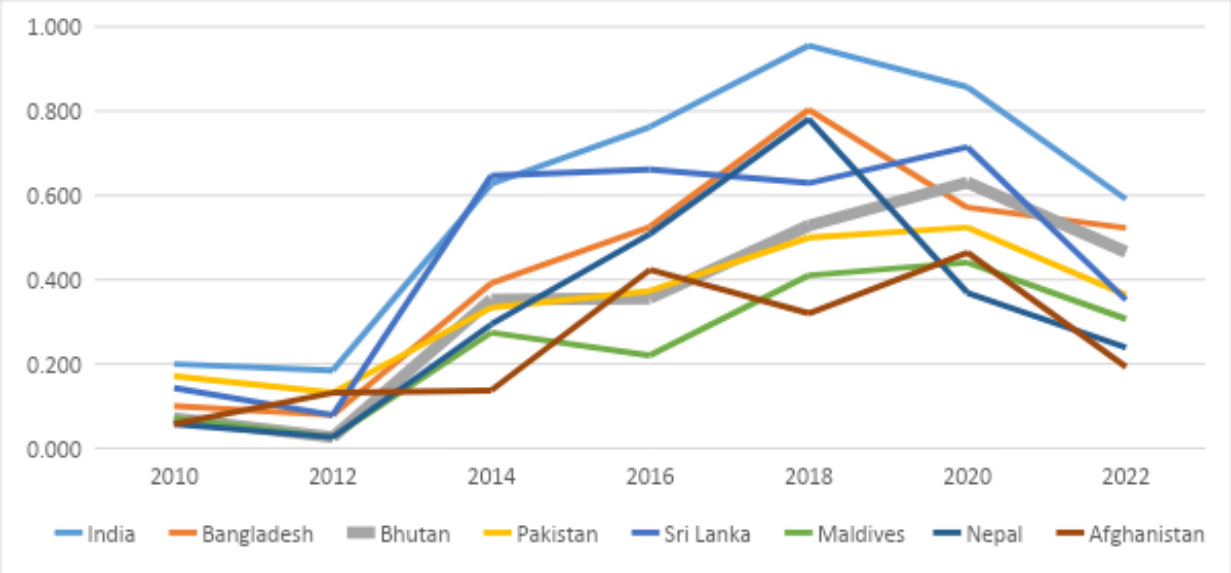


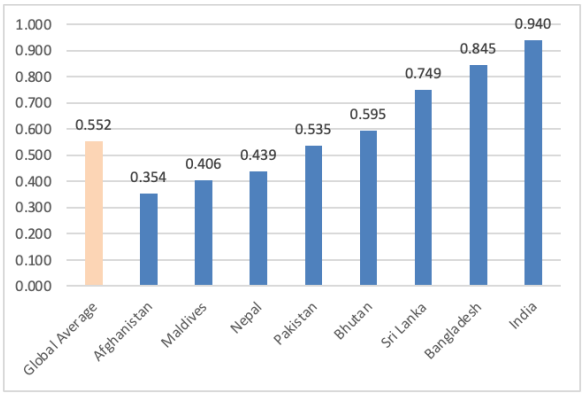
Figure 5 Index and of the other SAARC countries (2010-2022)

Source: (UN, 2023)

3.1.2. GovTech Maturity Index (GTMI)

32. In 2022, Bhutan exceeded the global average on the GovTech Maturity Index (GTMI), yet its ranking remained comparatively low among certain SAARC nations. The GTMI serves as a gauge of digital transformation levels worldwide, drawing on four key components: the Core Government System Index (CGSI), Public Service Delivery Index (PSDI), Digital Citizen Engagement Index (DCEI), and GovTech Enablers Index (GTEI).

33. Bhutan achieved a score of 0.595 on the GTMI, surpassing the global average of 0.552. Within the SAARC region, Bhutan's performance outstripped that of Afghanistan, Maldives, Nepal, and Pakistan (Figure 6(a)). Despite commendable scores on the CGSI and PSDI pillars, Bhutan lagged behind on the DCEI component (Figure 6(b)).



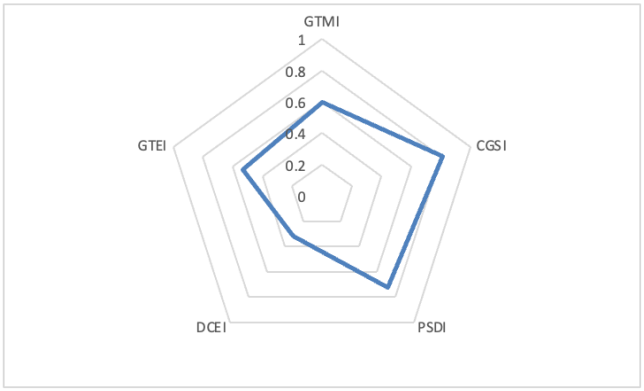


Figure 6(a) Bhutan's GTMI score in comparison to SAARC countries (2022) Figure 6(b) Bhutan's GTMI score by components (2022)

3.1.3. Global Cybersecurity Index (GCI)

34. The Global Cybersecurity Index (GCI) measures the commitment of countries to cybersecurity at a global level. As cybersecurity has a broad field of application, cutting across many industries and various sectors, each country's level of development or engagement is assessed along five pillars, including legal measures, technical measures, organisational measures, capacity development, and cooperation.[18]

35. In the 2020 GCI, with a score of 18.3, Bhutan ranked 134th among the 160 surveyed countries. For cybersecurity, Bhutan's score is the third lowest in the SAARC region, for each of the five pillars, out of 20 total scores - the highest the country got was 8.30 for legal measures, but the lowest was zero for cooperative measures.

[18] (ITU, 2020)

36. Bhutan's position in the GCI appears relatively lower compared to other SAARC countries. With a score of 18.34, Bhutan ranks below India, Bangladesh, Pakistan, Sri Lanka, Nepal, but higher than Afghanistan and Maldives (Figure 7(a)). This substantial gap indicates that Bhutan faces significant challenges or deficiencies in its cybersecurity infrastructure and preparedness compared to its regional counterparts. It underscores the urgent need for Bhutan to bolster its cybersecurity capabilities and implement robust measures to mitigate cyber threats effectively. Strengthening cybersecurity frameworks and investing in advanced technologies would be essential for Bhutan to elevate its standing in the global cybersecurity landscape.

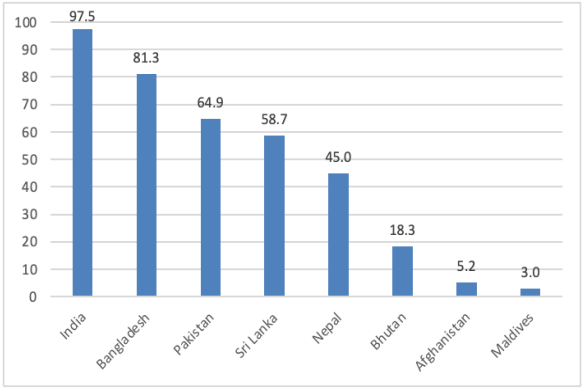


Figure 7(a) Bhutan's GCI score in SAARC (2020)

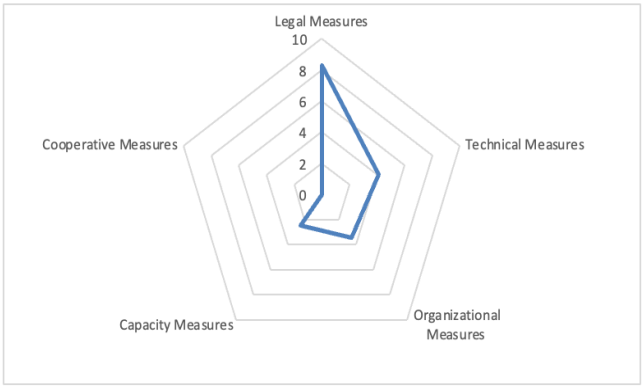


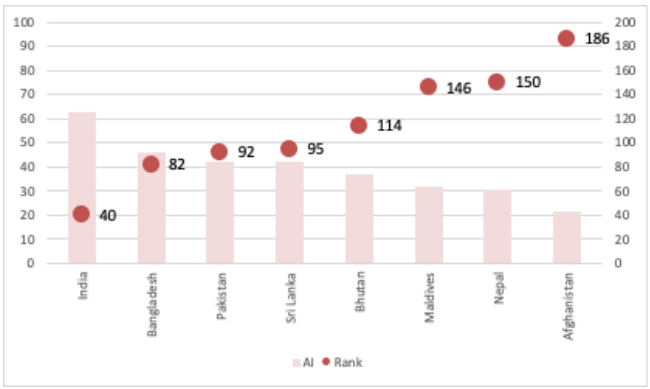
Figure 7(b) Bhutan's GCI score by components (2020)

Source: (ITU, 2020)

3.1.4. Government AI Readiness Index

37. For the Government AI Readiness Index, Bhutan also ranks low, even at the SAARC level. Bhutan's AI readiness score of 36.88 out of 100 positions it in the middle range among the SAARC countries. Bhutan lags India, Bangladesh, Pakistan, and Sri Lanka, which have higher AI readiness scores. However, Bhutan outperforms Maldives, Nepal, and Afghanistan in terms of AI readiness. Globally, the country is ranked 114th out of 193 member states (Figure 8(a)).

38. These scores indicate that Bhutan has made some progress in adopting and preparing for AI technologies but still has room for improvement to catch up with its more advanced neighbours. Strengthening AI infrastructure, investing in research and development, and promoting digital literacy could help Bhutan further enhance its AI readiness and competitiveness in the region. For the three specific pillars, Bhutan scored at 36.81 for Government pillar, 24.31 for Technology pillar, and 49.52 for Data and infrastructure pillar (Figure 8(b)).



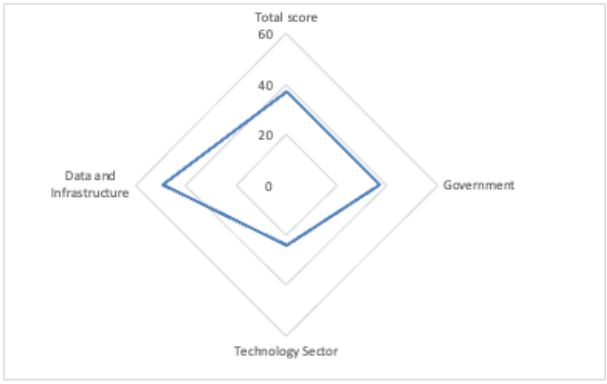


Figure 8(a) Bhutan's Government AI Readiness Index in SAARC (2023) Figure 8(b) Bhutan's Government AI Readiness Index by components (2023)

Source: (Oxford Insight, 2023)

3.2. On data governance

3.2.1. Statistical Performance Indicators (SPI)

39. Bhutan's score on the Statistical Performance Indicators (SPI) is ranked second lowest among the SAARC countries. The SPI provide an open-source framework for assessing the performance of statistical systems in five key areas, including data use, data services, data products, data sources, and data infrastructure.

40. As shown in Figure 9, Bhutan's SPI score is lower than all SAARC countries except Afghanistan, suggesting relatively poor statistical performance compared to these nations. Bhutan's SPI score varies across its pillars, with Pillars 1 (Data Use) and 3 (Data Products) performing better than Pillars 2 (Data Services), 4 (Data Source), and 5 (Data Infrastructure). This shows potential for improvement to match levels observed in regional counterparts. Strengthening data collection methods, increasing data source accessibility, enhancing statistical capabilities, and improving data infrastructure could drive further enhancement in statistical performance indicators.

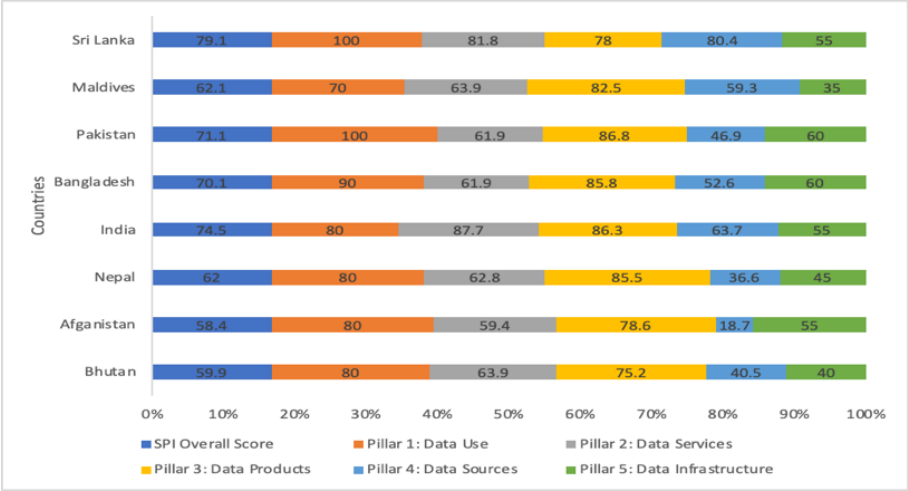


Figure 9 Bhutan's SPI pillars and components score in SAARC (2020)

Source: (World Bank, 2020)

3.2.2. Open Data Inventory (ODIN)

41. Bhutan is ranked third in terms of Open Data Inventory (ODIN) overall score in 2022 in the SAARC region but is still one of the least open countries in terms of data with a global rank of 109th out of 195 the member states. The Open Data Inventory (ODIN) assesses the completeness and adherence to international openness standards of a country's statistical data. Data must originate from official sources and be published on recognised government websites. Coverage scores consider the availability of key indicators over time and geographic subdivisions. Openness scores evaluate factors such as data accessibility, format, metadata availability, and terms of use, which Bhutan is lagging (42.1) compared to its coverage score (48.2), as shown in Figure 10.

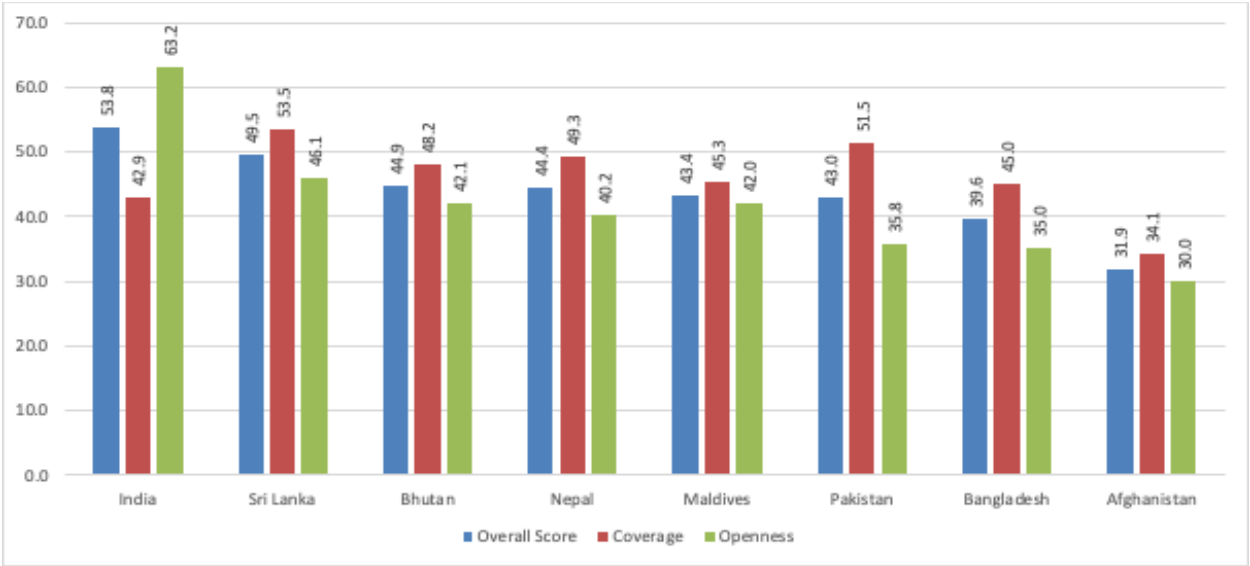


Figure 10 Bhutan's ODIN score compared to the other SAARC countries (2020)

Source: (Open Data Watch, 2020)

4. Bhutan's data governance – the four pillars

4.1. Policy

4.1.1. Concepts and international practices

42. In both public and private sector organisations, the establishment of legal and policy frameworks forms the fundamental basis for data governance. While addressing technical aspects such as data quality, accuracy, and availability is essential, it offers only short-term solutions and does not rectify systemic shortcomings. Extracting public value from data needs a long-term strategy that involves understanding the economic and political dimensions of data governance and management, and adeptly navigating the evolving landscape of data security and privacy.[19] Given that data governance extends beyond technical functions, governments must adopt a comprehensive, whole-of-government approach to develop a comprehensive data governance framework supported by a national data strategy and an encompassing data ecosystem.[20]

43. The adoption of an existing data governance structure by a government can impede further progress in effective data management. In many countries, data governance is still intertwined with IT or ICT governance, constraining governments' abilities to capitalise on new opportunities and adequately address evolving challenges, including data security and privacy concerns. The challenge arises as IT authorities may lack the capability to resolve specific data-related issues within newer data frameworks and systems (such as e-government platforms), and users may be uncertain about how to request or access necessary data. This situation can negatively impact data availability, integrity, interoperability, security, and privacy. Occasionally, data governance is implemented on an ad hoc basis, which is not a sustainable long-term strategy. It is imperative for governments to embrace a comprehensive data governance framework with a structured approach that supports sustainable development.

