# Enhancing Systematic Tracking of Hazardous Events and Disaster Losses and Damages in the Maldives

*Strengthening Disaster Data Governance and Practice*

**National Disaster Management Authority**

**Maldives**

Enhancing Systematic Tracking of Hazardous Events and Disaster Losses and Damages in the Maldives

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## Abbreviations

| | |
|---|---|
| ABAS | Antigua and Barbuda Agenda for SIDS |
| AgroNAT | Agro National Corporation (AgroNAT) |
| BPM | Business process management |
| CAP | Common Alerting Protocol |
| CARE | Collective benefit, Authority to control, Responsibility, Ethics |
| DAMA | International – Data Management Association |
| DDRRMM | Digital Disaster Risk Reduction Maturity Model |
| DMADD | Digital Maldives for Adaptation, Decentralization and Diversification |
| DMBOK | Data Management Body of Knowledge |
| ECLAC / CEPAL | United Nations Economic Commission for Latin America and the Caribbean |
| EW4All | Early Warning For All |
| FAIR | Findability, Accessibility, Interoperability, and Reuse |
| FAO | Food and Agriculture Organisation of the United Nations |
| ICT | Information and communications technology |
| MBS | Maldives Bureau of Statistics |
| MMS | Maldives Meteorological Service |
| MNDF | Maldives National Defence Force |
| MoF | Ministry of Finance and Planning |
| MoH | Ministry of Health |
| MoTE | Ministry of Tourism and Environment |
| MoSFD | Ministry of Social and Family Development |
| MRC | Maldivian Red Crescent |
| MSRO | Maldives Space Research Organisation |
| NDMA | National Disaster Management Authority |
| PPP | Public private partnerships |
| ROI | Return on investment |
| SADDD | Sex, age, disability disaggregated data |
| SFIA | Skills Framework for the Information Age |
| SWOT | Strengths, weaknesses, opportunities, and threats |
| TRACT | Toward Risk-Aware and Climate-resilienT communities |
| UNDRR | United Nations Office for Disaster Risk Reduction |

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## Executive Summary

This report targets recommendations for strengthening disaster data governance in the Maldives. It focuses on efforts and processes to collect, analyse, and use losses and damages data from hazardous events, specifically extending beyond household level loss and damage data collection and use. The report aims to support the National Disaster Management Authority (NDMA) in strengthening existing systems, tools, and processes such as the DALA Portal, Island Disaster Management Plans, and various others. It is based on research and stakeholder meetings in Male in December 2024.

The Maldives, a low-lying archipelago in the Indian Ocean, is susceptible to various hazard events, particularly flooding, sea-level rise, and urban fires. A range of public and non-public, digital and paper-based disaster data and information systems exist in the Maldives. Ongoing disaster data collection efforts and a new software (DALA) target the digital transformation of household loss and damage data. Challenges include the assessment of damages and losses due to data collection limitations, gaps in historical disaster data, including disaggregation by sex, age, disability, and income, cross-ministry coordination issues, and limited data capacities within the NDMA. While some historical data exists, there is a dearth of experience in applying this data to implement disaster risk reduction actions. Future priorities include digital data collection, tracking climate impacts, enhancing the Common Alerting Protocol (CAP), impact-based forecasting and anticipatory action.

Several Government information systems and services complement the disaster data and information systems. While digital transformation and E-Government services are advancing in the Maldives, no definition for data governance can easily be found within the Government websites. Effective data sharing and Whole-of-Government data standards are limited, which hinders the centralisation and adoption of digital services and systems. Overall, 55 Government agencies (with their respective systems) are identified as disaster related stakeholders.

Opportunities exist to redesign and innovate aspects of disaster data and information systems. This includes a combined approach to disaster and climate data, which maximises synergies and consolidates resources, while project collaboration across different initiatives can create further efficiencies. Effective disaster data systems are built on robust data governance, which includes policies, people, and processes, supported by appropriate technologies to manage and use data effectively as an asset. Data governance and respective practices can differ across sectors, and national statistical offices have a key role to implement strategies and harmonise data for common use across systems. The NDMA could drive stakeholder engagement, coordination, and partnership programs to co-design disaster and climate data governance for improved interoperability across existing systems.

Detailed recommendations throughout the report can be consolidated into high-level aspects to strengthen disaster data governance and good practice for disaster losses and damages in the Maldives. This includes:

- Define and strengthen good data governance and the enabling environment needed with people, policies, and processes for disaster and climate losses and damages data to address data gaps and innovate information systems.
- Collaborate with data and information producers and users such as Island Councils, Maldives Bureau of Statistics, Maldives Meteorological Services, Maldives Red Crescent, Ministry of Finance and Planning, Ministry of Tourism and Environment and others to co-design disaster and climate data frameworks and processes, guided by a formal steering committee and an informal working group.

- Audit and strengthen current and historical disaster data and information to clarify who is doing what, how, when, and where.
- Build on existing systems, such as DALA, OneMap Maldives, and others to align, digitalise, and mainstream disaster and climate data collection, management, and use through ongoing and modular efforts, and use business process management for effective data flows.
- Collaborate and use public private partnerships such as tourism, insurance, and others to optimise the interoperability and integration of disaster and climate data while reducing duplication and embedding good practice.
- Enhance dedicated and skilled data capacities within the NDMA through additional positions such as data scientists or data managers, and a range of ongoing professional development activities.

# 1. Introduction

## 1.1. Purpose and scope of this report

This report targets recommendations for strengthening disaster data governance in the Maldives. It focuses on efforts and processes to collect, analyse, and use losses and damages data from hazardous events, specifically extending beyond household level loss and damage data collection and use. The report aims to support the National Disaster Management Authority (NDMA) in strengthening existing systems, tools, and processes such as the DALA Portal, Island Disaster Management Plans, and various others. It is based on research and stakeholder exchanges in Male between 1st and 5th December 2024.

## 1.2. Background (Based on the Terms of Reference)

The Maldives, a low-lying archipelago in the Indian Ocean, is susceptible to various hazard events, particularly flooding, sea-level rise, and urban fires. These hazards have become common place due to poor understanding of the risks and how to mitigate them, a factor that only exacerbates those fueled by climate change. However, the country has struggled to assess the damages and estimate losses of these events on the population due to limited data collection of losses and damages from past events and cross-ministry coordination issues. While efforts continue on collecting this data, particularly with the launch of a new software called DALA, which seeks to move reporting of household loss and damage to digital formats, the present tools do not strongly capture disaggregation of data by sex, age, disability, and income and lack in their utility to constructing early warning messages and other efforts to reduce the risk of disasters in the future. Lastly, while some historical data exists, there is a dearth of experience in applying this data to implement disaster risk reduction actions.

# 2. Disaster data systems in the Maldives

Disaster data systems are not only technologies; as systems comprise crucial human elements like collaboration, capacities, and governance as essential prerequisites to manage and use disaster data, information, and knowledge effectively for decisions.