44. There are many global and regional examples of key laws and policies on data governance initiatives. Among them are the Right to Privacy in the Digital Ages (2013) by the UN, Personal Data Protection and Privacy Principles (2018) by the UN, Berlin IGF Messages on Data Governance (2019) by the Internet Governance Forum (IGF), General Data Protection Regulation (2018) by the European Union, and the OECD Privacy Framework (2013) by the OECD, as shown in Table 5.

[19] (Yang Lee, 2014)

[20] (UNDESA, 2020)

Table 5. Global and regional policy initiatives relating to data governance

Key documents	Institutions, year, and links
The right to privacy in the digital age	United Nations Member States (2013) (https://undocs.org/A/RES/68/167)
Personal Data Protection and Privacy Principles	United Nations System (2018) (https://archives.un.org/sites/archives.un.org/files/_un-principles-on-personal-data-protection-privacy- hlcm-2018.pdf)
Berlin IGF Messages on Data Governance	Internet Governance Forum (IGF) (2019) (https://www.intgovforum.org/multilingual/filedepot_download/9212/1802)
General Data Protection Regulation	European Union (2018) (https://gdprinfo.e/)
OECD Privacy Framework	Organisation for Economic Co-operation and Development (OECD), Working Party on Information Security and Privacy (2013) (https://www.oecd.org/sti/ieconomy/oecd_privacy_framework.pdf)
APEC Privacy Framework	Asia-Pacific Economic Cooperation (APEC) e-Commerce Steering Group (2015) (https://www.apec.org/Publications/2005/12/ APEC-Privacy-Framework)
African Union Convention on Cyber Security and Personal Data Protection	African Union (2014) (https://au.int/en/treaties/african-union-convention-cyber-security-and-personal- data-protection)
ASEAN Framework on Personal Data Protection	Association of Southeast Asian Nations (ASEAN) (2016) (https://asean.org/storage/2012/05/10-ASEAN-Framework-on-PDP.pdf)
OAS Principles on Privacy and Personal Data Protection	Organisation of American States (OAS) (2015) (https://www.oas.org/en/sla/dil/docs/CJI-doc_474-15_rev2.pdf)
Standards for Personal Data Protection for	Ibero-American Data Protection Network (RIPD) (2017) (https://www.privacysecurityacademy.com/wpc

Ibero- American States	ontent/uploads/2019/03/Standards_Personal_Data_IberoAmerican_eng_Con_logo_RIPD.pf
Modernised Convention for the Protection of Individuals with Regard to the Processing of Personal Data	Council of Europe International Conference of Data Protection and Privacy Commissioners (2018) (https://edoc.coe.int/en/international-law/7729-convention-108-convention-for- the-protection-of-individuals-with-regard-to-the-processing-of-personal-data.html)
International Standards on the Protection of Personal Data and Privacy	International Conference of Data Protection and Privacy Commissioners (ICDPPC) (2009) (https://edps.europa.eu/sites/edp/files/publication/09-11-05_madrid_int_standards_en.pdf)

Source: (UNDESA, 2020)

4.1.2. The findings on Bhutan

45. With rapid digitalisation, especially after the COVID-19 pandemic, the government has given more attention to data governance. However, most of the key informants pointed out the significant gaps in the current policy and legal frameworks (as discussed below), coupled with insufficient support from the executive level for data governance. The online survey shows almost half of the respondents (48%, including 32% who partially agreed) having some sort of plan or rules for managing data, like strategies, policies, and instructions (Figure 11).

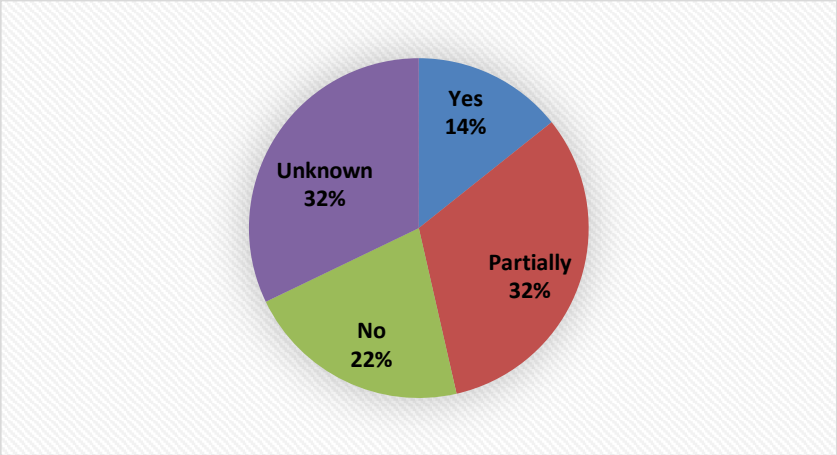


Figure 11 Policy for legitimising data governance through strategies, policies, directives and other regulatory documents (% of responses)

46. As per the online survey respondents, information handling is regulated by various rules and agreements. Despite the requirement for case details to be accessible on the judiciary website, which is presently non-functional, alternative methods such as Excel or papers are being utilised. Additionally, specific sectors like aviation have their own set of regulations. While laws such as the Information, Communications and Media (ICM) Act 2018 and the Data Management Guide 2023 establish fundamental rules and guidelines, more detailed instructions are outlined in documents like the Forest Information Monitoring System (FIRMS) Data Management Protocol by the Department of Forests Park and Services (Ministry of Energy and Natural Resources). Furthermore, regulations govern technology usage, media communication, and medical records management.

Policy and legal frameworks

47. The government has adopted some key policies and laws to guide the development of data governance and are planning to finalize a few others. The key policies and legal documents adopted include the ICM Act 2018, the e-Governance Policy 2019, the Executive Order issued to NSB in 2006, the National Strategy for the Development of Statistics, and others (Table 6). At the same time, there are also plans to amend the ICM Act 2018 and push for the enactment of the Statistics Act of Bhutan.

Table 6. Existing policies and legal documents on e-government in Bhutan

Policies and legal documents	Description
Information, Communications and Media Act of Bhutan	The ICM Act 2018 comprises distinct sections addressing Privacy and Data Protection. These segments aim to safeguard the privacy and personal information of users, with a focus on online settings.

2018[21]	
e-Governance Policy 2019[22]	The primary aim of the policy is to offer clear direction for executing e-Governance projects within the nation. Specific goals encompass safeguarding citizens' confidentiality and privacy to enhance confidence in online services.
Royal Monetary Authority (RMA) Act 2010[23]	The Act grants RMA the power to compel individuals, companies, organisations, and government bodies to collect and provide data concerning monetary and credit systems, balance of payments, and banking. It also mandates the regular publication of statistics derived from the authority's powers under relevant sections of the Act.
National Digital Identity (NDI) Act 2023[24]	The NDI Act of Bhutan 2023 prioritises privacy and security, restricting access to personal data even for government entities. The Act includes measures to protect citizens' digital identities.
Executive Order of 2006 for National Statistics Bureau (NSB)[25]	The NSB functions according to an Executive Order issued in 2006, which appoints it as the primary authority responsible for gathering, organising, and publishing all official data, as well as its safekeeping.
National Strategy for the Development of Statistics (NSDS) 2019-2023[26]	The objective of the NSDS is to establish a national statistics system (NSS) to efficiently manage, gather, organise, analyse, and distribute accurate and unbiased official data. This aims to support well-informed decision-making, debate, and discussion.
Strategic Plan to Improve Statistics in Bhutan[27]	The main goal of this strategic plan is to enhance and reinforce the BSS, ensuring it becomes more responsive, resilient, and effectively coordinated to generate statistics that are both timely and reliable. Moreover, it strives to elevate the execution of statistical operations and deliver top-tier statistics to both data users and the broader public, facilitating evidence-based decision-making
e-Government Interoperability Framework (e-GIF)	The e-GIF 2014 aims to deliver effective automated and connected services of the highest standards and quality with a whole-of-government perspective. It defines and ensures implementation of Data Reference Model (DRM) with standards to describe, share,

[21] (National Assembly of Bhutan, 2018)

[22] (DITT, 2019)

[23] (RAM, 2010)

[24] (Parliament of Bhutan, 2023)

[25] (RGoB, 2006)

[26] (NSB, 2023)

[27] NSB, 2020)

2014[28]	structure and classify data. It institutes a set of standards and guidelines that the government agencies must adopt to enable better sharing and collaboration within government agencies. It allows diverse government application systems to seamlessly exchange data and use the data that has been exchanged meaningfully, with support of standardised technologies, data and applications. It aims to facilitate interoperability among RGoB systems, including all official statistics generating system such as the Bhutan Statistical Database System, the Labour information Management System, and the e-Patient Information System.
Bhutan Information and Communications Technology Policy and Strategies (BIPS) 2004 *[revised in 2014]:* Data Interoperability Standards 2011[29]	The Data Interoperability Standards 2011 contains a standardised list of data, for example, *Dzongkhag* code, *Gewog* code, *Chiwog* code, etc., that are commonly used by agencies.
Standardisation of Measurement Unit Survey, Bhutan 2022	The survey on standardisation of measurement units aims to standardise the measurement units used across the country in order to ensure quality data.
Bhutan Standard Statistical Code (BSSC) 2020[30]	In order to streamline the common definitions and concepts as well as codes used by the BSS, the NSB has standardised them based on UN conventions and best practices which are contextualised, modified and made suitable for our national context. The objective for developing statistical code of practice is to ensure data consistency, comparability and to integrate data over time period and across different data sources. For ease of reference for the users, the standard codes of practice are arranged based on commonly used modules in surveys - Household and Household Members, Demography, Education, Employment, Health, Water and Sanitation, Housing Materials, Housing Amenities and Household Assets.
Bhutan Standard Statistical Geographic Code 2020[31]	It defines assignment of codes to a geographic location. It provides groundwork for statistical activities, data comparability and data mapping across different dataset obtained through statistical censuses and surveys, administrative records and other innovative data sources.

[28] (DITT, 2014)

[29] (MoIC)

[30] (NSB, 2020)

[31] (NSB, 2020)

Bhutan Standard Classification of Occupation (BSCO) 2022[32]	The BSCO 2022 enables coding of all occupations for statistical purposes. The adoption and use of these standards in the collection, analysis and dissemination of statistics will ensure consistency and comparability of data, facilitating meaningful analysis and usage.
Bhutan Standard Industrial Classification (BSIC) 2020[33]	The BSIC 2020 is a standard classification of economic activities in the country. Its main purpose is to provide a set of activity categories that can be utilised for the collection and presentation of statistics by various types of economic activities.
Royal Monetary Act 2010[34]	The Royal Monetary Act 2010 authorises the RMA to collect and disseminate financial related data from relevant agencies and set standards thereof.
Guidelines on Data Privacy and Data Protection 2022[35]	The main aim of the guidelines is to ensure financial data privacy by implementing the privacy by design and default approach. The document also highlights data protection by design and default approach, and the need to appoint a data protection officer to ensure protection and security of data.

48. Specific legal and policy gaps still need to be addressed. As one example, the privacy provisions under the ICM Act 2018 hold vendors accountable for safeguarding personal information during transfer, but the definition of data processing remains vague. The regulations impose a heavy and ongoing burden on vendors when transferring personal data out of Bhutan, despite potential rights for third-party recipients. Additionally, the data protection clauses under the ICM Act 2018 restrict the disclosure of personal data to third parties except permitted by law or authorised by the 'concerned person', hindering cross-border data flows critical for digital commerce. This narrow approach risks negative perceptions by domestic providers and impedes digital trade.[36]

49. The government has already initiated some sort of open government data (OGD) to be a part of the broader data governance policy. Some of the initiatives include Bhutan Interactive Data Portal (Box 1), Bhutan Geospatial Portal and plans are put in place in the 13th five-year plan to establish an Open Data Platform. In order to build on these initiatives, it is important that the government takes a holistic approach by not just focusing only on specific initiatives but also taking the broader policy and

[32] (NSB, 2022)

[33] (NSB,2020)

[34] (RMA, 2010)

[35] (RMA, 2022)

[36] World Bank 2018

institutional framework into account.

Box 1. Bhutan Interactive Data Portal

The National Statistics Bureau (NSB) and the World Bank launched the Bhutan Interactive Data Portal, the redesigned NSB website and a new mobile application to expand access to timely statistics, improve evidence-based decision-making, and promote a data-driven culture in Bhutan.

In collaboration with the World Bank, the NSB created the Bhutan Interactive Data Portal, which features more than 1,000 statistical indicators on Bhutan. The data is organised under eight different themes: population, welfare, social conditions, economy and industries, energy and environment, infrastructure and transport, agriculture, and the digital economy. The data portal can be used for a variety of purposes to gain insights into the Bhutanese economy and population, and more generally to promote a data-driven culture. Interactive maps and graphs allow users to view and compare different indicators over time or compare between different Dzongkhags helping researchers and policy makers to easily access and understand indicators. The content of the portal will be expanded gradually over time to fill the gaps.

50. While the upcoming laws and policies will complement the existing ones, ensuring legal and policy consistency can be very challenging. Interviews indicated that, although there has not yet been one umbrella law or policy on data governance, specific legal provisions on the matter can be found in various sectoral laws, policies and executive orders, ranging from those on statistical management, geospatial, ICT, telecommunications, tax regulations, license renewal, etc. Additionally, ministries/agencies are formulating policies, laws, guidelines, and rules and regulations, including the new property taxation system, the GIS Policy, and the data management guide, which are relevant to data governance. With these many moving parts, coordination and ensuring legal and policy consistency has become particularly challenging.

4.2. Institutions

4.2.1. Concepts and international practices

51. The institutional framework for data governance outlines the organisational arrangements and the roles and responsibilities of those involved. Such institutional set up can take the form of legislative functions (defining policies, standards, and procedures), executive functions (implementation, administrative, and compliance works), and judicial-like functions (e.g., issue management). The setup might also have different layers depending on the size and scope of the concerned organisation. The

actors can be a committee, a unit, or a team.[37]

52. For the public sector, more countries have introduced some important institutional changes to support their data governance. One noticeable trend is the setup of data offices and the appointment of chief data officers and/or chief information officers. In some countries, data offices are set up at the highest levels, within the offices of the national, provincial, or local leadership. They are commissioned to capture data, perform analytics and provide rapid policy solutions to public policy questions. Many governments are now hiring data scientists, recognising that their role in government is as essential as that of statisticians, information officers, economists, and other quantitative social scientists.

53. There are many data roles in the realm of institutional data governance. Those include policymakers, decision-makers, and data stewards with leadership and oversight roles (policy advisory responsibilities and/or policy approval authority), as well as data analysts, data scientists, and general public administrators. There is certainly no one-size-fits-all approach, but it is evident that not all public officials need to be trained and function as data scientists. Different data roles and skill sets are required at different levels, as illustrated in Table 7.

Table 7. Different roles and skill sets for data users in the government

Roles (non-exclusive)	Description	Required skill sets
Data leadership, data stewards	Various titles and functions: - Chief data officer - Chief digital strategy officer - Chief information officer - Chief technology officer - Chief evaluation officer - Chief innovation officer - Data ambassador	Leadership skills (in technical and policy areas) to provide data oversight, policy and technical frameworks for data reuse, sharing, scalability (such as master data management), data quality, security and privacy; set cross-government data standards and manage inventory of data assets; manage OGD.
Policymakers and decision-makers	Ministers, secretaries, directors, or other senior officials with decision-making roles	Understand and interpret reports in data analytics for value-adding insights and decision-making; derive data-driven or data-centric insights to generate desired outcomes and impacts through strategic decision-making.

[37] (World Bank, 2022)

Policy analysts (sectoral)	Those with analytical skills, especially with domain expertise relating to specific sectors (such as health or education); able to assist in policy analysis in support of public policy making (from planning to implementation to evaluation)	Skills in using business intelligence tools and self-service analytics and adept at working with data to "discover" answers; provide data-driven insights and foresight for policymakers to understand structured and unstructured data; use algorithms in analytics software programs to make informed decisions in diverse fields (including health care, disaster management, crime and security, and traffic management)
Public officers (administrators)	Most public sector employees	Able to benefit from data visualisations; can use data for daily operations or reporting.
Data scientists	Technically trained specialists in analytics and data science; "power users" associated with business intelligence	Trained academically or technically; have specific skills (able to deal with Python and other data tools and data services); able to handle data-based infrastructure, data warehousing and statistics; have a contextual understanding of domain subject-matter expertise; may have specialised skills (in areas such as AI)

Source: (UNDESA, 2020)

4.2.2. The findings on Bhutan

Key institutional setups and changes

54. The online survey assessed the presence of institutional units responsible for overseeing various aspects of data governance, including leadership, coordination, enforcement, standardisation, and management. Findings revealed that 14% of respondents affirmed the existence of such units, while 34% reported partial implementation. However, 27% indicated a lack of these units, and 25% remained uncertain about their existence (Figure 12).