## 2.1. Disaster and climate data systems

A range of public and non-public, digital and paper-based disaster data and information systems exist in the Maldives. This includes the NDMA website, DALA portal, DesInventar, Island Disaster Management Plans with historical disaster data and templates for disaster data collection, Disaster Statistics, Red Crescent data collection and archive, media and online newspapers, files (records and archives) in digital and paper formats, and more. The existing information appears well structured and consistent, while data gaps exist. Data processes appear as paper-based and ad hoc or organically evolved, and opportunities exist to redesign and innovate aspects of disaster data and information systems. Future priorities include digital data collection, tracking climate impacts, enhancing the Common Alerting Protocol (CAP), impact-based forecasting and anticipatory action.[1]

Disaster and climate data can benefit from a combined approach that maximises synergies and consolidates resources. In fact, it would create a lot of duplication and extensive costs if disaster

[1] Maldives Presidents Office. (2024). President states that early warning systems are an investment in livelihoods and prosperity. https://presidency.gov.mv/Press/Article/32153

and climate data are governed and managed separately. Opportunities include efficiencies and project collaboration such as the Early Warning For All (EW4All) initiative with the Maldives global leadership to develop an implementation roadmap;[2] Digital Maldives for Adaptation, Decentralization and Diversification (DMADD P177040),[3] Building Climate Resilient Safer Islands in the Maldives,[4] Toward Risk-Aware and Climate-resilienT communities (TRACT) - Strengthening climate services and impact-based multi- hazard early warning in Maldives,[5] and others.

The existing disaster data systems in the Maldives are complemented by several Government information systems and services such as the OneGov, Data Portal (beta), One map, Meteorological Services, City Council and Atoll Council and Island Council systems, and others. Overall, 55 Government agencies (with their respective systems) are identified as disaster related stakeholders as illustrated in Figure 1, while no specific Whole-of-Government disaster information system exists.[6]

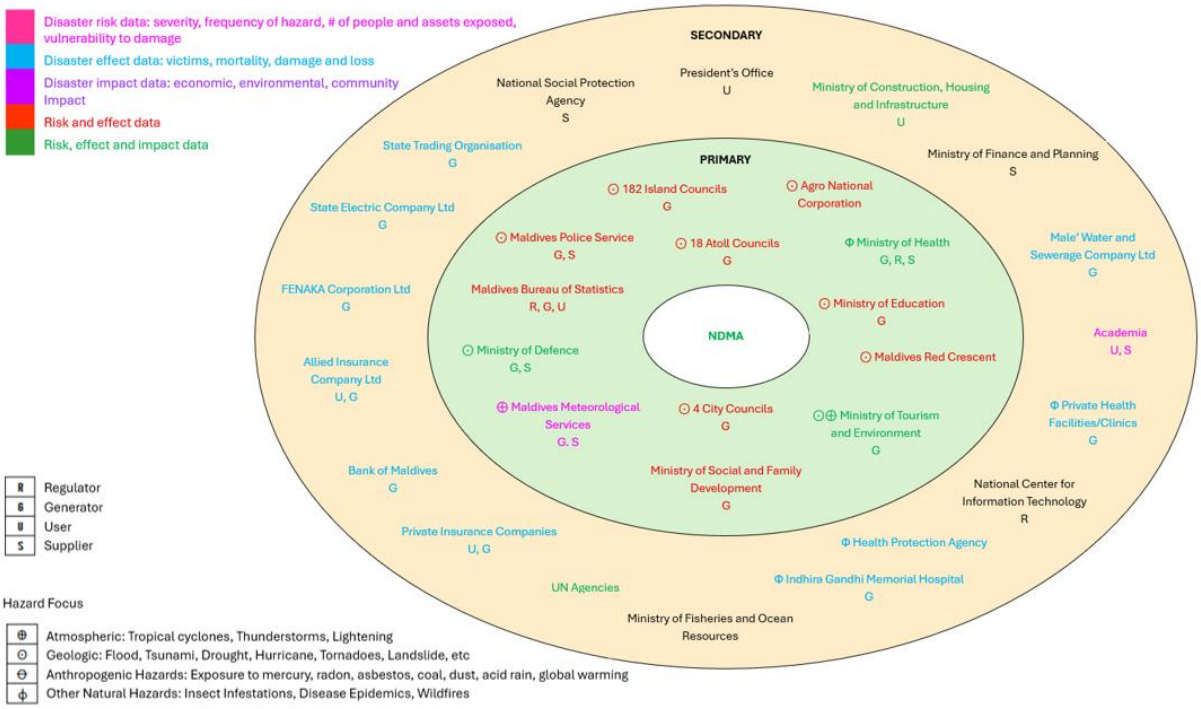


*Figure 1: Stakeholder map of key DRM institutions in the Maldives. Source: NDMA & UNDRR*

[2] NDMA. (2023). Scaling up early warning systems implementation roadmap: Maldives 2023 – 2027. https://www.environment.gov.mv/v2/download/3487/

[3] World Bank. [2025]. MV: Digital Maldives for Adaptation, Decentralization and Diversification. https://projects.worldbank.org/en/projects-operations/document-detail/P177040?type=projects

[4] Green Climate Fund & Japan International Cooperation Agency. (2024). Project FP165: Building Climate Resilient Safer Islands in the Maldives. https://www.greenclimate.fund/project/fp165

[5] Green Climate Fund & United Nations Environment Programme. (2024). Toward Risk-Aware and Climate-resilienT communities (TRACT) - Strengthening climate services and impact-based multi- hazard early warning in Maldives. https://www.greenclimate.fund/search?keywords=tract

[6] NDMA & UNDRR. (2022). Report on the Maturity and Capacity Assessment of Disaster related Data in the Maldives. [Internal report]

## 2.2. Disaster data maturity and capacity

Different disaster data maturity and capacity assessments were documented in 2022.[6, 7, 8] The aggregated NDMA maturity score was 18.5 out of 35 or 53% out of 100%.[6] Other Government agencies scored between 10.4 to 25.8 out of 35, or 30 – 85%. The reports include an analysis of strengths, weaknesses, opportunities, and threats (SWOT) as shown in Figure 2. The NDMA strengths include stakeholder engagement, coordination, and partnership programs, while weaknesses include data management capacities and information and communications technology (ICT) infrastructure.

| Strengths | Weaknesses |
|---|---|
| - Good relation with local governments<br>- Disaster management law<br>- Ability to verify the data<br>- Some knowledge in data management<br>- Data Collection through various methods<br>- Good engagement and communication with stakeholders | - Data management (especially comprehensive data collection from all sectors), Interpretation and publishing, reporting of data<br>- Need to improve the ICT infrastructure to cater to big data analysis, data integration, applications and analytical softwares |
| **Threats** | **Opportunities** |
| - Data users can manipulate the data shared as excel sheets are used for data collection<br>- Cyber-attacks, Security, misuse of data<br>- Sharing sensitive data | - Predict the loss due to disasters & incorporate DRR into development planning based on the existing data<br>- Automation of data collection<br>- International and national support platforms, Eg: MNU's MOU a tool for data capacity building support |

*Figure 2: SWOT analysis of NDMA regarding disaster data. Source: NDMA & UNDRR[6]*

A mapping of existing and needed capacities within the NDMA aligns with the identified strengths and weaknesses, and it is documented in Table 1. The reports highlight that coordination among stakeholders and additional human resources including data skills are required to manage disaster data effectively. Recommendations for capacity enhancement are documented in section 7 on page 22. Key recommendations of the maturity and capacity assessment report are documented in Appendix 9.1 on page 24.

[7] NMDA & UNDRR. (2022). Deliverable 3 and 5: Proposal for Stakeholder and Government Entities Coordination Mechanism for damage and loss data collection for Sendai Framework Monitoring. [Internal report]

[8] UNDRR & UNDP. (2022). Data and digital maturity for disaster risk reduction: Informing the next generation of disaster loss and damage databases. https://www.undrr.org/publication/data-and-digital-maturity-disaster-risk-reduction-informing-next-generation-disaster

*Table 1: Capacity assets vs needs. Source: NDMA & UNDRR[6]*

| | Capacity Assets | Capacity Needs |
|---|---|---|
| **Enabling Environment** | • Institutional capacity to develop and use internal channels to spread information throughout the organization | • Staff to manage disaster data<br>• Infrastructural support (Building, office workspace, etc.)<br>• Sufficient budget allocation for staff training in data management |
| **Organizational level** | • Engagement of stakeholders<br>• Ensure accuracy, reliability of information collected<br>• Use Data in decision making at the organization | • Make available key datasets to support disaster response<br>• Frame, manage and interpret a comprehensive analysis of the disaster data<br>• Ability to meet data reporting requirements under national and international agreements<br>• Design and undertake analysis of data at disaggregated level |
| **Individual Level** | • Knowledge and skills to apply statistical standards to classify and analyse data | • Training on Disaster data management and analysis.<br>• Knowledge of relevant staff handling disaster data of where to get required data |

Different disaster data mapping tables have been produced during the maturity assessment. They document the types of disaster data collected by institutions in the Maldives as illustrated in Table 2, data collection methods, users and producers of disaster data and other aspects. This information adds much value as baselines for future data governance activities including the coordination of who is doing, what, how, when, and where. Selected tables are consolidated in Appendix 9.2 on page 26.

*Table 2: Types of disaster data collected by institutions in the Maldives. Source NDMA & UNDRR (2022)*[9]

| Institution | Data collected | Contribution to Sendai Indicators | Hazard Focus | Data Disaggregation |
|---|---|---|---|---|
| National Disaster Management Authority | All Disaster specific data<br>Number of people affected<br>Loss and Damage assessments<br>Structural damage<br>Household damage<br>Agricultural loss<br>Hazards/ Disaster events (details such as date, time location, amount of damage to infrastructure)<br>DM plans at island level collects information on vulnerabilities ( people, places and things), Maps hazards, risk, capacity etc | A-1, A-2, A-3<br>B-1, B-2, B-3, B-4<br>C-2<br>D-1, D-2, D-3, D-4<br>E-1, E-2<br>F-1, F-2, F-3<br>G-1, G-2, G-3, G-4, G-5 | Geologic<br>Atmospheric<br>Anthropogenic<br>Other Natural and man made disasters | Started in 2022 by age, gender, Island, atoll, hazard type |
| Atoll Councils | Loss and damages data from monitoring of islands<br>Flood, fire, tidal waves, tornados etc.<br>Data on assistance provided by government in disasters<br>Damages incurred to the islands<br>Damages due to severe weather conditions<br>Environment related disasters caused to inhabited and uninhabited islands<br>Environment related damage to reef/costal areas<br>Covid-19 pandemic related data | A-1, A-2, A-3<br>B-1, B-2, B-3, B-4<br>D-1, D-2, D-3, D-4 | Geologic<br>Atmospheric<br>Anthropogenic<br>Other Natural and man made disasters | By age, gender, Island, atoll, hazard type |
| City Councils | Fire ,damages, flood & others<br>Damages to the people affected<br>Number of house holds affected<br>Flooded areas<br>Number of people effected by disaster | A-1, A-2, A-3<br>B-1, B-2, B-3, B-4<br>D-1, D-2, D-3, D-4 | Geologic<br>Atmospheric<br>Anthropogenic<br>Other Natural and man made disasters | By age, gender, Island, atoll, hazard type |

## 2.3. Data in NDMA strategies

The NDMA Strategic Plan 2024 – 2029[10] and the Disaster Risk Reduction Strategy Maldives 2024 – 2030[11] highlight the need to advance disaster and climate data, information, knowledge, and systems. Key statements are documented in Table 3.

*Table 3: Data references in the NDMA Strategic Plan and DRR Strategy*

| NDMA Strategic Plan 2024 - 2029 | DRR Strategy Maldives 2024 - 2030 |
|---|---|
| 1. Enhancing Emergency Response and Preparedness<br>1.4 Risk information for all:<br>• Establish a mechanism for the dissemination of multi-hazard risk information for risk-informed decision making.<br>• Develop a Disaster Information Management System. | Addressing Data Gaps and Strengthening Risk Assessment: Stakeholders emphasised the need for continuous data |

[9] NDMA, UNDRR, UNDP & Suzana Mariyam. (2022). Maturity and Capacity Assessment of Disaster related data in the Maldives: Climate and Disaster Data Enhancement Project. Presentation. [Internal document}

[10] NDMA. (2024). National Disaster Management Authority Strategic Plan 2024 - 2029. https://ndma.gov.mv/en/strategic-plan-2

[11] NDMA. (2024). Disaster Risk Reduction Strategy Maldives 2024 - 2030. https://ndma.gov.mv/en/publications/disaster-risk-reduction-strategy-maldives-2024-2030

| | |
|---|---|
| 2. Organisational Development and Reform<br>2.3 Enhance the use of technology and innovation<br>• Digitalise the Loss and Damage reporting mechanism in the Maldives.<br>• Improve the utilisation of technology in emergency response and preparedness.<br>• Digitalise the disaster management archive.<br>• Digitalise the Hazard, Vulnerability and Capacity Assessment Maps.<br>2.4 Establish a culture of continuous learning to meet the emergent risk landscape<br>• Develop a competency framework based on technical and non-technical training needs.<br>2.5 Enhance role of media and public relations<br>• Enhance the public image of NDMA to build public confidence and trust.<br>• Increase media engagement and accessibility in all phases of the disaster management cycle.<br>3. Building National Resilience<br>3.1 Integrate climate change adaptation into community-based disaster risk management. | collection and risk assessment to inform DRR strategies. This includes improving data collection on local hazards, vulnerabilities, and historical disaster events. Strengthening risk assessment methodologies will ensure that DRR efforts are targeted towards the most critical areas and potential threats.<br>Monitoring NAP process: Align data collection plans between agencies to complement each other preventing any duplication of work. Establish and implement data sharing mechanisms between agencies including parameters and areas of focus |

## 3. Data governance

Effective disaster data systems are built on robust data governance, which includes policies, people, and processes, supported by appropriate technologies.

### 3.1. Data governance in the Maldives

While digital transformation and E-Government services are advancing in the Maldives, no definition for data governance can easily be found within the Government websites. The Stakeholder Engagement Plan for the Digital Maldives for Adaptation, Decentralization and Diversification project states that "*improved data governance will help ensure that as people, services, and economic transactions move online, there are appropriate enablers and safeguards in place to make this transition as inclusive, secure, and convenient as possible*."[12] It also states that the "*absence of robust data governance architecture curtails interoperability and shared services among Government entities*".[12] Effective data sharing and Whole-of-Government data standards are limited, which hinders the centralisation and adoption of digital

[12] Maldives Ministry of Environment, Climate Change, and Technology. (2022). Stakeholder Engagement Plan: Digital Maldives for Adaptation, Decentralization and Diversification (P177040). https://www.environment.gov.mv/v2/wp-content/files/publications/20220331-pub-stakeholder-engagement-plan.pdf

services and systems. Some strategic frameworks mention data governance, for example the Maldives Bureau of Statistics Statistical Action Plan 2025 – 2027 or the Maldives Police Service Strategic Plan 2024 – 2028.[13, 14]

### 3.2. Data governance definitions

Data governance refers to the people, policies, and processes, complemented by technologies, to manage and use data effectively as an asset.[15, 16] It targets the regulated creation, management, sharing, and use of data for different purposes, while strengthening accountability, interoperability, and trust as well as reducing risks and duplication.[17, 18] It represents and strengthens the enabling environment of effective data management and use or reuse as illustrated in Figure 3 and Figure 4.