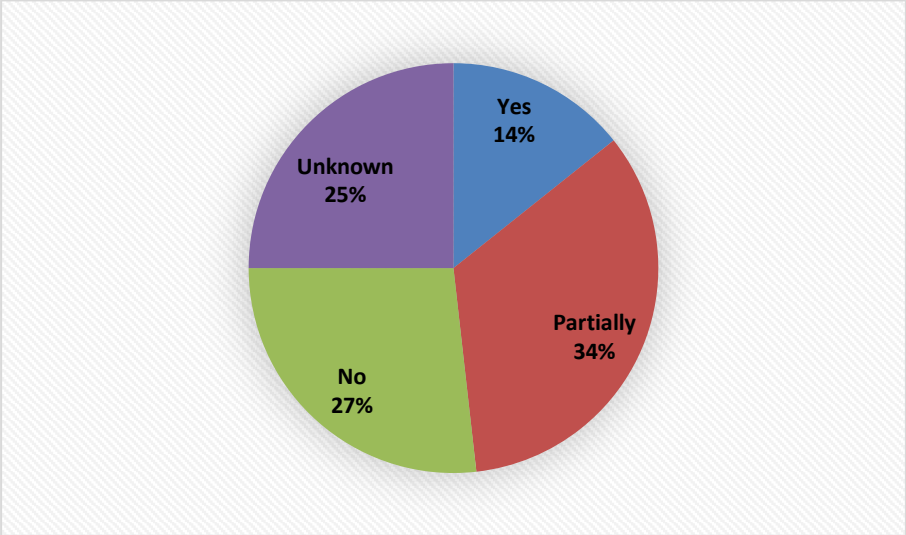


Figure 12 Existence of institutional set up (% of responses)

55. The institutions, as reported by respondents who indicated the existence or partial existence of institutional units, include government departments overseeing education, forestry, and livestock, specialised divisions focusing on labour market information and air traffic services, units providing IT services, academic units within educational institutions, entities involved in policy formulation and planning, HR management divisions, judiciary and legal entities, statistical and research entities, among others. Together, these institutions contribute to data governance, management, and service delivery across the government machinery.

56. In terms of statistics, Bhutan has developed the BSS. As per the current setup, significant participants within the BSS are categorised into data generators, facilitators of the system, and recipients of data. Development partners are also involved in supportive capacities. Within the government, primary participants comprise of the NSB, various ministries and agencies, and the RMA.[38]

57. Creation of Governance Cluster Group, one of the four clusters in the overall governance, has brought GovTech Agency and the NSB under one governance group headed by the Cabinet Secretary. This setup will help these important agencies work together better on managing data.

Roles, responsibilities, and coordination

58. While acknowledging the government's dedication to e-government and digital data governance, interviewees highlighted the necessity for clearer delineation of roles and responsibilities among the various stakeholders. Specifically concerning data matters, there is a need for clarification regarding the connection between the existing BSS and the newly formed institutional framework

[38] NSB, 2018

related to e-government, and data governance.

59. The official establishment of GovTech Agency in December 2022 represented a crucial step forward in advancing digital transformation efforts aimed at enhancing government effectiveness, boosting efficiency, modernising public services, and cultivating a secure and prosperous digital economy in Bhutan. Under this initiative, all ICT operations have been centralised under GovTech Agency, and exclusively provides support for ICT systems.[39] GovTech Agency is overseen by a Commission headed by the Hon'ble Prime Minister with representatives from both the government and non-government sectors.

60. More clarity is required regarding the respective roles of the NSB and current statistical entities (including in the corporate sector), and GovTech Agency. This ambiguity touches upon the conceptual difference between official statistics and data. From our interviews, it appears that existing policies do not explicitly define this distinction. Furthermore, the future roles of the NSB in the context of e-government, where digital data management is crucial, remain unclear.

4.3. Processes

4.3.1. Concepts and international practices

61. Process and procurement focus on the technical and execution parts of the overall data governance. As indicated by DAMA International (2017), data processes and procedures differ from data policies in the sense that the former describes 'the how' while the latter focuses on the 'what' (what to do and what not to do) of data governance. Data governance tasks that require standard processes and procedures include, among other things, metadata management, data sharing and interoperability, data security, data privacy, data storage, and data quality assurance.

62. Several international guidelines and practices are found in relation to specific data processes and procedures. More discussion is provided in the next section about the six technical elements of data governance. In this section, it is worth mentioning a few of those guidelines and practices, including the DAMA Data Management Body of Knowledge (DAMA DMBOK), the Generic Statistical Business Process Model (GSBPM), Statistical Data and Metadata Exchange (SDMX), the Enhanced General Data Dissemination System (e-GDDS), and others (Box 2).[40]

[39] (RCSC, 2024)

[40] (DAMA International, 2017)

Box 2. Selected international guideline and practices on data process and procedures

DAMA Data Management Body of Knowledge (DAMA DMBOK) is an accessible, authoritative reference book for data management professionals. It supports DAMA's mission by 1) providing a functional framework for the implementation of enterprise data management practices, including guiding principles, widely adopted practices, methods and techniques, functions, roles, deliverables, and metrics; 2) establishing a common vocabulary for data management concepts and serving as the basis for best practices for data management professionals; and 3) serving as the fundamental reference guide for the CDMP (Certified Data Management Professional) and other certification exams. It covers specific topics on data governance, ranging from data architecture to data modelling and design, data storage and operation, data security, data integration, and interoperability.

The Generic Statistical Business Process Model (GSBPM) provides a basis for statistical organisations to agree on standard terminology to aid their discussions on developing statistical metadata systems and processes. It serves as a flexible tool to describe and define the set of business processes needed to produce official statistics. It is applied to all activities undertaken by producers of official statistics at both the national and international levels, which result in data outputs. It comprises of four levels - Level 0: the statistical business process; Level 1: The nine phases of the statistical business process; Level 2: The sub-processes within each phase; and Level 3: A description of that sub-process.[41]

Statistical Data and Metadata Exchange (SDMX) is an international initiative aimed at facilitating the exchange of statistical data and metadata. It comprises a model to describe data and metadata, a standard for automated machine-to-machine communication and supporting technology. SDMX supports data dissemination by 1) allowing multiple organisations to retrieve data from a single source (i.e., moving from "push" to "pull" dissemination), thus reducing reporting burden; 2) enabling machine readability which helps improve efficiency and speed of data exchange, increase scalability, and reduce (human) errors; 3) utilising common dimensions, descriptions, and data models to facilitate easy access for users; and (iv) allowing for monitoring of data releases by organisations.[42]

Enhanced General Data Dissemination System (e-GDDS) is a data standard initiative by the IMF. Adopted in 2015 to supersede the GDDS, the e-GDDS provides the standard for participating

[41] (UNECE Secretariat, 2019)

[42] (IMF, 2022)

countries to compile and disseminate 15 key data categories relating to real, fiscal, monetary and financial, and external sectors. It adopts the five dimensions of data quality defined in the IMF's Data Quality Assurance Framework (DQAF) with assurances of integrity, methodological soundness, accuracy and reliability, serviceability, and accessibility. Accordingly, the e-GDDS metadata includes definitions and general considerations for (i) quality, (ii) coverage, periodicity, and timeliness; and (iii) access by the public.[43]

4.3.2. The findings on Bhutan

63. The online survey asked the implementation status of structured work processes designed to manage tasks related to data governance elements. As shown in Figure 13, only 9% of respondents confirmed the full establishment of such processes within their organisations. A larger proportion, 27%, reported partial implementation, suggesting ongoing efforts but incomplete execution. In contrast, a significant portion (41%) indicated a complete absence of structured work processes for data governance tasks. Additionally, 23% of respondents were unsure about the existence or status of these processes within their organisations.

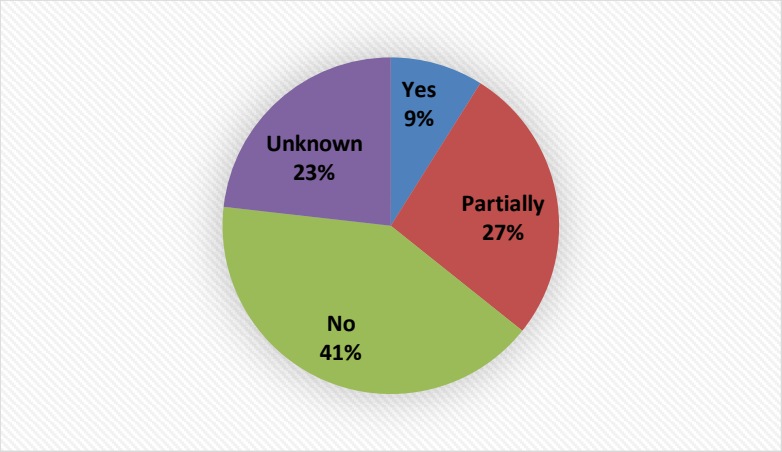


Figure 13 Existence of a defined structured work process to operationalize data governance (% of responses)

64. The outlined processes, as stated by the survey respondents, cover a wide array of activities concerning data management, governance, and sharing across various departments and divisions. While some processes are structured, like standardised formats and data sharing mechanisms, others are less formal or unstructured. Data reporting, storage, and analysis take place through different channels, including digital platforms like Google Sheets, with plans for future digital reporting. Specific procedures are also delineated for tasks such as flight data entry, amending operational procedures,

[43] (IMF, 2015)

and ensuring system accuracy during development. Furthermore, detailed guidelines for data privacy and sharing encompass steps like requesting data, assessing sensitivity, de-identification, and obtaining necessary approvals.

65. Some processes and procedures for data governance are being developed in Bhutan. As will be elaborated in a later section on the six elements, Bhutan has participated in and implemented specific international standards on data management, such as the IMF's Enhanced General Data Dissemination System (e-GDDS) and the UN's International Standard Industrial Classification. However, many gaps remain, including the rules and procedures for classifying data by level of sensitivity which in turn dictates its shareability, the data standards needed to ensure smooth exchange and interoperability, and the processes to ensure data security and privacy.

4.4. People and resources

4.4.1. Concepts and international practices

66. Governments need proper infrastructure, human resources and budgets to support their data governance works. More specifically, they need reliable internet access, basic digital skills across the population, and human resources equipped with data-related skills in government, private sector, and civil society. Public sector agencies, in particular, need a sufficient budget to support both their relevant regular operations and investment. These resource needs apply not only at the national but also at the sub-national level where most service delivery responsibilities reside and, hence, more demand for better data.[44]

67. Data skills and capability are core elements of effective data governance. A workforce with the right skills and capability to manage and use data effectively is essential for government agencies. This means ensuring all staff have a basic level of data literacy and enough staff with specialised data skills spread across the organisation. Given the advanced digitalisation, the specialised data skills can range from basic data literacy to more advanced expertise needed for large amounts of data, implementation and management of data systems, data engineering and cyber security.[45]

68. There are several good practice cases identified in this study, one of which is the case from New South Wales (NSW) Government in Australia. According to its Data Governance Toolkit, the NSW Government indicates that a public institution needs a combination of data skills, including those listed

[44] (ITU, 2023)

[45] (NSW Government, 2023)

below.

- **Data-literate**: all staff have a foundational level of data literacy;
- **Specialised**: staff with specialised data skills are spread evenly across the organisation and can be leveraged when required;
- **Development-focused**: senior leadership supports the professional development of data skills and awareness across all levels of the organisation;
- **Cross-disciplinary**: teams have the right combination of technical data skills, as well as non-technical policy, project, and business acumen; and
- **Training**: staff have access to data skills resources and are trained in relevant governance policies and procedures.[46]

69. The good practices from the NSW also offer concrete ideas on how data-related workforce and skills can be developed. Those include the implementation of workforce skills and capabilities needs assessment, a clear job description, the development and implementation of a workforce strategy, regular professional development for staff, the development of cross-disciplinary skills among staff, and access to data governance resources. The NSW Government also refers to the California Health and Human Services Agency for specific guidelines on data governance (Box 3).

Box 3. Building data governance workforce and skills – NSW Government, Australia

The NSW Data Governance Toolkit (2021) offers specific guidance on how to build a data governance workforce and skills. **First, an organisation should consider conducting a capability assessment.** This analytical task can help facilitate a conversation within the organisation to identify and address data skills and capability gaps. This exercise focuses on assessing an organisation's current assets and capabilities—including technology and human resources – to leverage their data to help formulate program or policy solutions. In the process, the following questions should be asked:

- What data do you currently collect?
- What technology can you leverage?
- What data analytics tools do you have available within the department or agency?

[46] (NSW Government, 2024)

- What established processes can you leverage?
- What are the training needs?

Second, informed by the need assessment, the organisation can proceed to develop a workforce strategy to address data skills and capability gaps. The strategy should include the development of training, resources, and education to build and develop individual capabilities. It is best practice to include a mix of face-to-face, discussion-based and leadership-led training as well as self-guided online training. For self-guided learning resources, refer to the NSW Data Skills – Learning Resources and the APS Data Literacy Learning Guide.

Third, equally important is the need to invest in the development and recruitment of staff with specialised data skills. The following examples provide a good reference point for identifying the skills required across teams, as well as the agency:

- Data analyst – manipulate and interpret data for decision making and to solve problems;
- Data policy and law expert – monitor the effectiveness of controls, resolve compliance challenges, advise on legal rules and controls to meet applicable legislation and standards;
- Data scientists – are hybrid experts in analysis and software programming, possess strong business acumen, coupled with an ability to communicate findings;
- Data infrastructure engineers – support the infrastructure required to make data applications and platforms available in agencies and across the public service;
- Data architects – ensure the design of data systems, and provide technical support for systems to undertake analysis.

Other areas for consideration include establishing multidisciplinary teams to achieve skill-sharing and optimal project outcomes. If there is a lack of data expertise in the agency, it is important to consider engaging staff with specialised data skills when the skill is required. Another is to ensure role descriptions including the skills and capabilities relevant to the data governance and management activities staff are expected to undertake.

Source: (NSW Government, 2021)

4.4.2. The findings on Bhutan

70. The survey also aimed to evaluate the engagement of designated individuals, such as data or information officers, in managing and leading elements of data governance. Results revealed that only

9% of respondents confirmed the full engagement of such individuals with the requisite knowledge and skills within their organisations. A larger proportion, constituting 39%, reported partial engagement, suggesting ongoing efforts but incomplete involvement in data governance leadership roles. Conversely, a significant portion (34%) stated a complete absence of designated individuals with the necessary knowledge and skills to manage data governance elements. Additionally, 18% of respondents were uncertain about the engagement status of designated individuals within their organisations (Figure 14).

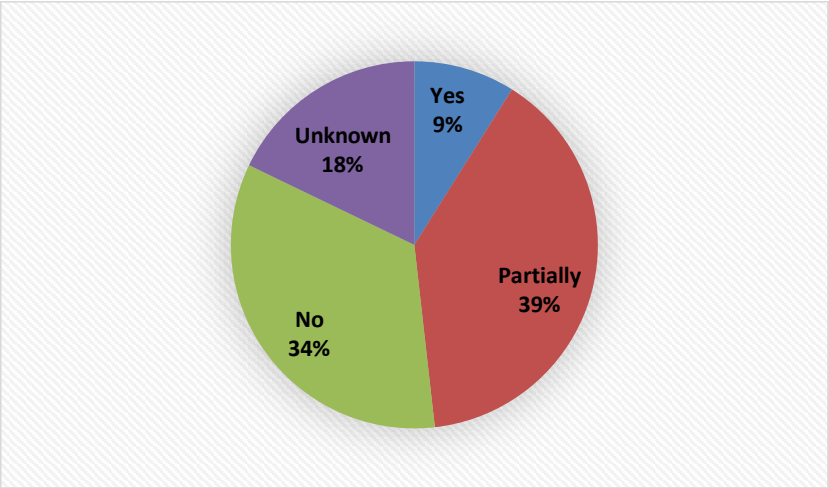


Figure 14 Existence of a designated people to operationalize data governance (% of responses)

71. The survey further reveals that the listed types of personnel involved in data governance activities in Bhutan encompass a diverse range of roles and responsibilities across various sectors. These include e-MIS focal from respective divisions, statistical officers, ICT personnel, registration unit staff, engineers, legal assistants, section in-charges, epidemiologists, mining engineers, and individuals multitasking in the information and communication sector. Additionally, there are designated focal points at department and field office levels for administering specific data reporting and monitoring systems. Furthermore, leadership and technical staff from different divisions are engaged in data governance activities, including those from policy and planning, HR management, and technology units.