*Figure 3: Data governance core areas. Source: United Nations Data Strategy[16]*

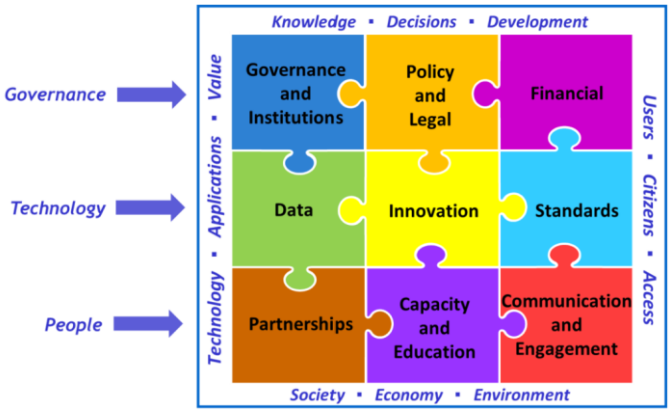


*Figure 4: United Nations Integrated Geospatial Information Framework (IGIF) – Strategic Pathways. Source: UN-GGIM[19]*

Examples of data governance aspects include a) people with roles and responsibilities such as data stewards or data custodians, capacities with skills and professional development; b) governance with strategies, frameworks, policies, and alignment, collaboration / coordination, compliance, monitoring and evaluation; c) processes or data lifecycles / value chains with

[13] Maldives Bureau of Statistics. (2025). Statistical Action Plan 2025 - 2027 to implement the National Strategy for the development of Statistics (NSDS) 2021 - 2030. https://statisticsmaldives.gov.mv/mbs/wp-content/uploads/2025/01/NSDSActionPlan.pdf

[14] Maldives Police Service. (2024). Strategic Plan 2024 - 2028. https://police.gov.mv/uploads/Strategic_Plan_2024_2028_26c9963b9e.pdf

[15] United Nations Statistical Commission. (2024). Data Governance across systems: exploring strategies for official statistics. Seminar on emerging issues. https://unstats.un.org/UNSDWebsite/events-details/un55sc-23022024-M-data-governance/

[16] United Nations. (2020). Data Strategy of the Secretary-General for Action by Everyone, Everywhere with Insight, Impact and Integrity 2020-22. https://www.un.org/en/content/datastrategy/images/pdf/UN_SG_Data-Strategy.pdf

[17] United Nations Office for Disaster Risk Reduction. (2023). UNDRR Data Strategy and Roadmap. https://www.preventionweb.net/media/88385/download?startDownload=20241229

[18] Digital Regulation Platform. (2024). Navigating Data Governance: A Guiding Tool for Regulators. https://digitalregulation.org/navigating-data-governance-a-guiding-tool-for-regulators/

[19] United Nations Global Geospatial Information Management (UN-GGIM). [2024]. United Nations Integrated Geospatial Information Framework (IGIF). https://ggim.un.org/UN-IGIF/

business requirements, quality control, metadata; and d) technologies with hardware, software, security, maintenance, and other criteria. Data governance can be seen as a subset of good governance, and it is related to data ecosystems,[20, 21, 22] digital governance, digital transformation, maturity,[23] e-governance or e-government,[24] information governance,[25] information cultures, and other topics.

Data governance and respective practices can differ across sectors, and national statistical offices have a key role to implement strategies and harmonise data for common use across systems.[15] While no globally agreed definition exists, a global data governance framework is in preparation, which targets a shared understanding within the United Nations system and support for Member States.[26] A selection of data governance definitions across the public and private sector is documented in Appendix 9.3 on page 37.

The following sections contain recommendations for strengthening disaster data governance and the enabling environment in the Maldives.

## 4. Collaboration and co-design for disaster and climate data

Collaboration is critical to co-design and manage disaster data across sectors (horizontal) and from sub-national to national and global levels (vertical). Disaster data cannot work effectively in isolation nor without sharing.

### 4.1. Steering committee and working group

Establish a formal high level steering committee and an informal practical working group that different stakeholders advance collaboratively disaster data governance and digital transformation activities.

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[20] Van Den Homberg, M., & Susha, I. (2018). Characterizing data ecosystems to support official statistics with open mapping data for reporting on sustainable development goals. ISPRS International Journal of Geo-Information, 7(12), 456. https://www.mdpi.com/2220-9964/7/12/456

[21] Van Esch, S., Van den Homberg, M., & Boersma, K. (2021, May). Looking beyond the data: an assessment of the emerging data ecosystem of Nepal's Flood Early Warning Systems. In 18th International Conference on Information Systems for Crisis Response and Management (pp. 282-293). Virginia Institute of Technology. https://research.vu.nl/ws/portalfiles/portal/132754356/ISCRAM2021_Final_Paper_88.pdf

[22] Lnenicka, M., Nikiforova, A., Luterek, M., Milic, P., Rudmark, D., Neumaier, S., ... & Bolívar, M. P. R. (2024). Understanding the development of public data ecosystems: From a conceptual model to a six-generation model of the evolution of public data ecosystems. Telematics and informatics, 102190. https://papers.ssrn.com/sol3/Delivery.cfm?abstractid=4831881

[23] UNDRR & UNDP. (2022). Data and Digital Maturity for Disaster Risk Reduction: Informing the Next Generation of Disaster Loss and Damage Databases. https://www.undp.org/publications/data-and-digital-maturity-disaster-risk-reduction-informing-next-generation-disaster-loss-and-damage-databases

[24] United Nations Department of Economic and Social Affairs (DESA). UN E-Government Survey 2024. https://publicadministration.un.org/egovkb

[25] Global Initiative on Disaster Risk Management (GIDRM). (2021). Information governance for disaster risk reduction (IG4DRR). Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). https://www.preventionweb.net/publication/information-governance-disaster-risk-reduction-ig4drr

[26] United Nations System Chief Executives Board for Coordination (CEB) High-level Committee on Programmes (HLCP) Working Group on International Data Governance. (2023). International Data Governance – Pathways to Progress. https://unsceb.org/international-data-governance-pathways-progress

- Include champions and influencers to drive positive change and align with other digital transformation efforts within projects and Government agencies.
- Coordinate regular meetings and a workplan or roadmap or strategy to address barriers and institutionalise / mainstream disaster data for operations.
- Provide effective communications and awareness across different channels including social media to enhance the internal and public understanding of disaster data and its requirements. Examples include data literacy, information literacy, weather literacy, and various other aspects.
- Include key collaboration partners such as the Maldives Meteorological Service (MMS), Maldives Bureau of Statistics (MBS), Maldivian Red Crescent (MRC); City / Atoll / Island Councils; Agro National Corporation (AgroNAT); Maldives Space Research Organisation (MSRO); Ministry of Tourism and Environment (MoTE); Ministry of Finance and Planning (MoF); Ministry of Health (MoH); Ministry of Social and Family Development (MoSFD); Maldives Police Service; Maldives National Defence Force (MNDF); Insurance/s; development partners; and others.

### 4.2. Co-design and joint efforts

Co-design effective data governance and systems with producers and users of disaster data to address key requirements and optimise adoption.