72. The survey also shows that a significant majority of staff (69.6%) have not received training on data management, while a smaller percentage (21.4%) have undergone such training. Additionally, the mean rating score of staff capacity is 5.4 out of 10, suggesting that, on average, staff members' proficiency in data management falls around the midpoint of the scale. This indicates a potential gap in skills and knowledge within the organisation, highlighting the importance of providing training opportunities to enhance staff capacity in handling data-related tasks effectively.

73. All key informants have also highlighted concerns regarding the scarcity of human resources. They mentioned instances of agencies having only one person responsible for data-related tasks, and in some cases, individuals without specialised data training fulfilling these roles. The shortage of personnel with data expertise is exacerbated by broader issues in personnel management. These include challenges in recruiting additional staff with backgrounds in ICT and statistics, the departure of trained personnel, insufficient mentorship from parent agencies, and the absence of organisational strategies for consistently enhancing staff skills.

5. Bhutan's data governance – the six elements

5.1. Data standardisation and classification

5.1.1. Concepts and international practices

74. Data standardisation and classification are essential for ensuring data consistency and compatibility, providing guidance on the sensitivity of specific data and how it can be shared. They enable uniform identification, collection, validation, and sharing of data, breaking down silos and creating interoperability between disparate systems and teams. These practices are crucial for maintaining data integrity, ensuring its value, consistency, and accuracy. However, enforcing them across specialised and autonomous governments and multiple sectors poses challenges.[47] Standardisation involves transforming data into a uniform format, eliminating inconsistencies and errors, thus improving data quality and facilitating interoperability. Classification organises data into meaningful categories, ensuring efficient management and retrieval. International practices for standardisation and classification involve adopting common standards and frameworks by organisations like ISO and IEC, ensuring data consistency and compatibility worldwide and promoting efficiency, accuracy, and transparency in data exchange and communication.[48]

75. At the international level, there exist guidelines for categorising specific data as confidential, restricted, internal, or public. ISO 27001 provides step-by-step guidance for organisations to classify their data, with confidential data being the most protected, followed by restricted, internal, and public information. These classifications are based on the sensitivity of the data and the associated risks.[49] Confidential data, including information protected by privacy regulations, requires the highest level of protection. In Israel, data privacy regulations, including the Protection of Privacy Law of 1981, address privacy concerns broadly, with additional regulations focusing on data security and international data

[47] DAMA International, 2017

[48] (Profisee, 2024)

[49] (IT Government, 2017)

transfers. These regulations mandate measures such as encryption for sensitive data, limited retention periods, database registration, and mandatory reporting of breaches.[50]

76. Data classification and standardisation can also concentrate on the particular technical procedures involved in data management. Data classification and standardisation are pivotal components of data management, encompassing the categorisation of data based on various criteria to enhance security, ensure regulatory compliance, and streamline processes. This involves identifying data types, implementing security measures, and aligning with business policies through collaboration between data management teams, executives, and IT professionals. Effective data classification enables organisations to comply with regulations, reduce costs, mitigate risks, and maintain data integrity, forming a vital part of a robust data governance strategy. Furthermore, data classification and standardisation address technical intricacies by establishing documented agreements on data representation, format, structuring, and management.[51]

5.1.2. The findings on Bhutan

77. The online survey reveals critical deficiencies in data governance practices with regard to data standardisation and classification (Figure 15). Firstly, only 14.3% have established explicit policy statements concerning data standardisation and classification, indicating the existence of gap in policy establishment. Furthermore, a mere 16.1% have clearly defined units or directorates responsible for managing these issues, indicating a lack of clarity in responsibility assignment. Additionally, only 12.5% report having trained and capable personnel designated to handle data standardisation and classification, highlighting a significant deficiency in personnel capability. Moreover, just 14.3% have well-defined work processes in place, underscoring the need for clearer procedures and guidelines.

[50] (Comforte, 2022)

[51] (Datamation, 2024)

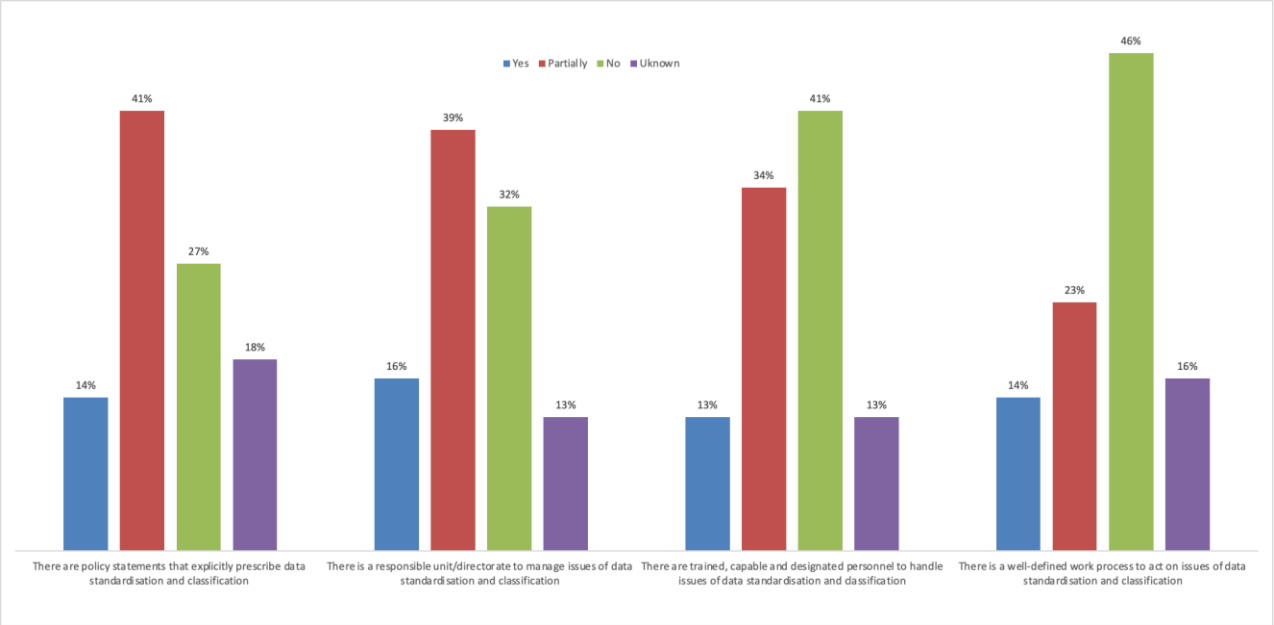


Figure 15 Responses on data standardisation and classification based on the four pillars

78. The online survey also asked about other elements of data standardisation and classification (Figure 16). It is evident that there is a notable percentage of individuals reporting partial implementation or uncertainty regarding key data management practices within departments/organisations. Specifically, while 14.3% affirm an ongoing process to harmonise data standards and classification, more than half (51.8%) indicate only partial implementation of data quality checks, and 33.9% report uncertainty regarding the reliability of submitted data/statistics. However, 42.9% of respondents acknowledge encountering challenges in data standardisation and classification within departments/organisations.

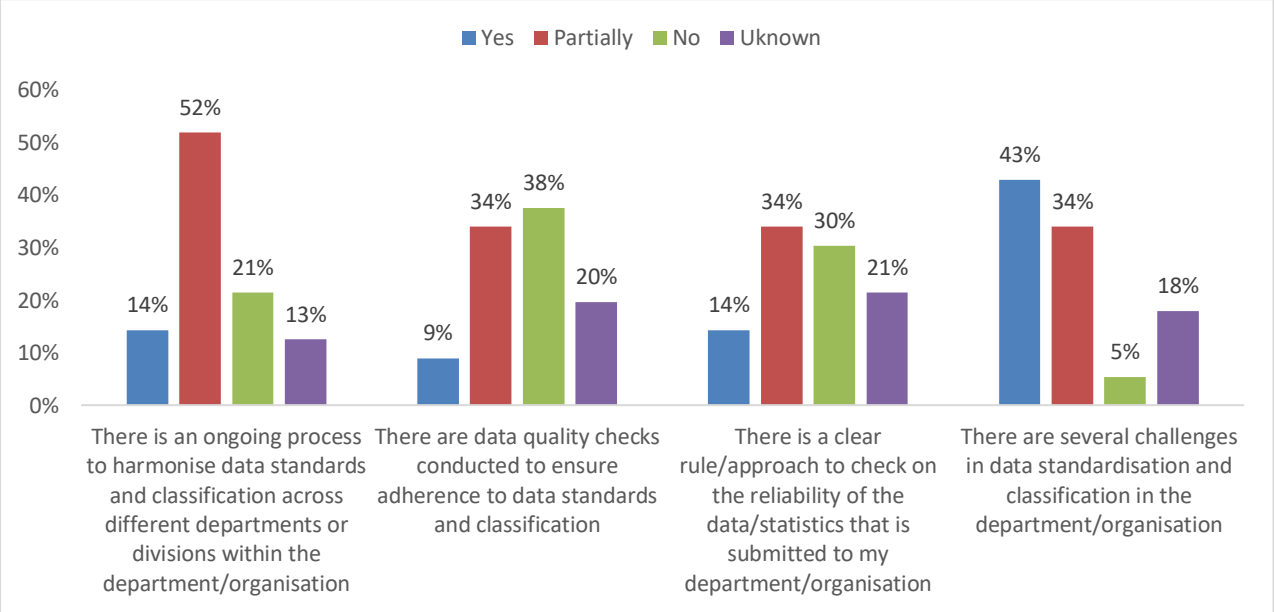


Figure 16 Responses on other aspects of data standardisation and classification

79. In terms of data standardisation, Bhutan has made noticeable progress. The country has used certain internationally accepted and recommended methodologies, classifications, and standards, such as on the Systems of National Accounts (SNA), a compilation of government finance statistics, Bhutan Standard Statistical Code, Bhutan Standard Statistical Geographic Code, Bhutan Standard Classification of Occupations, Bhutan Standard Industrial Classification, and the Statistical Data and Metadata Exchange (SDMX) for metadata.

80. Additionally, the Standardisation of Measurement Unit Survey 20O2, the Bhutan Standard Statistical Codes 2020, the Bhutan Standard Statistical Geographic code 2020, Bhutan Standard Industrial Classification 2020, the Bhutan Standard Classification of Occupation 2022, the Guideline on Assessing Quality of Administrative data for Producing Official Statistics, and the Bhutan Statistics Quality Assurance Framework 2020, with the NSB and mostly based on United Nations classification sets standard and quality for data coding and classification in Bhutan.

81. There is a recent push in terms of classification of data according to its sensitivity and shareability. For example, the Data Management Guide 2023 recommends concerned agencies to categorise data and set guidelines to ensure safe internal and external sharing, avoiding legal breaches and harm to the agency, its staff, or third parties. The data can be classified according to public, internal, confidential or strictly confidential.

82. There is no uniform and consistent legal provision in Bhutan on the classification of government data according to its sensitivity and shareability. All the key informants have confirmed this finding. What exists are specific articles in sectoral laws and regulations (such as the ICM Act 2018) which prohibits the sharing of information on any individuals and businesses except at the order of the court. With such fragmentation in the legal frameworks, there is often uncertainty as to what data is considered confidential, private, or public. Nevertheless, the metadata management plan of the NSB for survey data and the guidelines on assessing quality of administrative data for producing official statistics based on the Executive Order issued to the NSB in 2006 functions as the alternate form of legal provision to classify data in Bhutan.

83. The absence of clear legal guidelines has hindered data sharing universally. All interviewees noted a tendency to withhold data from other ministries and private individuals unless there is explicit approval from management, a procedure that is often lengthy and demotivating. Furthermore, some officials have used vague legal provisions as excuses to conveniently categorise data as ‘sensitive’ data.

84. A commonly recognised challenge lies in the coordination between various ministries and

agencies. For instance, different ministries maintain slightly varied coding systems for geographical locations, such as *dzongkhag* and *gewog*. Similarly, some agencies have not uniformly adopted standard industry classifications.

5.2. Data sharing, exchange, and interoperability

5.2.1. Concepts and international practices

85. Data sharing and exchange is critical to inter-ministerial coordination and cross-sectoral policy integration. However, key challenges need to be addressed before this can be achieved. First, there is the cohesion in the way that data is shared and managed. At the horizontal level, one way is to combine and share data about an individual or a business entity from several systems across agencies to gain a better overall picture of the individual or the business. That approach will allow governments to provide e-services using a life-event approach.

86. Comprehensive interoperability would have a transformative impact in a number of areas. This ranges from the way governments monitor the effects of specific initiatives to the way they deliver services to the public. To benefit from this, different government departments would have to set up effective mechanisms for data exchange. Various approaches have been used by different countries to promote data sharing and interoperability, as indicated in Table 8.

Table 8: Approaches to sharing, linking, and exchanging data and strengthening interoperability

Approach	Description
Open government data	Publishing open government data that are accessible internally within the government and externally to the general public.
Linked data	Linked data is a technical standard for structuring complex information and relating and linking independent sets of data from different sources; used for launching linked open government data portals to connect isolated data repositories (data silos).
Data sharing	Sharing government data in accordance with guidelines, policies or other instruments that govern data formats and dictate data management, retention, security and privacy rules.
Interoperability	Enabling systems and devices to exchange machine-readable data from multiple sources in a standardised and contextualised way and to interpret shared data. Standards are essential for data interoperability, as they allow different system components to be integrated seamlessly without any loss

	of meaning or integrity.
Data exchange	Often a combination of two or more of the elements listed above; platforms that provide two-way data exchange through application programming interfaces (APIs), data exchange portals or centralised data services.

Source: (UNDESA, 2020)

87. For statistical data, there are international standards on what and how such data should be shared. One example is the IMF's General Data Dissemination System (GDDS) which was started in 1997 and was later upgraded and grouped to Enhanced General Data Dissemination System (e-GDDS), Special Data Dissemination System (SDDS) and SDDS Plus. The e-GDDS indicates specific types of statistical data that need to be made public (there are 15 of them), and the timeliness and periodicity of the data releases. As of now, about 95% of the IMF's member countries are participants in the GDDS schemes. Bhutan belongs to the e-GDDS group.[52]

5.2.2. The findings on Bhutan

88. The online survey unveils a mixed landscape regarding data sharing and interoperability practices within departments/organisations (Figure 17). While a moderate percentage reported the existence of policy statements (17.9%) and responsible units (19.6%) for managing these aspects, there is a glaring deficiency in personnel capability, with only 12.5% indicating trained and capable personnel. Additionally, the presence of well-defined work processes (17.9%) remains relatively low. However, there is a considerable focus on data security with a quarter of the respondents mentioning measures in place to protect sensitive or confidential data during sharing and interoperability (Figure 17).

[52] (IMF, 2022)

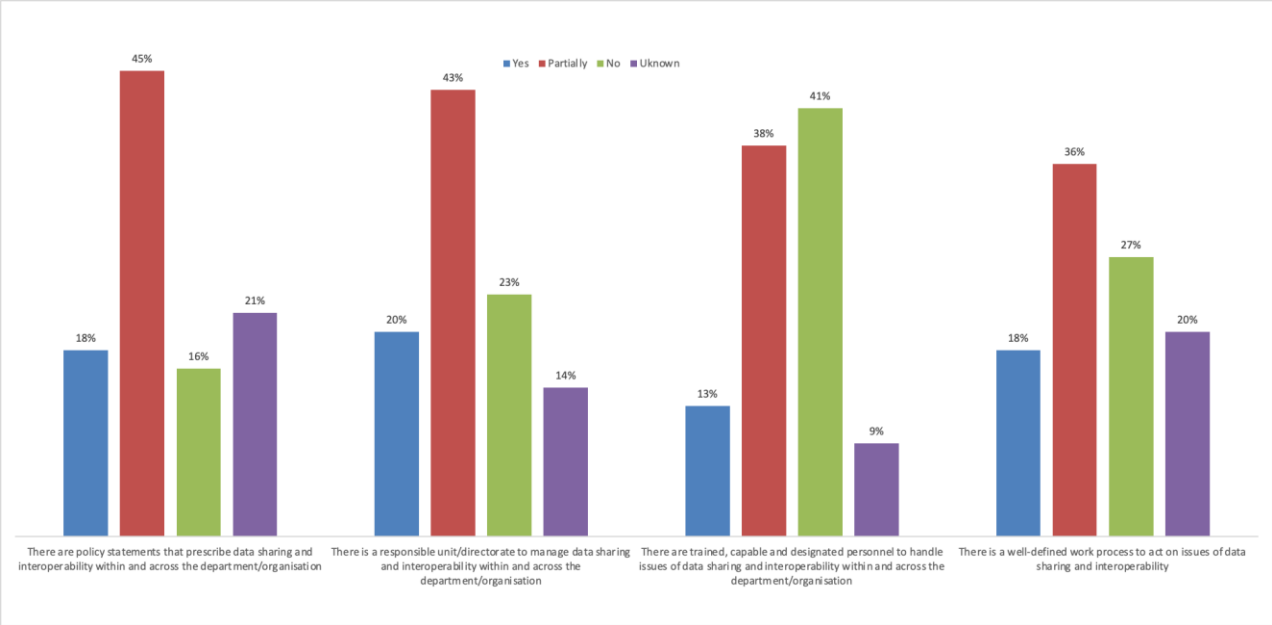


Figure 17 Responses on data sharing and interoperability based on four pillars

89. The survey also reveals a mixed landscape regarding data sharing and interoperability practices within departments/organisations and with external entities (Figure 18). While some measures are in place to protect sensitive data during sharing (25%) and there are established agreements for data exchange with external entities (21%), there is a considerable lack of strategy for prioritising datasets for open data initiatives (9%). Additionally, while there is partial ease reported in sharing data within departments/offices (38%) and with external organisations (50%), there are still significant proportions reporting difficulties or lack of clarity in these processes. About one-third (32.1%) of respondents acknowledge encountering challenges in managing data interoperability among systems within and across departments/organisations, indicating the presence of significant obstacles in this area.

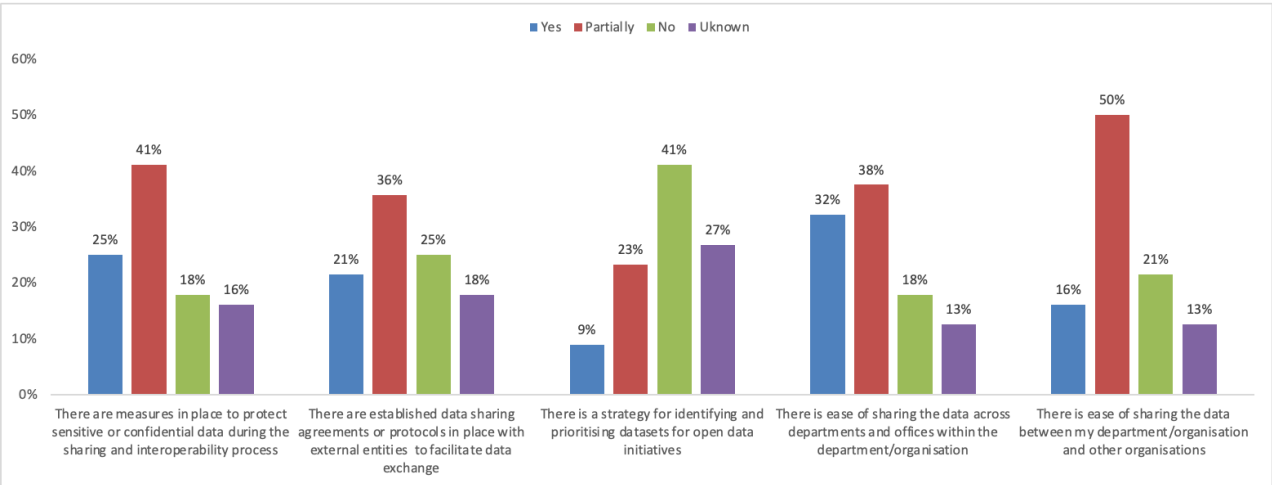


Figure 18 Responses on other key aspects of data sharing and interoperability

90. Datahub platform project was initiated to enhance data integration and sharing, thereby supporting data-driven decision-making. The initiative aims to establish a national information exchange layer that serves as the central access point for government agencies' data needs. Additionally, protecting user privacy is a fundamental aspect of this collaborative system.

91. The national information exchange layer was built using WSO2 Application Program Interface (API) Manager and WSO2 Enterprise Integrator, with WSO2 Identity Server managing authentication and identity verification. This system enables data custodians to develop and publish APIs in the API store, accessible in both staging and production environments, for government agencies to discover and utilize. By doing so, it eliminates data duplication, streamlining access to information. Agency users and developers are now required to adapt their IT systems to integrate with the data hub. Moreover, the citizen user store, integrated with citizen data, securely authenticates users, ensuring privacy and confidentiality are maintained.

92. Although there are various data sharing standards in place, such as the e-Governance Framework, Data Management Guide, and Interoperability Framework with GovTech Agency, effectively implementing these standards has been a significant technical challenge for data sharing. Interviews have revealed that in cases and areas such as national accounts and government statistics, where international data standards have been adopted and put into practice, data sharing among relevant government agencies (e.g., NSB, MoF, and RMA) has been advancing.

93. In the recent years, more data has been made available on government agencies' websites, as well as data are shared through online requests (public use files for NSB) and through standard format requests (e.g., hydrometeorological data). The online survey shows that top three methods of data sharing include through email exchange, followed by excel/spreadsheets and the Google Workspace suite (including Drive, Docs, and Sheets) reflecting the popularity of cloud-based collaboration tools for sharing and working on documents.

94. Some efforts are also underway to enhance data sharing and compatibility within the government and with the public. One such initiative is the implementation of the National Summary Data Page (NSDP) of the NSB, which facilitates automatic exchange and sharing of statistical data and metadata using Statistical Data and Metadata eXchange (SDMX), a standard for machine-to-machine transmission. Currently, the NSDP has data on macroeconomic and financial data, and demographic and socio-economic indicators.

95. The Bhutan Statistical Database System (BSDS), which is a centralised initiative led by the NSB to manage, disseminate, and utilize statistical data effectively in Bhutan, attempts to address the

challenge of disparate data sources by consolidating information from *gewog* to the national level. The BSDS aims to streamline administrative data processes, including collection, validation, maintenance, and dissemination, promoting efficiency and accuracy. Key objectives of the BSDS include facilitating closer collaboration among stakeholders involved in statistical activities and integrating existing data systems for a unified statistical platform. Moreover, the system prioritizes user-centric data dissemination by tailoring reports to meet specific user needs. It has plans to integrate with other systems such as Education (EMIS), and Forestry (FIRMS).

96. The NSB also launched the Bhutan Interactive Data Portal, offering over 1,000 statistical indicators covering various aspects such as population, welfare, economy, and more. The portal aims to foster a data-driven culture and facilitate insights into the Bhutanese economy and population. It features interactive maps and graphs for users to analyse trends over time and compare between different *dzongkhags*.

5.3. Data security (and protection)

5.3.1. Concepts and international practices

100. Data security concerns protection of digital information from unauthorised access, data corruption or theft throughout its entire data lifecycle. This concept encompasses the entire spectrum of ensuring information security, privacy and protection. It includes the physical security of hardware technology and storage devices, along with administrative and access controls. It also covers the logical security of software applications and organisational policies and procedures.[53] Almost every country experiences some form of government data security breach. Although the cost implications could be enormous, it is necessary to proactively embed the foundational principles of privacy by design and employ privacy enhancing technologies during every stage of the data life cycle to ensure robust data protection, in an effort to prevent data security risks to privacy and other harms.[54]

101. Data security includes the planning, development and execution of security policies and procedures to provide proper authentication, authorisation, access, and auditing of data and information assets.[55] For instance, personal data should be de-identified, where appropriate, using such methods that can minimize any potential risks to privacy, taking into account the likely occurrence of any potential harms associated with data use. Personal and sensitive data when transferred to or

[53] What is Data Security? (IBM) Retrieved from https://www.ibm.com/topics/data-security

[54] (United Nations Development Group, 2017)

[55] (DAMA International, 2017) (UNDESA, 2020)

from any network-connected server should be encrypted. No de-identified data should knowingly and purposely be re-identified, unless there is a legitimate, lawful and fair basis. Such measures should be employed in ways that it maximises the positive impact expected from the data use to fulfil the purposes of obtaining the data. Data access should be limited to authorised personnel only, based on the "need-to-know" principle. Personnel should undergo regular and systematic data privacy and data security trainings. Prior to data use, vulnerabilities of the security system should be assessed. Finally, data security measures should be assessed considering the risks, harms and benefits of data use.[56]

102. Data security depends on the overall quality of cybersecurity in an organisation. It is determined by the strengths of the five pillars or measures of (i) Legal Measures, (ii) Technical Measures, (iii) Organisational Measures, (iv) Capacity Development, and (v) Cooperation.[57] Therefore, when considering the risks associated with the vulnerability of data security systems, it is important to consider factors such as intentional or unintentional unauthorised data leakage or breach by authorised personnel, by known third parties who have requested or may have access, or may be motivated to get access to misuse the data and information, and by unknown third parties.[58]

103. DAMA International stipulates that organisations need to identify data security requirements, defining the data security policy standards, assessing the security risks and by implementing appropriate controls and procedures. There are numerous specific tools and techniques available, which includes immediate patch deployment, protective software, metadata tracking, data masking and encryption etc.[59] According to guidelines based on existing international instruments and relevant rules, policies of UNDG members, special attention should be paid when using cloud services, especially with regard to the data security setup and physical locations at which data is stored. Usage of non-cloud storage should be considered for sensitive data. When third-party cloud storage providers are used, potential risks and harms associated with the use of such cloud storage should be considered.[60]

5.3.2. The findings on Bhutan

104. The survey shows varied levels of implementation and challenges related to data security management within departments/organisations (Figure 19). While a minority have clear policy statements (21.4%) and designated units for managing data security (25.0%), a significant portion

[56] (United Nations Development Group, 2017)

[57] (ITU)

[58] (United Nations Development Group, 2017)

[59] (DAMA International, 2017)

[60] (United Nations Development Group, 2017)

report partial implementation or lack thereof. Similarly, trained personnel specifically designated for data security are scarce (16.1%), with partial implementation being more common (35.7%). Additionally, well-defined processes for addressing data security issues are limited (12.5% fully, and 33.9% partially).

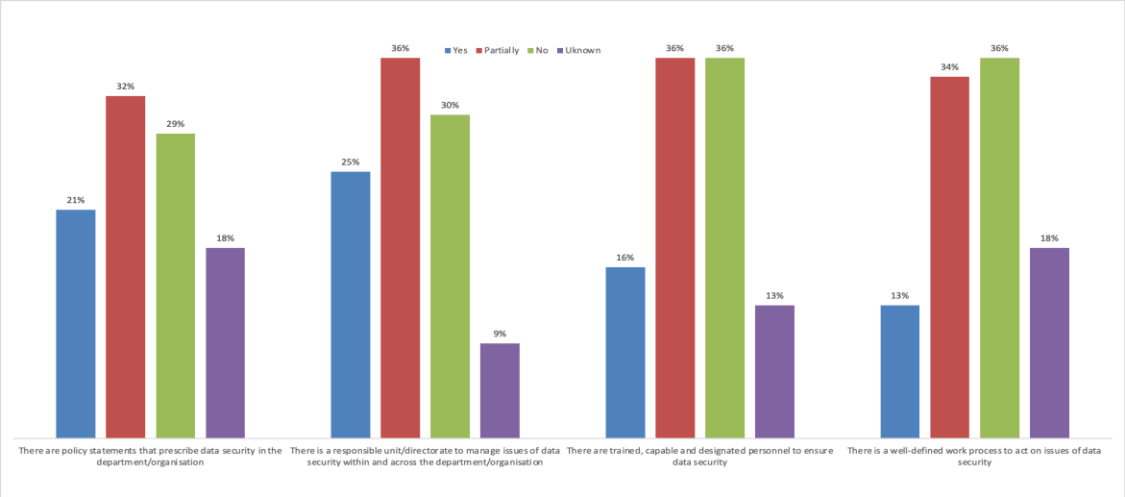


Figure 19 Responses on data security based on four pillars

105. Figure 20 highlights significant disparities in the implementation of key data security measures within departments/organisations. While a minority affirm the presence of procedures for data classification and handling based on sensitivity (16%) and protocols for data backup and disaster recovery (23%), there is notably low adoption of regular awareness exercises about data security risks (9%) and mechanisms to protect data during storage, transmission, and disposal (11%). Furthermore, access management appears to be a challenge, with only 14% reporting mechanisms to track and manage access privileges. Moreover, most respondents acknowledge facing challenges in managing data security (35.7% fully, and 41.1% partially), showing widespread difficulties in ensuring robust data security practices.

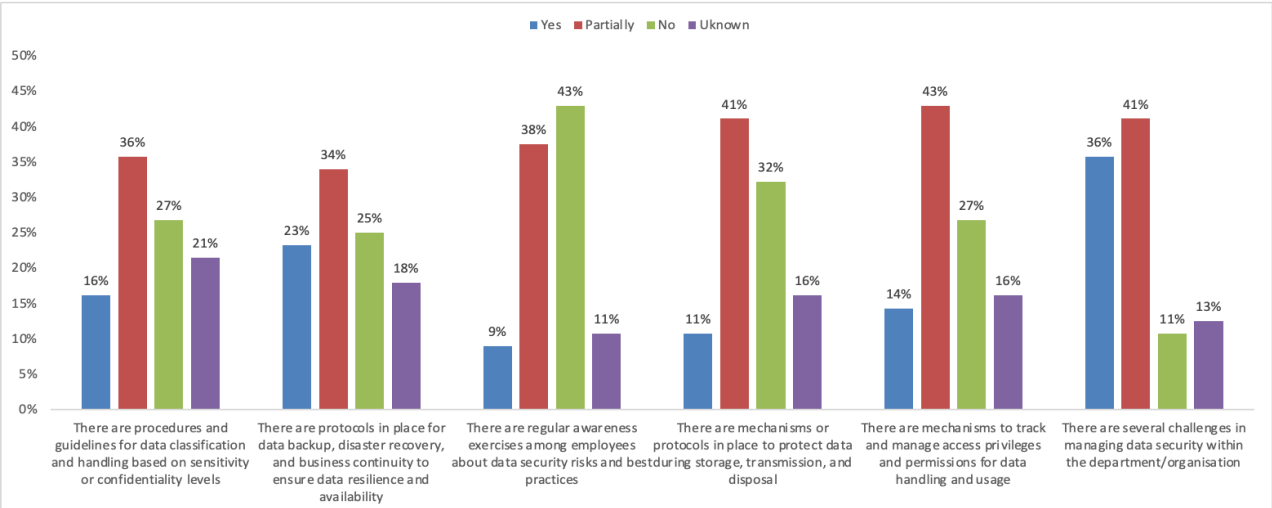


Figure 20 Responses on other key aspects of data security (and protection)

106. Starting off with overall cybersecurity, Bhutan has made good progress in recent years, but the overall situation is still very vulnerable. The establishment of Bhutan Computer Incident Response Team (BtCIRT) as the cyber incident response unit (CIRT) and a single point for international coordination is a key progress in institutional setup. However, challenges are still to overcome and tasks to complete, including on legal and technical aspects.

107. The government recognizes the importance, and the challenges associated with cyber security in general and data security in particular. Key informant interviews highlight specific issues that increase the public sector's susceptibility to cybersecurity and data risks. Those include excessive use of unlicensed software, users' exposure to computer viruses, and the risk of data loss. The online survey shows that at least a quarter of the respondents reported data loss incidents in the last three years (Figure 21).

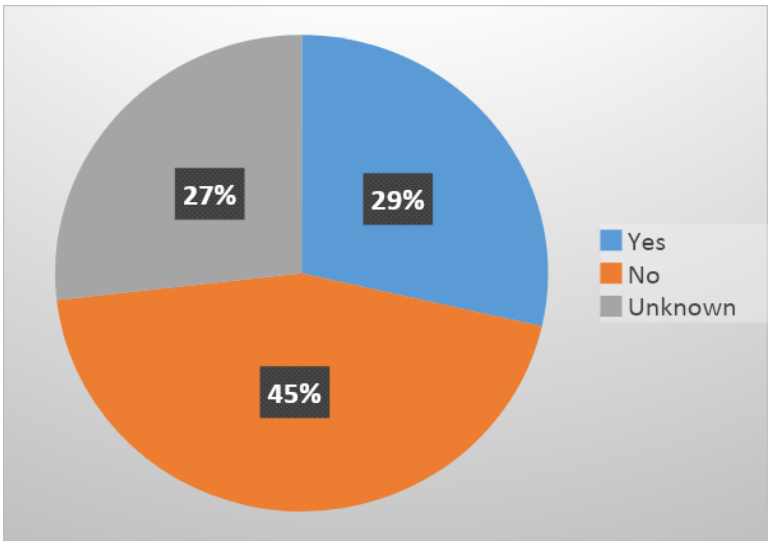


Figure 21 Responses on the data loss incidents in the last three years

5.4. Data privacy (and ethics)

5.4.1. Concepts and international practices

108. At the international level, privacy is unequivocally recognised as a fundamental human right. The right to privacy is enshrined by the Universal Declaration of Human Rights (article 12), the International Covenant on Civil and Political Rights (ICCPR, article 17), the Convention on the Rights of the Child (article 16), and the International Convention on the Protection of All Migrant Workers and Members of Their Families (article 14). A report of the Special Rapporteur to the Human Rights Council (A/HRC/23/40) defines privacy as “the presumption that individuals should have an area of autonomous development, interaction and liberty, a ‘private sphere with or without interaction with others, free from State intervention and from excessive unsolicited intervention by other

individuals'".[61] While most of the literature and legislature concentrates on "the right to privacy", in another such report of the Special Rapporteur on the right to privacy, it has been noted that there is currently no internationally accepted definition of privacy.