- Mobilise interoperability and reduced duplication through agreed Whole-of-Government approaches with mutual benefits.
- Consider public private partnerships (PPP) to advance the digital transformation of disaster data and its governance with relevant actors involved.
- Complement limited resources and address gaps through collaboration and PPPs.

## 5. Audit and strengthen current and historical disaster data and information

An audit or mapping and catalog or inventory helps understanding the current disaster data status with volumes and varieties of data and information across different sources. It can also support consolidating and enhancing historical disaster data.

### 5.1. Audit / map and catalogue disaster data

Audit existing disaster data and systems and establish a disaster data catalogue or inventory with quality metadata to clarify who is doing what, how, when, and where.

- Build on the mapping and tables from the disaster data maturity assessment (as illustrated in Table 2 and listed in Appendix 9.2 on page 26) to reuse existing information and reduce duplication.
- Consider the United Nations Economic Commission for Latin America and the Caribbean (ECLAC / CEPAL) recommendations and matrix to clarify and document aspects of data from the DALA, DesInventar, Sendai Framework Monitor, and other disaster and climate data such as mandates and ownership, roles and responsibilities or

accountabilities,[27] methodologies, sharing, use, and more as illustrated in Figure 5 and Figure 6.[28]

- Include existing Government methodologies, typologies, codes, plans, etc. to strengthen interoperability and alignment with existing systems.
- Consider synergies and requirements of national reporting and Sustainable Development Goals reporting.
- Consider a workshop (series) to 'show and tell' about disaster related data and information systems for knowledge exchange, mutual learning, trust building, and co-creating the disaster data catalogue.
- Identify high value and high volume data and information assets with specific requirements and strengthen digital information asset management over time.
- Reuse the data catalogue or inventory to support an asset registry and a virtual central repository within existing platforms.

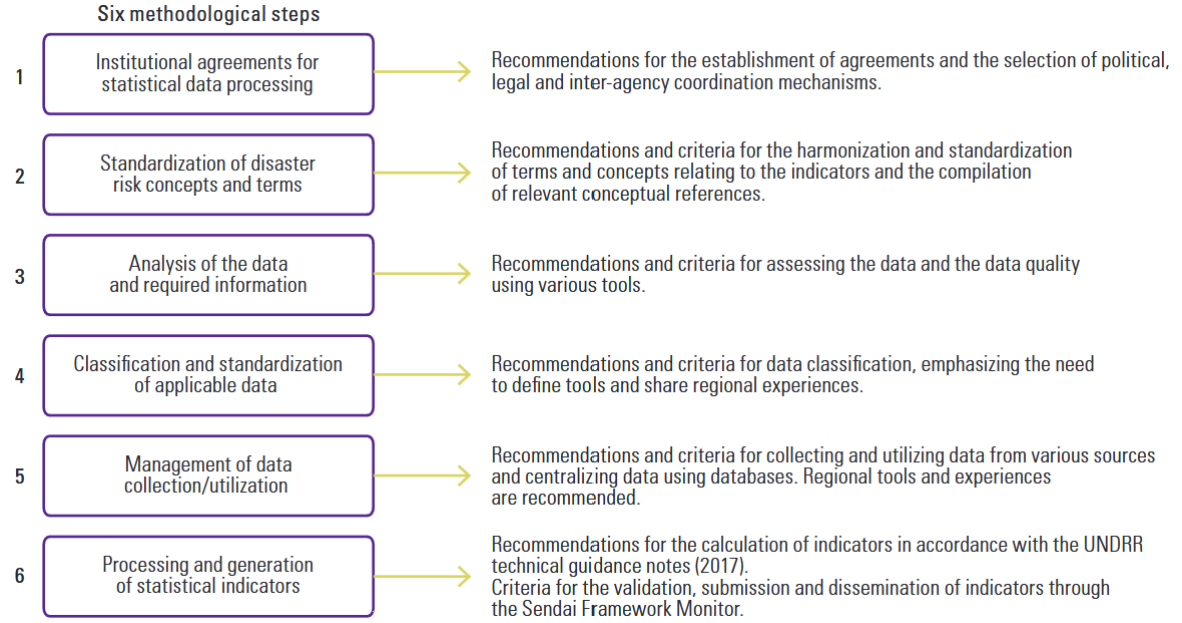
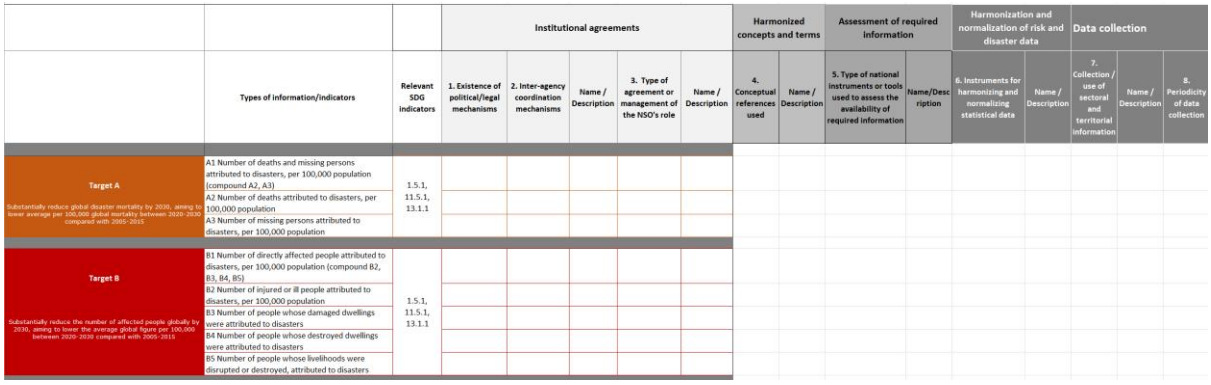



*Figure 5: Methodological Steps for Measuring Indicators for the Disaster-Related SDGs and the Sendai Framework. Source ECLAC / CEPAL[28]*

[27] OCHA. (2021). Data Responsibility Guidelines. https://centre.humdata.org/the-ocha-data-responsibility-guidelines/

[28] United Nations Economic Commission for Latin America and the Caribbean (ECLAC / CEPAL). (2022). Institutional and methodological recommendations for the measurement of indicators for the disaster-related Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction. https://repositorio.cepal.org/entities/publication/85a1326d-3908-4625-931e-04dc15782d84



| | | | Institutional agreements | | | | | Harmonized concepts and terms | | Assessment of required information | | Harmonization and normalization of risk and disaster data | | Data collection | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Types of information/indicators | Relevant SDG indicators | 1. Existence of political/legal mechanisms | 2. Inter-agency coordination mechanisms | Name / Description | 3. Type of agreement or management of the NSO's role | Name / Description | 4. Conceptual references used | Name / Description | 5. Type of national instruments or tools used to assess the availability of required information | Name/Description | 6. Instruments for harmonizing and normalizing statistical data | Name / Description | 7. Collection / use of sectoral and territorial information | Name / Description | 8. Periodicity of data collection |
| Target A<br>Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared with 2005-2015 | A1 Number of deaths and missing persons attributed to disasters, per 100,000 population (compound A2, A3) | 1.5.1, 11.5.1, 13.1.1 | | | | | | | | | | | | | | |
| | A2 Number of deaths attributed to disasters, per 100,000 population | | | | | | | | | | | | | | | |
| | A3 Number of missing persons attributed to disasters, per 100,000 population | | | | | | | | | | | | | | | |
| Target B<br>Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared with 2005-2015 | B1 Number of directly affected people attributed to disasters, per 100,000 population (compound B2, B3, B4, B5) | 1.5.1, 11.5.1, 13.1.1 | | | | | | | | | | | | | | |
| | B2 Number of injured or ill people attributed to disasters, per 100,000 population | | | | | | | | | | | | | | | |
| | B3 Number of people whose damaged dwellings were attributed to disasters | | | | | | | | | | | | | | | |
| | B4 Number of people whose destroyed dwellings were attributed to disasters | | | | | | | | | | | | | | | |
| | B5 Number of people whose livelihoods were disrupted or destroyed, attributed to disasters | | | | | | | | | | | | | | | |

*Figure 6: Matrix requirements (Extract) - Institutional and methodological recommendations for measuring Sendai Framework targets and indicators. Source: adapted from CEPAL / ECLAC*[28]

### 5.2. Historical disaster data

Consolidate and enhance historical disaster effects / impact data and information into a single source of truth.