109. With the increasing trend and uptake of e-services and increased use of government data, data privacy has become even more relevant and pronounced today. While governments must collect and use large data sets to create good algorithmic models for policy making, there are concerns over whether the governments are making use of the collected data in ways that are transparent and respectful of the privacy of individuals and businesses. As a response, one of the measures adopted by many countries is for their governments to put out privacy statements on their e-government portals. However, about a third of all UN member states have not adopted such an approach yet.[62]

110. Several international practices on data protection employ several instruments with a set of core data protection and privacy standards. While these instruments have different names and vary in scope and content, personal data protection and privacy frameworks typically consist of the following groups of standards[63]:

(i) **Purpose specification:** Personal data should be processed only for one or more specified, explicit and legitimate purpose(s), stated to the data subjects at the point of collection.

(ii) **Data minimisation:** Personal data should be adequate, relevant and limited (i.e., minimal) to what is necessary in relation to the purpose(s) for which it is being processed.

(iii) **Lawfulness, fairness and transparency:** Personal data should be processed in a lawful, fair and transparent manner.

(iv) **Accuracy:** Personal data that is processed should be accurate, complete and, where necessary, up-to-date. The opposite would be inaccurate (incorrect or misleading), incomplete or outdated personal data.

(v) **Retention limitation:** Personal data should only be retained in a form that permits the identification of data subjects for the period of time that is necessary to achieve the purposes for which it was collected and processed. The right to privacy requires that no personal data is kept by the data controllers if the use purpose(s) has been fulfilled or is no longer pursued.

(vi) **Security:** Personal data, as well as the infrastructure relied upon for processing personal data, must be secure during storage, transmission and use. Appropriate physical, technological and organisational measures must be taken to ensure the security of data and systems, to protect

[61] (UNGA, 2014)

[62] UNDESA (2020)

[63] (Wagner, B, Ferro, C., Stein-Kaempfe, J. et. Al.,2021)

personal data from unauthorised or unlawful processing, and against accidental or deliberate loss, destruction, modification, disclosure, or unauthorised access and

(vii) **Accountability:** Those who process personal data should be accountable for demonstrating compliance with the data protection and privacy principles, fulfilment of their obligations, and facilitating the exercise of the data subject rights.

In sum, the focus is on applying data protection and privacy standards effectively and providing practical solutions for managing technology, including privacy by design, biometrics, cloud computing, automated decision-making, and AI. These approaches are utilised by major internet companies but not much is understood with regard to their applications in the public sector.[64]

111. Addressing ethical issues remains to be a critical concern but they are harder to address than privacy issues, because they exist outside the law but are a reflection of the society's collective and moral understanding.[65] The challenge for governments is that ethical issues cannot be always codified in data policies and regulations for data governance and digital technologies. Therefore, in cases where this is not possible, judgments on the appropriate use of government data must be governed by wider moral bearings or consensus. Given the increasing amount of available digital data, its use for AI and other purposes and the growing amount of regulatory activity around data indicates that the current data governance policy landscape should evolve around being grounded in ethical thinking, typically expressed in terms of human rights, aware of likely concerns, based on well-established principles and in the process of being codified in legislation, regulations and institutions.[66] However, the practical implementation of these principles, for instance about how conflicts among these principles can be resolved, remain unclear due to its complexity fuelled by diverse public perceptions around data privacy over time.

5.4.2. The findings on Bhutan

112. As per the online survey, there are significant shortcomings in data privacy and ethics practices. Only a small percentage reported the existence of policy statements (17.9%) and responsible units (25.0%) for managing these issues, indicating a lack of robust policy establishment and responsibility assignment. Moreover, there is a concerning shortage of trained personnel, with just 10.7% indicating

[64] UNDESA (2020)

[65] UNDESA (2020)

[66] (Eke, D., & Stahl, B., 2024)

capability in ensuring data privacy and ethics. Additionally, the presence of well-defined work processes to address these issues is low at 7.1% (Figure 22).

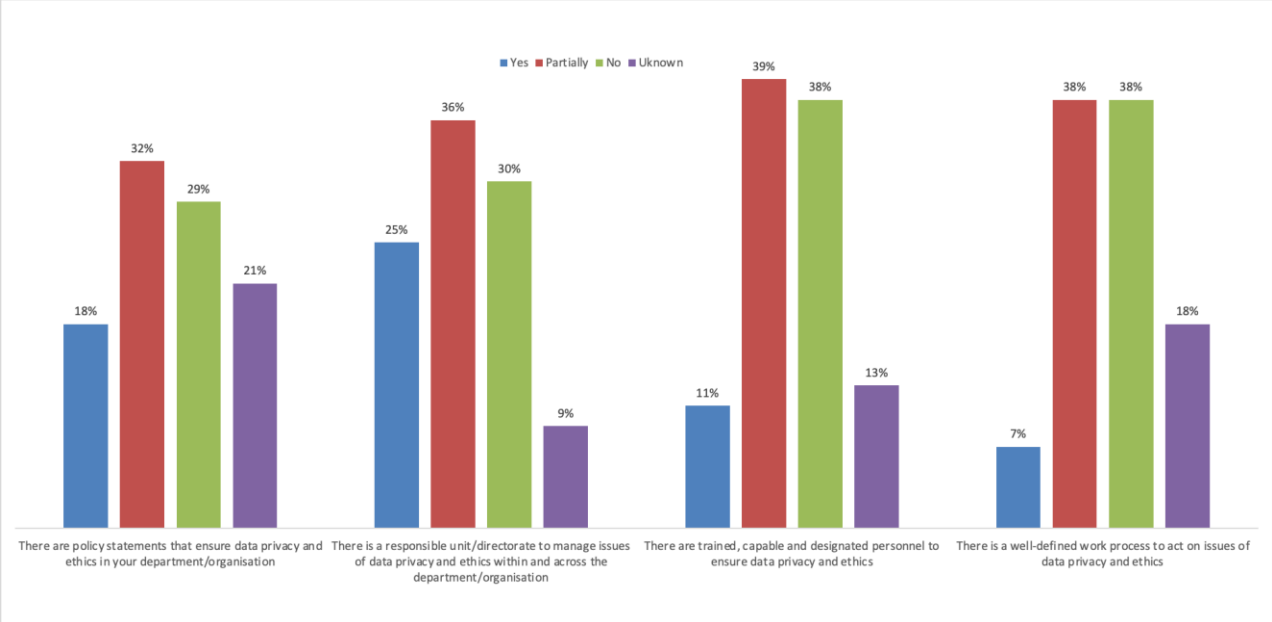


Figure 22 Responses on data privacy based on the four pillars

113. The survey also highlights deficiencies and challenges in data privacy practices within departments/organisations. While a minority affirm the presence of protocols for handling data breaches (16%) and requirements for informed consent (21%), few report compliance processes with data protection regulations (9%) or clear rules for data classification (14%). Moreover, a substantial 34% acknowledge various challenges in establishing data privacy and ethics (Figure 23).

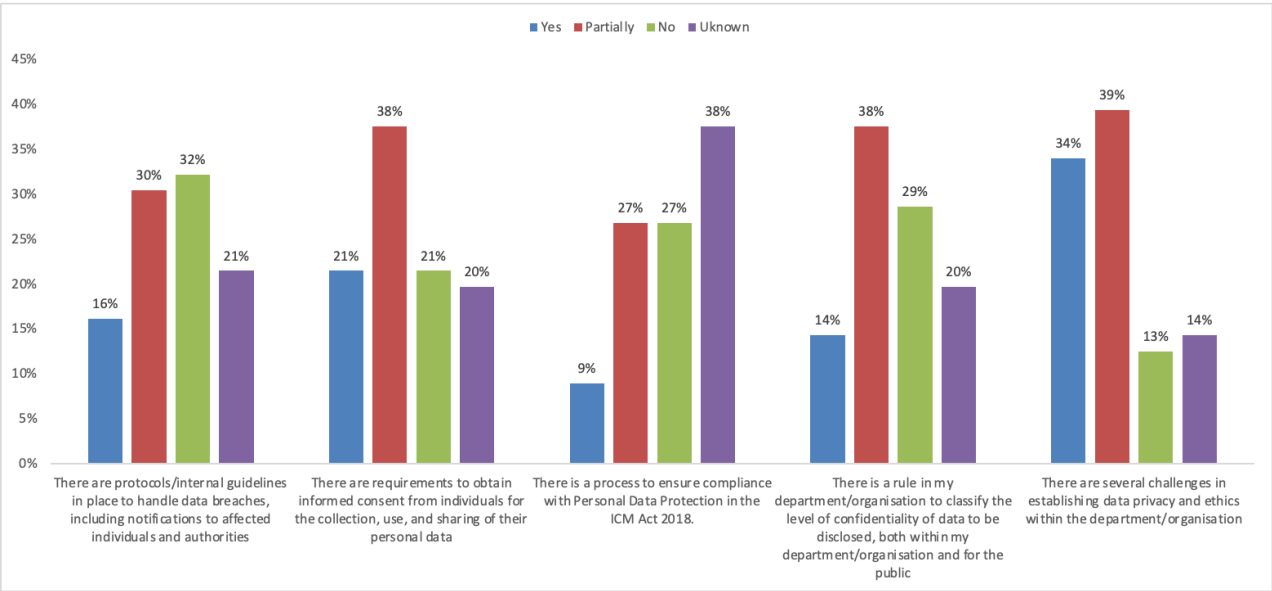


Figure 23 Responses on other key aspects of data privacy (and ethics)

114. The country's ICM Act 2018 captures limited aspects of privacy besides data protection, electronic transactions, public information and cybercrime. The current provisions in the Act lack coherence, clarity, and adequate protection, potentially imposing unnecessary restrictions on the use, disclosure, and transfer of data.[67]

5.5. Data infrastructure

5.5.1. Concepts and international practices

115. Data infrastructure refers to the various components - including hardware, software, networking, and services that enable data consumption, storage, and sharing. It provides the foundation for governments to create, manage, use, and secure its data. One of its most critical roles is to ensure that the right data can get to the right users or systems at the right time to make effective data-driven decisions.[68]

116. While it is difficult to say with certainty what exactly falls under elements of data infrastructure, some of the commonly agreed possibilities include:[69]

Physical infrastructure

- Storage hardware
- Processing hardware
- I/O networks
- Data centre facilities (including power, rack space, and network connectivity)

Information infrastructure

- Business applications
- Data repositories (including databases, data warehouses, data banks, data marts, and data lake houses)
- Virtualisation systems
- Cloud resources and services (including software as a service (SaaS) application, virtual services)

Business infrastructure

- Business intelligence (BI) systems
- Analytics tools (including big data, artificial intelligence (AI), and machine learning (ML) systems)

[67] (Gap Analysis of ICM Act 2018, World Bank)

[68] (Hewlett Packard Enterprise, 2024)

[69] (Hewlett Packard Enterprise, 2024)

117. Having a right data infrastructure strategy is critical for governments seeking to undertake data-driven digital transformation to have seamless data flows, protect data quality, minimize redundant data, and prevent crucial data from being isolated into silos. Data infrastructures often operate quietly in the background but its impact on the data strategy can be profound. It determines the quality of the data that is supported by a resilient system. Inefficient infrastructures can lead to costly ramifications in terms of data quality as well as revenue loss.

118. Simply upgrading the existing systems is often considered not sufficient to ensure the sizable and ever-increasing quantity of data. The strategy must facilitate to make informed decisions about data quality and its usefulness through sound judgments on its purpose rather than on regulations of existing data.[70]

119. Another data infrastructural development concern is that governments are increasingly transitioning to cloud infrastructures. Although this appears to be an inevitable shift from traditional relational database servers, there are technical, organisational and policy challenges. In view of this situation, it maybe strategic to explore developing cloud-based systems and commercial cloud providers to facilitate access to data and in delivery of public services.[71]

5.5.2. The findings on Bhutan

120. Figure 24 illustrates significant gaps in the establishment and maintenance of data infrastructure within departments/organisations. Only a small percentage report the presence of policy statements (11%), responsible units (16%), trained personnel (13%), and defined work processes (9%) pertaining to data infrastructure. The majority of responses indicate partial implementation or absence of these crucial elements, highlighting the urgent need for comprehensive efforts to develop and maintain robust data infrastructure, including clear policies, designated units, skilled personnel, and defined processes.

[70] UNDESA, (2020)

[71] UNDESA, (2020)

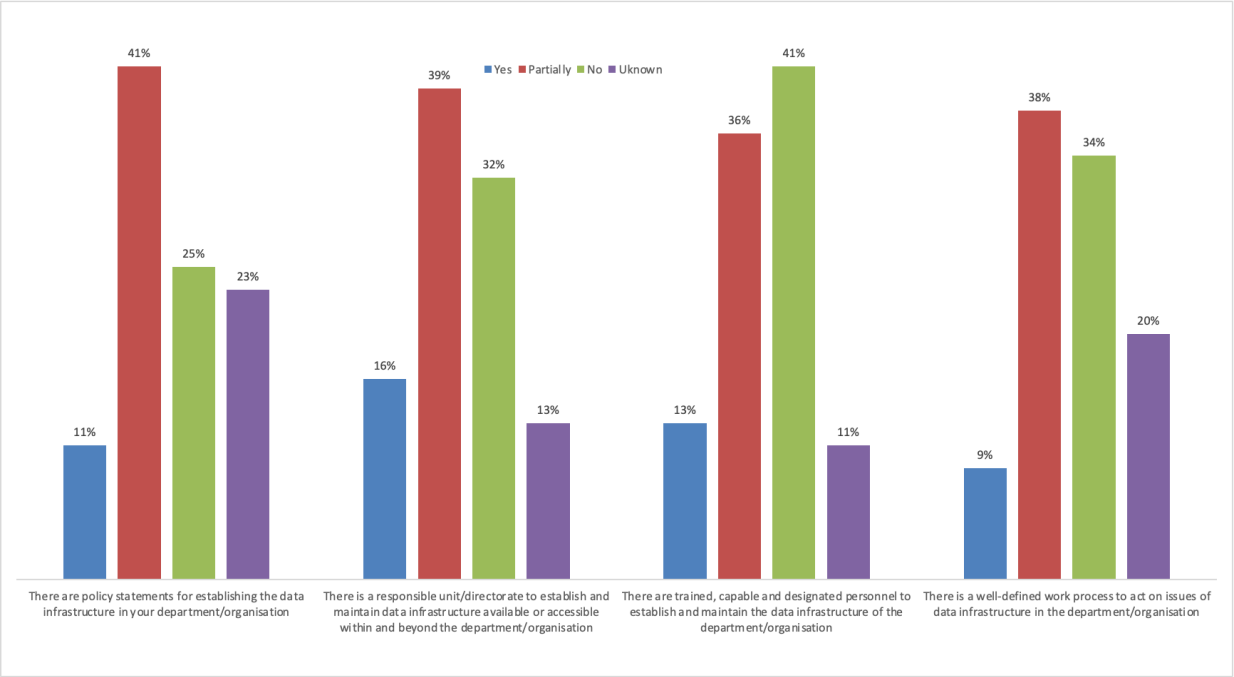


Figure 24 Responses on data infrastructure based on the four pillars

121. The survey result, as shown in Figure 25, also highlights significant gaps and challenges in establishing and maintaining robust data infrastructure within departments/organisations. While only a small percentage affirm the presence of mechanisms for scalability assessment (9%), data accessibility promotion (11%), security measures (13%), and performance monitoring (9%), partial implementation is reported across these aspects. Moreover, a notable portion indicates the absence of such mechanisms.

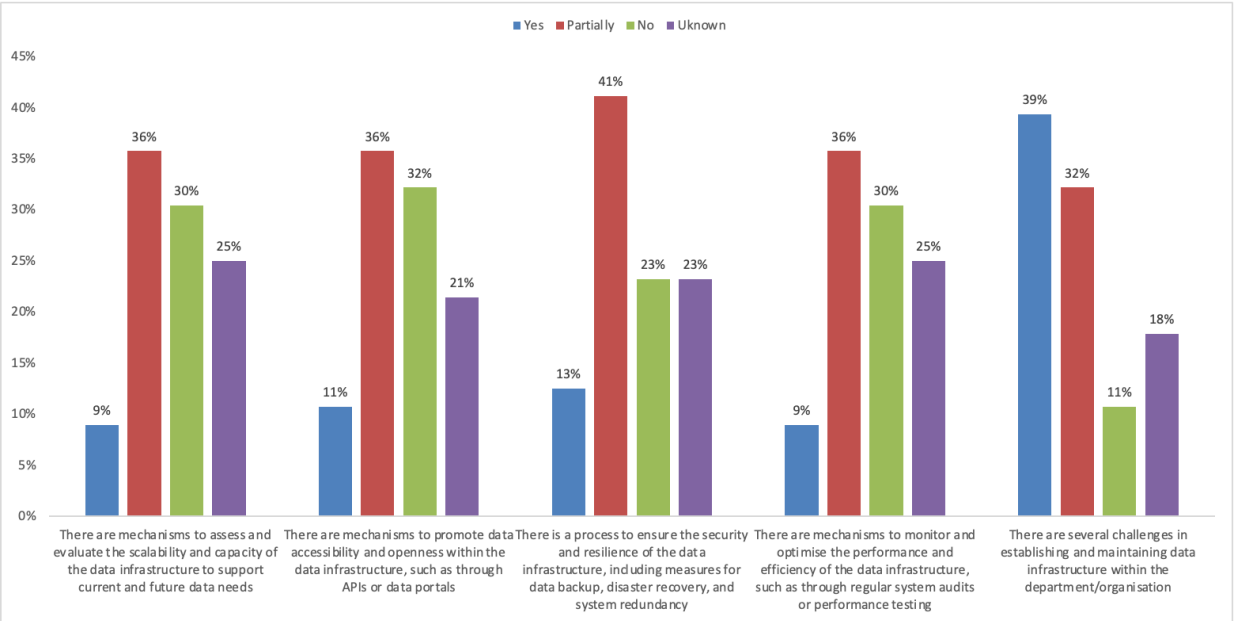


Figure 25 Responses on other key aspects of data infrastructure

122. Established in March 2017, the Government Data Centre (GDC) represents Bhutan's inaugural centralised governmental data repository, situated within the Thimphu TechPark. Principally dedicated to addressing cybersecurity concerns, this facility fosters interagency information sharing, thereby enhancing online public service delivery. Integral to Bhutan's aspirations of transitioning into an ICT-enabled society, this initiative underscores governmental commitment to advancing technological integration. Beyond its primary objective of strengthening public service provision, GDC serves as a catalyst for a holistic governmental transition towards ICT, promoting strategic alignment and operational efficacy across administrative domains. It has multiple redundancy levels and connectivity features, supported by a team of skilled technical personnel with expertise in IT solutions.

123. The utilisation of unlicensed software and operating systems is widespread within government agencies, as highlighted by key informants. This practice exposes these agencies to an elevated risk of encountering newer vulnerabilities and security threats. Recognising the severity of this issue, concerted efforts are currently being made to rectify the situation. One such initiative involves the implementation of a centralised ICT procurement mechanism aimed at ensuring the authenticity and legitimacy of applications and software utilised by government entities. Through this collective procurement approach, endeavours are being made to transition towards licensed software usage, thereby mitigating potential security risks associated with unauthorised software usage.

124. Data infrastructure in Bhutan remains in its nascent phase of development. One prominent challenge is the limited coordination and connectivity among the numerous program systems and databases managed by various line ministries and agencies. According to the government's evaluation, approximately 400 systems have been independently developed across governmental bodies. Predominantly, these systems have been designed to fulfil specific functions within their respective domains, with minimal interoperability, even within departments of the same ministry or agency. Nevertheless, interviews conducted for this study affirm recent advancements in interoperability, indicating a positive trajectory in addressing this issue.

125. The e-Governance Policy for the Royal Government of Bhutan 2019 emphasizes the need for a clear policy framework regarding ICT infrastructure. It highlights that while the government has made investments in various ICT initiatives to enhance public services, the absence of a coherent policy has led to redundant systems and infrastructure across government agencies. This redundancy results in underutilisation of ICT assets and unnecessary expenditure. To address this issue, the policy advocates for optimal utilisation of ICT assets through sharing and reuse. It mandates relevant government agencies to ensure the reuse and sharing of common services, ICT infrastructure, and data/information for all ICT initiatives, while complying with ICT standards. Additionally, the policy stipulates that all ICT initiatives must be endorsed by the relevant committees within the e-Gov Governance structure or

Multi Sectoral Committee before funds are allocated, to ensure adherence to the principles of reuse and sharing. Thus, the policy aims to promote efficiency and cost-effectiveness in ICT infrastructure management across government agencies.

5.6. Digital identity

5.6.1. Concepts and international practices

126. Digital identity serves as the cornerstone for securely sharing data within and between government agencies, enhancing public service delivery. By 2020, approximately 65% of UN member states had integrated digital identity into their portals, enabling users to access e-services securely. Estonia has been at the forefront of digital government development since 2014 with its e-Residency program, offering secure digital identities for remote service access. Similarly, Singapore's SingPass system, established in 2003, grants secure access to over 1,000 digital services, while Norway's BankID and South Korea's i-PIN, introduced in 2003 and 1999 respectively, facilitate secure authentication for accessing government and financial services. These examples underscore the pivotal role of digital identity in advancing digital government initiatives and enhancing data applicability.[72]

127. India's e-government systems owe much of their success to the nation's electronic identity (eID) system. The success of e-government systems in India is largely attributed to the country’s electronic identity (eID) system, which has played a vital role in modernising government processes and services. With the implementation of the National e-Governance Plan (NeGP) and various state-level initiatives, India has made significant strides in improving access to government services and promoting citizen engagement. The eID system, including initiatives like Aadhaar, stands as India's groundbreaking initiative towards establishing a comprehensive digital ID system. Aadhaar, derived from the Hindi word for 'foundation', is a 12-digit unique identification number designed to serve as proof of identity and address across the nation, managed by the Unique Identification Authority of India (UIDAI) on behalf of the government. This system captures three types of biometric data—fingerprints, iris scans, and facial photographs—that are stored in a centralised database. Initially aimed at curbing fraud in social benefit programs, Aadhaar has rapidly expanded its utility to facilitate access to government services, banking, and telecommunications. Despite being voluntary, it has achieved remarkable ubiquity, with 1.3 billion Aadhaar cards generated to date, making it the most extensively used digital ID system globally.[73]

[72] (ADB Institute, 2022)

[73] (Socrates, 2016)

128. Similar to India, Nigeria has embarked on establishing a digital identification system to address the absence of a formal ID for a significant portion of its population. Spearheaded by the National Identity Management Commission (NIMC), Nigeria's ecosystem revolves around the National Identification Number (NIN), mandatory for most transactions, and the Bank Verification Number (BVN), used for banking authentication. Despite registering nearly 100 million Nigerians for NIN and issuing 58 million BVNs since 2014, challenges such as funding and operational issues persist, hindering the initiative's progress toward comprehensive digital ID implementation.[74]

5.6.2. The findings on Bhutan

129. Bhutan has launched a national digital identity system. The National Digital Identity (NDI) Wallet launched in 2023 aims to seek to empower individuals and entities alike by providing a digital identity accessible through personal devices. This digital identity enables a multitude of transactions, including applications for financial services, employment opportunities, and government-to-citizen (G2C) services. This initiative will drive Bhutan's digital economy forward, bolster social security measures, enhance accessibility, and facilitate seamless identity utilisation for citizens traveling domestically and internationally, among various other benefits.

130. It stands as the sole government-operated digital identity system utilising blockchain technology, employing a decentralised, distributed ledger that eliminates centralised storage of individuals' identity and information. This decentralisation is a fundamental aspect of the NDI Wallet, fostering trust through confidence in the government as the issuer and its verified credentials for validating individuals' identity and information. The system is rigorously structured to instil a level of trust akin to that of a passport. Additionally, it aims to cultivate trust in users by prompting data sharing when necessary and notifying them of any usage or sharing of their data.

131. The analysis, based on online survey data, reveals substantial deficiencies in the process of issuing verifiable credentials (VC) with National Digital Identity (NDI) Wallet within departments/organisations. Policy statements guiding this process and responsible units overseeing it are lacking, with only 3.6% reporting the presence of such policies and 5.4% indicating designated units. Trained personnel and well-defined work processes are also scarce, with only 1.8% reporting personnel capability and process definition. Moreover, a significant percentage of respondents (19.6%) acknowledge encountering challenges in establishing and maintaining this process (Figure 26).

[74] (The Digital Identity Age)

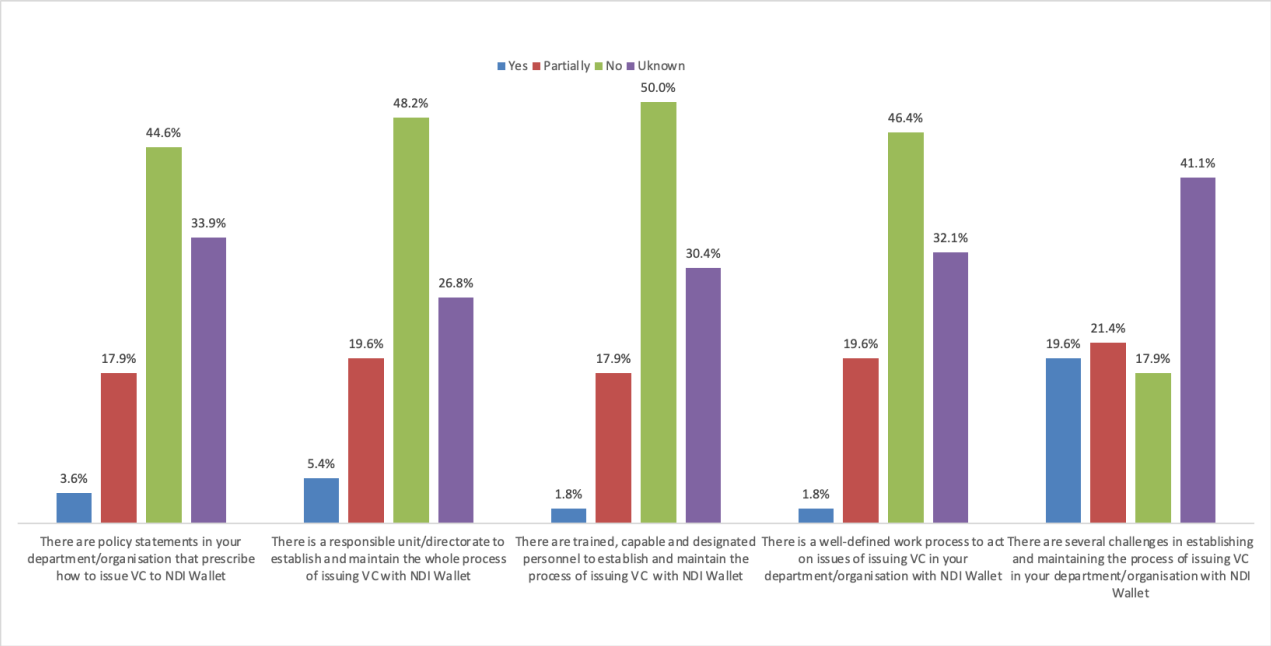


Figure 26 Responses on VC and NDI by four pillars

6. Conclusions and recommendations

132. Following the analytical framework employed throughout the analysis, this section of the report presents conclusions and recommendations across two sections: one structured around the four pillars, and the other on the six elements of data governance.

6.1. The four pillars of data governance

133. ***Policies:*** In Bhutan, there is currently no comprehensive policy, legislation, or specific regulations dedicated to data governance within the context of e-government. However, existing laws such as the ICM Act 2018 and the e-Governance Framework 2019 address aspects of data protection, cybersecurity, and the establishment of a unified data source. Additionally, an executive order oversees the collection and management of traditional data by the NSB. While these overarching documents are essential, the rapid digitisation in Bhutan necessitates the development of a comprehensive policy and legislation to ensure legal and policy coherence. This would establish long-term objectives, desired impacts, and measurable targets for progress assessment. The following recommendations are proposed:

- In the immediate step, a national Data Governance Policy should be formulated with the following suggestions: (1) Clearly define and delineate the mandates of relevant agencies involved in data governance to avoid overlap and ensure accountability. (2) Include provisions within the policy to promote and integrate a data economy, fostering innovation and economic growth through data utilisation, (3) Emphasise the enforcement of an interoperability

framework and the establishment of a single source of truth to ensure efficient data interoperability and maintain data integrity, and (4) Establish a Data Governance Committee, and promote data literacy among the populace to enhance collaboration and improve data management practices across agencies.

- In the medium term, amendment of the ICM Act 2018 is required to capture data protection and security aspects. The updated Act should encompass evolving data protection and security measures, accommodating various types and categories of data collected through both traditional methods like surveys and censuses, as well as modern digital channels. Additionally, the revised Act should also amend the provisions that have the potential to restrict transborder data flows, which are critical to trade in a global digital economy.

- Despite multiple attempts, the draft Statistics Act has not reached parliamentary deliberations. It is proposed to draft and enact a comprehensive "Data and Statistics Act" that encompasses a broad definition of data, and key elements of the draft statistics act. This proposed act should aim to be modern, versatile, and future-proofed, covering the entire data lifecycle and resonating with all stakeholders.

134. ***Institutions***: The establishment of GovTech Agency represents a significant step towards digital transformation, yet there is a need for clarity regarding its relationship with traditional statistical entities like the NSB. Overall, there is a clear recognition of the importance of effective data governance in the country. In the next step, following recommendations are proposed to be taken up:

- The distinction and relationship between statistical management and data governance should be clearly and explicitly spelled out to all stakeholders involved.

- The roles, responsibilities, and relationships between GovTech Agency and the NSB, at national agency and *dzongkhag* level should be clarified and emphasised.

- In the medium to long term, there is a need to set up dedicated data divisions/units, piloting in some ministries before rolling out in all other ministries/agencies.

135. ***Processes:*** There have been more stated processes and procedures on statistical matters but not data governance in broader terms. Bhutan has participated in and implemented specific international standards on data management, such as United Nations Statistical Commission, United Nations National Quality Assurance Framework, International Standard Industrial Classification Revision 4 (ISIC) and International Standard Classification of Occupations (ISCO). Despite the adoption of international standards, critical deficiencies remain in areas such as data sensitivity classification, interoperability standards, and data security protocols. In the next step, following recommendations are proposed to

be taken up:

- Develop comprehensive guidelines and standards for data governance processes and ensure their consistent implementation across all sectors and organisations. This includes establishing clear protocols for data classification, sharing, storage, privacy and protection. Some of these aspects can be drawn from the Data Management Guide 2023.

- Raise awareness among decision-makers, policymakers, and the general public about the importance of data governance and the role it plays in supporting informed decision-making, transparency, and accountability. Promote data literacy and provide educational resources to help stakeholders better understand their roles and responsibilities in data governance.

136. ***People***: There are significant gaps and challenges in data governance leadership and skills. Only a small percentage of organisations have fully engaged designated individuals with the necessary knowledge and skills for managing data governance elements. A diverse range of roles are involved in data governance activities, but there is a lack of systematic assessment of digital and data skills, leading to concerns about proficiency. Additionally, scarcity of human resources and challenges in recruitment and staff training exacerbate the shortage of personnel with data expertise. In the next step, following recommendations are proposed to be taken up:

- Implement systematic assessments of digital and data skills for the public sector in Bhutan. This will help identify areas of proficiency and areas needing improvement, enabling targeted training and development initiatives.

- Establish mentorship programs to support staff in developing and enhancing data governance and management skills and expertise.

- In the long term, government agencies should prioritize cultivating a skilled workforce including digital infrastructure, cybersecurity, data governance, software and applications, data and AI, and digital innovation. Within the data governance and data and AI tracks, specific roles such as Data Governance Officer, Data Protection Officer, Data Risk Analyst, Data Engineer, Data Analyst, and Data Scientist should be established.

6.2. The six elements of data governance

137. ***Data standardisation and classification*****:** Efforts to classify data based on sensitivity and shareability are recent, but there is no uniform legal provision in Bhutan for this purpose, leading to fragmentation and uncertainty. Despite progress in adopting international standards, coordination challenges persist among ministries and agencies, affecting data coding uniformity. In the next step,

following recommendations are proposed to be taken up:

- Ensure that the upcoming legislation includes clear provisions regarding data protection, specifically focusing on the classification of data based on their sensitivity and the extent to which they can be shared.

- Enhance coordination and collaboration among ministries and agencies to address challenges related to data coding uniformity. This may involve establishing mechanisms or platforms for sharing best practices and ensuring consistency in data classification efforts across different entities.

- Continue efforts to adopt and implement international standards for data classification and standardisation. This would entail providing training to relevant stakeholders to facilitate the adoption process and ensure alignment with global best practices.

138. ***Data sharing, exchange, and interoperability:*** There is a mixed landscape in data sharing, exchange, and interoperability practices, with deficiencies in policy, personnel capability, and work processes. Challenges persist in prioritising datasets and ensuring smooth sharing within departments and externally. Legal risks, resource limitations, and technical constraints hinder effective data sharing. Promising initiatives aim to enhance data sharing, but uneven timeliness and coverage pose limitations. Following recommendations are proposed, which need to be taken up immediately:

- Conduct a comprehensive assessment of existing systems to identify similarities and overlaps in functionality.