- Establish an ongoing workstream to strengthen historical disaster and climate data and information.
- Digitalise historical information including digital preservation and automation to ensure ongoing access.
- Include key stakeholders and researchers, universities, digital transformation and digital preservation experts, consultants, and other partners.
- Include existing sources such as the DesInventar, Disaster Statistics, Red Crescent data collection / archive, Island plans with historical data, Records and archives in digital and paper formats, Media and online newspapers, Academic and grey literature, and other sources to consolidate information.
- Consider tourism incidents, finance information, insurance records, libraries, archives, and other sources.
- Strengthen historical data covering 30 to 50 years and locally downscaled to support climate finance, loss and damage including coastal erosion, and other aspects.
- Build on the data catalogue to reduce duplication.

## 6. Align, digitalise, and mainstream disaster and climate data collection, management, and use

Existing systems should be innovated and digitalised through ongoing, iterative, and modular co-design and co-creation efforts with stakeholders to maximise interoperability and integration. It includes tools or technologies, forms or templates, processes and workflows, and other aspects to optimise data flows and reduce duplication.

### 6.1. Review and innovate disaster data systems

Identify priority systems and services to review, innovate, align, and digitalise for improved disaster data collection, management, and use.

- Connect the DALA system with relevant forms, tools, and processes based on the audit and data catalogue.
- Review and align the DALA data structure with the Sendai Framework Monitor and data collection forms or other relevant disaster data systems.
- Standardise hazards according to the Hazard Information Profiles to harmonise data and optimise analysis.[29]
- Strengthen sex, age, disability disaggregated data (SADDD) to optimise the evidence for disaster and risk analysis and risk reduction.[30]
- Collaborate with Maldives Bureau of Statistics and other partners to anonymise disaster data according to standards to protect privacy and identity of citizens.
- Collaborate with the Maldivian Red Crescent and other partners to coordinate and strengthen digital data collection for rapid assessments and feedback mechanisms using Kobo Toolbox or other tools.
- Collaborate with Maldives Meteorological Service, Maldivian Red Crescent and other partners to strengthen impact-based forecasting and anticipatory action with improved historical disaster data and innovative systems.
- Collaborate with sector stakeholders to co-design sector modules that enable standardisation and interoperability or integration with existing and future disaster data.
- Collaborate with the Agro National Corporation, Food and Agriculture Organisation of the United Nations (FAO), and other partners to strengthen agriculture data and including FAO methodologies.
- Collaborate with the Island councils to digitalise the Island Disaster Management Plans and transform data collection, management, and use.
- Collaborate with the Island Councils, Maldives Meteorological Service, and other stakeholders to strengthen traditional knowledge and its use to reduce disaster risks and effects. Clarify how the Nakaiy seasonal weather charts and calendar system can add value.
- Collaborate with Ministry of Finance and sector stakeholders to specify sector losses and damages beyond household level and including livelihoods, effects / impact, insurance, Government compensation, calculation and quantification of economic loss, yields, sector infrastructure disruptions, environmental loss, fiscal risk assessment, slow onset events (processes), non-economic losses and other aspects.
- Collaborate with the Ministry of Tourism and Environment to strengthen incident reporting and interoperability.

### 6.2. Good practice

Selected examples of good practice relate to aspects identified during the research and stakeholder meetings.

- Build on existing systems and avoid re-inventing the wheel.
- Include advocacy, incentives, change management, and other aspects for data producers and users to optimise participation, adoption, sustainability, information sharing, and other aspects. Clarify ‘what’s in it for me’ and mutual benefits such as ‘give and take’ or the return on investment (ROI).

[29] UNDRR & International Science Council (ISC). [2025]. Hazard Information Profiles (HIPs) online reference. https://www.preventionweb.net/drr-glossary/hips

[30] UNDRR & Wilcox, T. et al. (2021). Sendai Framework Monitor (SFM) Sex, Age and Disability Disaggregated Data (SADDD). https://www.undrr.org/publication/sendai-framework-monitor-sfm-sex-age-and-disability-disaggregated-data-saddd

- Consider standards and good practice such as the Digital Principles for sustainable and inclusive system development illustrated in Figure 7,[31] FAIR Principles to enhance the Findability, Accessibility, Interoperability, and Reuse of data,[32] and the CARE Principles to specify Collective benefit, Authority to control, Responsibility, Ethics.[33]
- Move beyond the single concept of 'data collection' and encompass the entire spectrum and requirements of disaster data lifecycles and data value chains as illustrated in Figure 8.[34]. Alternative expressions could include 'data collection, management, analysis, and use' or other terms relevant for the respective approach. This change targets a better understanding of efforts, financial and human resources, skills, time, and other requirements among stakeholders and especially decision makers. The Antigua and Barbuda Agenda for SIDS (ABAS) Declaration states "data collection, governance, management, analysis and assessment on hazards, disaster events and their impacts, including losses and damages".[35]
- Use a) business process management (BPM) as a discipline targets the identification, modelling, analysis, measurement, and improvement or optimisation of workflows;[36] and b) data value chains to illustrate different steps or activities to manage and transform data into information or knowledge products to support decision making and actions to establish and digitalise formal agreed data and information flows. BPM includes people and their behaviours or actions, governance such as regulations, systems or technologies, administrative structures, timelines, and other aspects to achieve goals or strategies, while it can also contribute to automation. Data value chains can be used as guidance or supporting material to optimise data flow charts and capture effectively who is doing what, where, how, when, and why.
- Strengthen quality metadata such as description for discovery, technical specifics including formats or software, access and rights including open data, source or provenance, preservation with update frequency, retention, archiving and other details.
- Specify data and information access with rights and sharing, potentially through a protocol with sensitivity classification (for example: open – low / no sensitivity, restricted – moderate sensitivity, confidential – high sensitivity, strictly confidential – severe sensitivity)[37], and licenses for reuse (for example Creative Commons)[38] at item metadata level.
- Include digital preservation to complement backup and optimise access over time.