- Establish interoperability standards and protocols to facilitate seamless communication and data exchange between integrated systems.

- Data should be classified according to sensitivity and shareability, and those falling in the latter category must be anonymised before sharing in machine readable format via a common platform.

139. ***Data security (and protection):*** There are varying levels of implementation and challenges in data security management within organisations in Bhutan. While some have clear policies and designated units for data security, many face obstacles such as a lack of trained personnel and well-defined processes. Disparities exist in implementing key security measures, including data classification and awareness exercises. The establishment of the BtCIRT signifies progress. Despite progress in cybersecurity, vulnerabilities exist due to legal gaps and risks associated with unlicensed software and computer viruses. In the next step, following recommendations are proposed to be taken up:

- Implement an efficient critical ICT Infrastructure protection strategy. Moving forward, cyber and data security issues affecting critical infrastructure such as electricity grids and the financial sectors should be prioritised.

- New initiatives such as BSDS and Single Source of Truth system should prioritise data security in order to instil more trust and buy-in from other line ministries and agencies.

- Develop and implement Comprehensive Data Protection Legislation that clearly defines personal data, sets out the rights of individuals, and establishes the responsibilities of organisations in collecting, processing, and storing data.

- Identify dedicated Regulatory Authority. Create an independent regulatory body or task existing relevant regulator with additional responsibility of overseeing data protection, privacy, and ethical data use with the power to enforce regulations, conduct audits, and handle complaints from individuals regarding data misuse or breaches.

140. ***Data privacy (and ethics):*** There are significant deficiencies in data privacy and ethics practices, with limited policy establishment, responsibility assignment, and trained personnel. Few protocols exist for managing data breaches and informed consent, with even fewer processes in place for compliance with data protection regulations or clear data classification rules. The current legal provisions lack coherence and clarity, potentially imposing unnecessary restrictions on data use. In the next step, following recommendations are proposed to be taken up:

- Invest in training and awareness programs to enhance the capacity of institutions and individuals including school children in understanding and adhering to data privacy and ethics standards.

- Take measures to improve trust in the use of technology by enhancing transparency, accountability, and security measures surrounding data handling practices. This could involve initiatives to demonstrate the responsible use of technology and the protection of individuals' data rights.

- Develop ethical guidelines for AI and big data. The data collection and analysis process could inadvertently perpetuate biases, particularly against marginalised groups. If not carefully managed, data-driven decisions could lead to unequal treatment or discrimination. Therefore, there is a need to create clear guidelines for the ethical use of AI and big data analytics, focusing on transparency, fairness, accountability, and the avoidance of bias while also ensuring it aligns with Bhutan’s cultural values and societal goals.

- Establish data sovereignty. Storing data abroad can lead to a loss of national control over the data, thus, reliance on foreign technology and data storage solutions raises concerns about data sovereignty. Therefore, the ethical implications of storing citizens' data outside the country, where it is subject to foreign laws and potential government access, need to be carefully considered while using any cloud services.

- Mandate informed consent practices. Ensure that organisations collecting personal data provide clear, understandable information about how data will be used and obtain explicit, informed consent from individuals supported by standardised consent forms and processes.

141. ***Data infrastructure:*** There are significant gaps in establishing and maintaining data infrastructure within departments/organisations. Key elements such as policy statements, responsible units, trained personnel, and defined work processes are lacking or only partially implemented. Data infrastructure remains in its early stages, with limited coordination among program systems and databases. Recent advancements in interoperability show progress - the GDC serves as Bhutan's primary centralised governmental data repository and system hosting environment. In the next step, following recommendations are proposed to be taken up:

- Promote improved coordination and interoperability among program systems and databases by developing standards and protocols for data exchange. Facilitate the enhanced use of standardised data formats and technologies to enable seamless integration and compatibility across platforms.

- Invest in the development and enhancement of the GDC to serve as a robust and centralised repository for governmental data. Ensure that the GDC is equipped with the necessary infrastructure, resources, and security measures to effectively manage and safeguard data.

142. ***Digital identity:*** Bhutan introduced the National Digital Identity (NDI) in 2023. It is a biometrics-enabled edge mega wallet as a foundation for digital transformation, connectivity, and inclusion in Bhutan. It provides individuals and entities to receive, store and share digital identity (verifiable credentials). This initiative serves various purposes, from facilitating financial services to government interactions and job applications. Operating on blockchain technology, it decentralises identity storage. The system emphasises user trust, enabling data sharing when necessary and providing notifications on data usage. As it is a newly adopted system, it is recommended to:

- Enhance user education and awareness campaigns to familiarise individuals and entities with the NDI Wallet by providing information about its benefits, functionalities, and how to securely use and manage their digital identities.

- Establish a feedback mechanism to gather input from users and stakeholders about their experience with the NDI Wallet. The feedback will help to identify areas for improvement and to address any issues or concerns.

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8. Annexes

Annex I: List of Key Informant Interviews

Groups	Line ministries/agencies and institutions
Government ministries and agencies	- Cabinet Secretariat (1) - Centre for Bhutan Studies (1) - GovTech Agency (5) - Ministry of Agriculture and Livestock (1) - Ministry of Education and Skills Development (2) - Ministry of Finance (2) - Ministry of Health (2) - Ministry of Industry, Commerce and Employment (1) - Ministry of Infrastructure and Transport (1) - National Centre for Hydrology and Meteorology (1) - National Statistics Bureau (4) - Royal Monetary Authority (4)
Non-government actors	- Private Legal Firm (1) - Tashi Cell Pvt Limited (1) - Thimphu Tech Park Limited (1) - UNDP (2)

Annex II: Survey Questionnaire

Part I: General Information

Kuzuzangpola! Welcome to this online-survey.

This online-survey is being conducted as part of the baseline study for finding out the present status of the national data governance framework of Bhutan, which is led by the UN Department of Economic and Social Affairs (UN DESA), in collaboration with GovTech Agency. A national data governance framework aims to develop institutional capacities for developing national digital data policies and strategies for ensuring data quality, access, security, privacy and usage, and for promoting data security through consultation, collaboration and shared benefits, making available relevant legislative information and toolkits for advancing digital data cooperation agreements through case studies.

The primary purpose of this survey is to assess the existing data governance practice among different government agencies and private sectors. The study will assess the present status of four pillars of a data governance framework: policy, institutions, people and processes. Each pillar will be studied in view of the following six key elements of data governance:

a) Data standards and classification

b) Data sharing, exchange and interoperability, including open government data

c) Data security

d) Data privacy and ethics

e) National data infrastructure (e.g., data centre, cloud, data services, etc.)

f) Linking data governance to digital identity

The responses that you share with us will remain confidential and all results will be reported at an aggregate level and not at an individual level.

Therefore, your professional response is highly appreciated. It will take on average 30 minutes to complete the questionnaire. Thank you in advance for your time and honestly responding to this survey questionnaire.

Should you need further clarification you may contact Mr. Cheku Dorji, National Consultant (17171980, cheku.bhutan@gmail.com).

Part II: Respondent and Organisational Information

1. **Name of your department/organisation (ministry/department/bureau/company):**

   _____

Part III. Data products and policy framework

1. For your department/organisation, please list 3 most common/regular data products that have been produced?

   Data product/statistics 1: ……

   Data product/statistics 2: ……

   Data product/statistics 3: ……

2. For the above data products, do you know if there are guiding rules and policies that you need to follow to manage and keep those data?

   - Yes, I know
   - No, I do not know

3. If yes, what are they?

   Rules/policies 1 ……

   Rules/policies 1: ……

   Rules/policies 1: ……

4. What are the key decisions/high level discussion that require the data from your department/organisation?

   Decision/discussion 1: ……

   Decision/discussion 2: ……

   Decision/discussion 3: ……

5. What kinds of tools/software do you use to keep and process data in your department/organisation? Please specify:

   (example: MySQL Server, PostgreSQL, Excel, Google sheets)

   Software 1: ……..

Software 2: ……..

Software 3: ……..

6. What kinds of tools/software do you use to share data from your department/organisation? Please specify:

(example: Paper, Excel, API link, Email, Thumb Drives)

Software 1: ……..

Software 2: ……..

Software 3: ……..

7. How would you rate the ease of looking for specific data in your current databases/data system?

Very poor (1)…. Perfect (10)

8. Has your department ever experienced data loss in the last three years?

9. Have your and/or your staff ever been trained on how to manage data in your department in the last three years?

10. How would you rate staff capacity on data in your department/organisation/data system?

Very poor (1)…. Perfect (10)

Part IV: Status of the Overall Data Governance Practice

In this part of the questionnaire, the statements are targeted on the overall status of the existing data governance practice and they are classified into the above mentioned four pillars of a data governance framework, i.e., policy, institutions, people and processes.

Based on current situation of your department/organisation, please choose one of the following options for each factual statement

- **Yes** = completely exercised in the department/organisation
- **Partially** = partially exercised in the department/organisation
- **No** = the department/organisation has not taken any visible initiative yet
- **Unknown** = information is not available

No	Factual Statement	Yes	Partially	No	Unknown
1	There exists a policy for legitimising data governance through strategies, policies, directives and other regulatory documents.				
For 'Yes' or 'Partially' state the policy document: _____					
2	**Institutional units** (e.g., departments, directorates, teams, etc.) are in place to lead, coordinate, enforce, standardise and manage elements of data governance.				
For 'Yes' or 'Partially' state the institutional unit: _____					
3	Designated **people** (e.g., data or information officer or equivalent) have been engaged with proper knowledge and skill to manage and lead elements of data governance.				
For 'Yes' or 'Partially' state the designated people: _____					
4	A structured work **process** is defined to operationalize tasks of data governance elements.				
For 'Yes' or 'Partially' state the work process: _____					

Part V: Status of Element-specific Data Governance Practice

In this part of the questionnaire, the statements are targeted to find out the six element-specific statuses of each pillar.

No	Factual Statement	Yes	Partially	No	Unknown
Element 1: Data Standardisation and Classification					
Data Standardisation refers to a process of defining the data format and semantic definitions for entities or concepts being used by a department/an organisation with appropriate data quality specification to ensure data quality. This would be applicable in the whole data life cycle (collection, use, storage and deletion of data) management. **Data classification** is a process of organising data into relevant categories to facilitate data sharing and manage risks related to data access and use. Data standardisation and classification are necessary to ensure the consistency and compatibility of data-centric processes in building digital government.					
1	There are policy statements that explicitly prescribe data standardisation and classification in your department/organisation.				
2	There is a responsible unit/directorate to manage issues of data standardisation and classification in the department/organisation.				
3	There are trained, capable and designated personnel to handle issues of data standardisation and classification.				
4	There is a well-defined work process to act on issues of data standardisation and classification.				
5	There is an ongoing process to harmonize data standards and classification across different departments or divisions within the department/organisation.				
6	There are data quality checks conducted to ensure adherence to data standards and classification.				
7	There is a clear rule/approach to check on the reliability of the data/statistics that is submitted to my department/organisation.				

8	There are several challenges in data standardisation and classification in the department/organisation.				

If you have any comments related to the data standardisation and classification practice at your department/organisation, please state here (200 words max).

_____

Element 2: Data Sharing and Interoperability (including open data)

Data sharing and interoperability refers to the process of defining proper access and use of shared data across parties in the department/organisation or with external entities as per the required level of data quality keeping smooth data movement and communication among multiple systems. An effective collaboration mechanism for data sharing and interoperability of government data is needed.

1	There are policy statements that prescribe data sharing and interoperability within and across the department/organisation.				
2	There is a responsible unit/directorate to manage data sharing and interoperability within and across the department/organisation.				
3	There are trained, capable and designated personnel to handle issues of data sharing and interoperability within and across the department/organisation.				
4	There is a well-defined work process to act on issues of data sharing and interoperability				
5	There are measures in place to protect sensitive or confidential data during the sharing and interoperability process.				
6	There are established data sharing agreements or protocols in place with external entities (e.g., other government agencies, private sector partners, research institutions) to facilitate data exchange.				
7	There is a strategy for identifying and prioritising datasets for open data initiatives.				
8	There is ease of sharing the data across departments and offices within the department/organisation.				
9	There is ease of sharing the data between my department/organisation and other organisations.				

10	There are several challenges in managing data interoperability among systems within and across the department/organisation.				

If you have any comments related to the data sharing and Interoperability practice at your department/organisation please state here (200 words max).

_____

Element 3: Data Security

Data security refers to the policies, practices, and control rules used in the department/organisation to mitigate risks and protect all data assets in the data life cycle (collection, use, share, storage and deletion of data) management to achieve data confidentiality, data integrity and data availability. It also acts in line with the data classification scheme.

1	There are policy statements that prescribe data security in the department/organisation.				
2	There is a responsible unit/directorate to manage issues of data security within and across the department/organisation.				
3	There are trained, capable and designated personnel to ensure data security.				
4	There is a well-defined work process to act on issues of data security				
5	There are procedures and guidelines for data classification and handling based on sensitivity or confidentiality levels.				
	There are protocols in place for data backup, disaster recovery, and business continuity to ensure data resilience and availability.				
6	There are regular awareness exercises among employees about data security risks and best practices.				
7	There are mechanisms or protocols in place to protect data during storage, transmission, and disposal.				
8	There are mechanisms to track and manage access privileges and permissions for data handling and usage.				
9	There are several challenges in managing data security within the department/organisation.				

If you have any comments related to the data security practice at your department/organisation, please, please state here (200 words max).

_____

Element 4: Data Privacy and Ethics

Data privacy and ethics refer to the right of an individual to protect her personal data across the data life cycle (collection, use, storage and deletion of data) management. Maintaining privacy of data is crucial since data storage, access and sharing are highly interlinked to personal identity and business entities.

1	There are policy statements that ensure data privacy and ethics in your department/organisation.				
2	There is a responsible unit/directorate to manage issues of data privacy and ethics within and across the department/organisation.				
3	There are trained, capable and designated personnel to ensure data privacy and ethics.				
4	There is a well-defined work process to act on issues of data privacy and ethics.				
5	There are protocols/internal guidelines in place to handle data breaches, including notifications to affected individuals and authorities.				
6	There are requirements to obtain informed consent from individuals for the collection, use, and sharing of their personal data.				
7	There is a process to ensure compliance with Personal Data Protection in the ICM Act 2018.				
8	There is a rule in my department/organisation to classify the level of confidentiality of data to be disclosed, both within my department/organisation and for the public.				
9	There are several challenges in establishing data privacy and ethics within the department/organisation.				

If you have any comments related to the data privacy practice at your department/organisation, please state here (200 words max).

_____

Element 5: Data Infrastructure					
Data infrastructure refers to the physical environment and software utilities to accommodate and support all activities in the data life cycle (collection, use, storage and deletion of data) management. Data infrastructure provides systematic design and managed infrastructure for storing, processing, accessing and securing data.					
1	There are policy statements for establishing the data infrastructure in your department/organisation.				
2	There is a responsible unit/directorate to establish and maintain data infrastructure available or accessible within and beyond the department/organisation.				
3	There are trained, capable and designated personnel to establish and maintain the data infrastructure of the department/organisation.				
4	There is a well-defined work process to act on issues of data infrastructure in the department/organisation.				
5	There are mechanisms to assess and evaluate the scalability and capacity of the data infrastructure to support current and future data needs.				
6	There are mechanisms to promote data accessibility and openness within the data infrastructure, such as through APIs or data portals.				
7	There is a process to ensure the security and resilience of the data infrastructure, including measures for data backup, disaster recovery, and system redundancy.				
8	There are mechanisms to monitor and optimize the performance and efficiency of the data infrastructure, such as through regular system audits or performance testing.				
9	There are several challenges in establishing and maintaining data infrastructure within the department/organisation.				
If you have any comments related to the data infrastructure practice at your department/organisation, please state here (200 words max). _____					

Element 6: Issuing Data as Verifiable Credentials to National Digital Identity (NDI)					
The issuance of **Verifiable Credentials** (VC) to **NDI Wallet** is the process of issuing credentials of individuals by department/organisation as authoritative data sources. Since the users will have full control of data in their NDI wallet, the safety, security, and privacy of data can be maintained while availing online services efficiently.					
1	There are policy statements in your department/organisation that prescribe how to issue VC to NDI Wallet.				
2	There is a responsible unit/directorate to establish and maintain the whole process of issuing VC with NDI Wallet.				
3	There are trained, capable and designated personnel to establish and maintain the process of issuing VC with NDI Wallet.				
4	There is a well-defined work process to act on issues of issuing VC in your department/organisation with NDI Wallet.				
5	There are several challenges in establishing and maintaining the process of issuing VC in your department/organisation with NDI Wallet.				
If you have any comments about the issuance of VC to NDI Wallet in your department/organisation, please state here (200 words max). _____					

Thank you for your time!


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