[31] Principles for Digital Development {Digital Principles]. [2025]. https://digitalprinciples.org/ and https://web.archive.org/web/20240302220010/https://digitalprinciples.org/

[32] GoFair. [2024]. FAIR principles. https://www.go-fair.org/fair-principles/

[33] Global Indigenous Data Alliance. [2024]. CARE Principles for indigenous data governance. https://www.gida-global.org/care

[34] Open Data Watch & Data 2x. (2018). The data value chain: Moving from production to impact. https://opendatawatch.com/publications/the-data-value-chain-moving-from-production-to-impact/

[35] United Nations Fourth Conference on Small Island Developing States. (2024). The Antigua and Barbuda Agenda for SIDS (ABAS) – a Renewed Declaration for Resilient Prosperity. https://sdgs.un.org/sites/default/files/2024-04/SIDS4%20-%20Co-Chairs%20FINAL.pdf

[36] Gartner. (2024). Gartner Glossary: Business Process Management (BPM). https://www.gartner.com/en/information-technology/glossary/business-process-management-bpm

[37] Inter-Agency Standing Committee. (2024). Information Sharing Protocol (Template). https://docs.google.com/document/d/1-deS1mG1lT_bm-9mcFNjp5Z31zlca0mNN2Y4FAw6rEQ/edit?tab=t.0 ; see also Working draft of the data responsibility guidelines (2018) https://www.unocha.org/attachments/fae8e176-36ca-305b-ae85-ea0971a46c38/OCHA-DR-Guidelines-working-draft-032019.pdf

[38] Creative Commons. https://creativecommons.org/ , https://creativecommons.org/share-your-work/cclicenses/

- Establish monitoring, evaluation, and learning including after action reviews for ongoing improvements.
- Include documentation and regular trainings to ensure that users are aware and new staff are informed.


*Figure 7: Digital Principles. Source: Digital Principles (2025)*

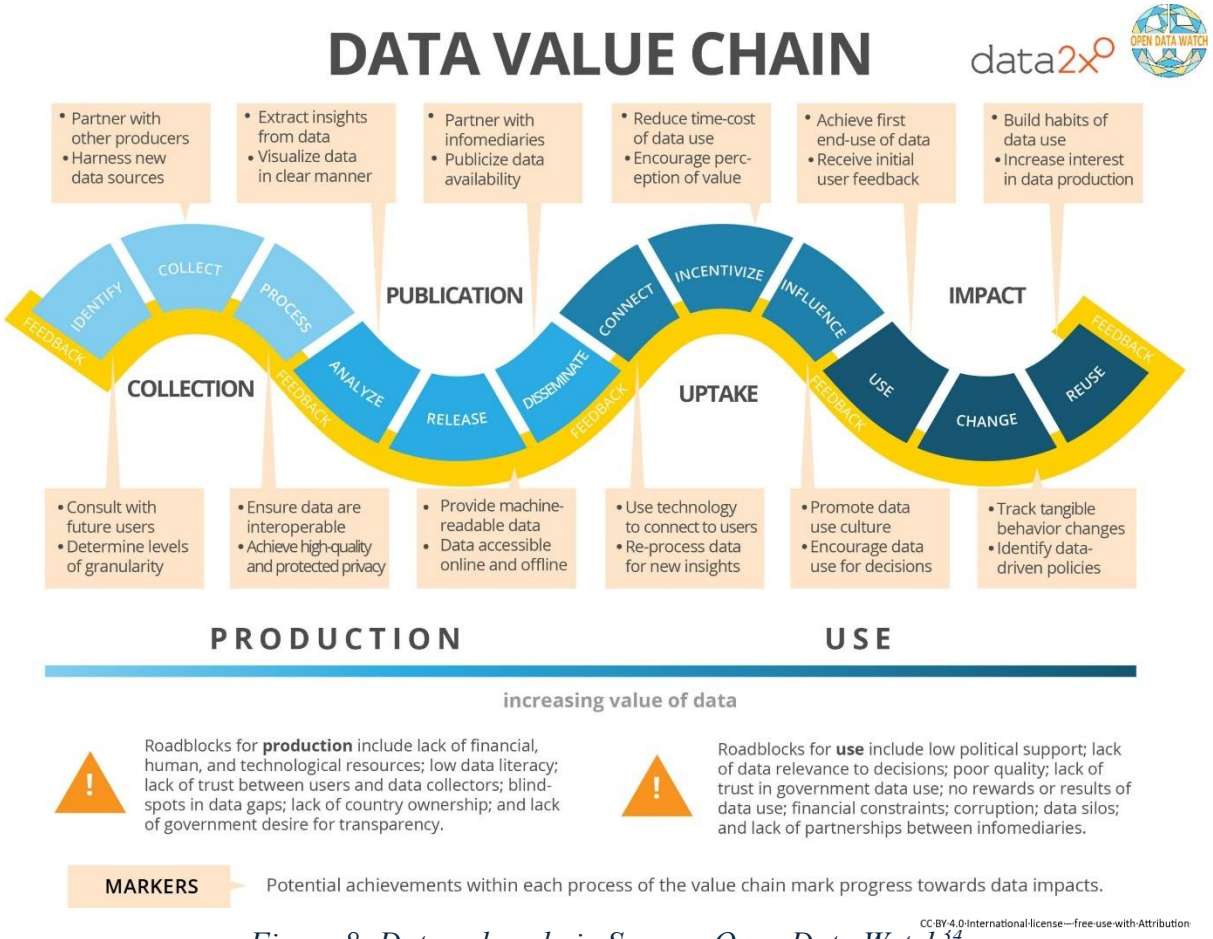



*Figure 8: Data value chain Source: Open Data Watch*[34]

## 7. Capacity and professional development

Capacity development focusing on data skills and additional dedicated capacities have been mentioned in stakeholder meetings and in the maturity and capacity assessment reports. Additional staff with data management or data science qualifications, skills, and proven expertise are recommended to address the continuously growing and changing data, information, and knowledge management requirements. A range of capacity enhancement options can be used.

- Mobilise a disaster and climate data and information team as additional dedicated and skilled capacities visible in the organisational chart to address the continuously growing volumes and dynamics of disaster and climate data within the NDMA.
- Ensure that projects include dedicated data, information, and knowledge management activities / funding to enable temporary project staff and cost-recovery for positions.
- Embed ongoing professional development for data, information and knowledge management in staff performance requirements with appropriate funding and support to ensure that continuously changing data and information needs can be addressed.
- Establish career pathways for NDMA staff within the organisation to incentivise continuity and reduce the risk of staff turnover.
- Engage with the Government human resources team and digital transformation agency to drive digital workforce planning and the development of a competency framework,

considering the Skills Framework for the Information Age (SFIA) to mobilise upskilling, and digital workforce development.[39]

- Consider complementing capacities through Government collaboration to reduce duplication and maximise synergies.
- Consider complementing capacities with support from development partners such as consultants, placements like Australia Assists or RedR, volunteers, students with disaster data curricula, etc.
- Engage in data training with certificates, professional associations with ongoing professional development programs, tertiary education including scholarships, and other options for short- or medium- and long-term learning opportunities.
- Mobilise knowledge exchanges and peer to peer exchanges with Government agencies within and outside the Maldives to enhance existing practices.
- Provide disaster data trainings and materials including worksheets with instructions and infographics to strengthen capacities in other Government agencies.
- Ensure regular simulations and exercises including after action reviews to practice and learn collaboratively.
- Consider training, mentoring, and learning placements with development partners including the UNDRR to enhance specific skills.

## 8. Recommendations

Considering the recommendations throughout the report, specifically from section 4 on page 15 onward, this section focuses on high-level aspects to strengthen disaster data governance and good practice for disaster losses and damages in the Maldives. This includes:

- Define and strengthen good data governance and the enabling environment needed with people, policies, and processes for disaster and climate losses and damages data to address data gaps and innovate information systems.
- Collaborate with data and information producers and users such as Island Councils, Maldives Bureau of Statistics, Maldives Meteorological Services, Maldives Red Crescent, Ministry of Finance and Planning, Ministry of Tourism and Environment including Climate Change, and others to co-design disaster and climate data frameworks and processes, guided by a formal steering committee and an informal working group.
- Audit and strengthen current and historical disaster data and information to clarify who is doing what, how, when, and where.
- Build on existing systems, such as DALA, OneMap Maldives, and others to align, digitalise, and mainstream disaster and climate data collection, management, and use through ongoing and modular efforts, and use business process management for effective data flows.
- Collaborate and use public private partnerships such as tourism, insurance, and others to optimise the interoperability and integration of disaster and climate data while reducing duplication and embedding good practice.

[39] SFIA Foundation. (2025). Skills Framework for the Information Age (SFIA): The global skills and competency framework for the digital world; SFIA 9 skills from A – Z. https://sfia-online.org/en/sfia-9/all-skills-a-z and SFIA for government. https://sfia-online.org/en/tools-and-resources/sfia-for/sfia-for-government

- Enhance dedicated and skilled data capacities within the NDMA through additional positions such as data scientists or data managers, and a range of ongoing professional development activities.

# 9. Appendices

## 9.1. Appendix: Disaster data maturity recommendations

The Digital Disaster Risk Reduction Maturity Model (DDRRMM) was used to assess progress and readiness in the Maldives in 2022.[23] Key recommendations for the seven DDRRMM components are shown in Table 4.[6]

*Table 4: Recommendations for the NDMA by the seven components of the DDRRMM. Source: NDMA & UNDRR (2022)[6]*

| Component Description | Component score for NDMA (Out of 5) | Recommendations |
|---|---|---|
| C1: Data Access and Sharing | 2.5 | • Automation of data collection tools can speed up data access and sharing. Eg: web based or online application to transfer data.<br>• Technical expertise and equipment are needed to integrate the big data compilation.<br>• Collect data disaggregated by socio economic indicators such as gender, age, locality, disability status.<br>• - Impact assessments, predictions and forecasts of disasters can be conducted through MOUs with local academia |
| C2: Digital Applications and Services | 2.3 | • Install analytical software such as SPSS, STATA or R and train staff in the usage<br>• - Create and disseminate weekly / monthly / annual disaster statistics to complement policy level decision making and community awareness and education |
| C3: ICT Infrastructure | 2.0 | • Improve Data storage for speedy recovery of data files from institutions and within departments<br>• Operationalise daily updating of the DesInventar and train stakeholders for its use.<br>• Establish the network infrastructure needed to capture data from all relevant institutions.<br>• - Install measures for data security to minimise data misuse and manipulation. |
| C4: Staff Competencies | 2.6 | • Hire trained data analyst for managing data at NDMA<br>• Create a Training portfolio in data management, analysis and reporting. |

| | | |
|---|---|---|
| | | • - Provide training for staff in statistical analysis, design of studies, interpretation and reporting of data for the public and for policy makers |
| C5: Institutional and Partnership programs | 3.4 | • Build data capacity of peripheral institutions such as island, atoll and city councils and provide the necessary ICT infrastructure such as drone technology, GIS mapping technology to track flooding levels and coastal erosion levels.<br>• - Allocate sufficient budget for data related staff training and infrastructure |
| C6: Governance | 2.5 | • Use the Disaster Management Law and the Maldives Statistics Act to mandate data flow from all relevant institutions towards NDMA<br>• Identify data sources and data focal points at each stakeholder institution for reporting of Sendai targets, disaster related SDG targets and SAP / NRR targets<br>• Learn from the high scoring countries such as Indonesia and Mauritius on their data management/integration strategies<br>• - Share best practices from high scoring local stakeholders such as the Health Protection Agency, Maldives Meteorological services and the State Agro National Corporation on how data is managed in disasters or emergencies. |
| C7: Alignment with DRR | 3.3 | • Ensure that all DRR interventions are evaluated against data and decision making is informed by available data.<br>• Produce hazard impact assessments, vulnerability maps to monitor future risk management activities<br>• - Use existing GIS mapping capacity at Land Survey Authority and Maldives Bureau of Statistics to complement future interventions |

## 9.2. Appendix: Disaster data mapping

The NDMA maturity and capacity assessment in 2022 included several tables with different disaster data criteria as shown below.[6],[9]

*Table 5: Disaster data collected by Institutions in the Maldives – consolidated table. Source: Author, based on NDMA & UNDRR (2022)[6],[9]*

| Institution | Type of Disaster Data | Data (variables) maintained /collected | Potential Contribution to Sendai Indicators | Hazard Focus | Data Disaggregation | Role in Disaster Data | Data collection method | Capacity building desired |
|---|---|---|---|---|---|---|---|---|
| National Disaster Management Authority | Disaster Risk Disaster Effect | All Disaster specific data Number of people affected Loss and Damage assessments Structural damage Household damage Agricultural loss Hazards/ Disaster events (details such as date, time location, amount of damage to infrastructure) | A-1, A-2, A-3 B-1, B-2, B-3, B-4 C-2 D-1, D-2, D-3, D-4 E-1, E-2 F-1, F-2, F-3 G-1, G-2, G-3, G-4, G-5 | Geologic Atmospheric Anthropogenic Other Natural and manmade disasters | Started in 2022 by age, gender, Island, atoll, hazard type | User / Regulator / Supplier / Producer | Forms | SPSS, STATA, MS Access, R, Data Collection, Management, Data Analysis and Interpretation |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | DM plans at island level collects information on vulnerabilities (people, places and things), Maps hazards, risk, capacity etc | | | | | | |
| Atoll Councils (Noonu, Alifdhaalu, Faafu& Lhaviyani) | Disaster Risk Disaster Effect | Loss and damages data from monitoring of islands Flood, fire, tidal waves, tornados etc. Data on assistance provided by government in disasters Assistance provided to other government institutions during a disaster Damages occurred to the islands Damages due to severe weather | A-1, A-2, A-3 B-1, B-2, B-3, B-4 D-1, D-2, D-3, D-4 | Geologic Atmospheric Anthropogenic Other Natural and manmade disasters | By age, gender, Island, atoll, hazard type | User / Producer / Supplier | Forms, Island councils monitoring form | Data collection, analyse and make meaning of it for decision making, GIS mapping |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | conditions<br>Environment related disasters caused to inhabited and uninhabited islands<br>Environment related damage to reef/coastal areas<br>Covid/pandemic related data | | | | | | |
| Male City Council | Disaster Risk<br>Disaster Effect | Fire, damages case flood & others | A-1, A-2, A-3 B-1, B-2, B-3, B-4 D-1, D-2, D-3, D-4 | Geologic<br>Atmospheric<br>Anthropogenic<br>Other Natural and manmade disasters | By age, gender, Island, atoll, hazard type | Producer | by people who were affected by disaster, disaster committee, district office | Preparedness, Response, and Recovery. |
| Addu City Council | Disaster Risk<br>Disaster Effect | Damages to the people and household,<br>Number of households affected<br>Flooded areas<br>Number of people effected by disaster | A-1, A-2, A-3 B-1, B-2, B-3, B-4 D-1, D-2, D-3, D-4 | Geologic<br>Atmospheric<br>Anthropogenic<br>Other Natural and manmade disasters | By age, gender, Island, atoll, hazard type | Producer | by people who were affected by disaster, disaster committee, district office | Data analysis and reporting |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Health Protection Agency / MoH | Disaster Risk Disaster Effect | Patient name, Age, Sex, Nationality, OP/IP, Event, Location, #of cases, date of onset, signs and symptoms, clinical details, laboratory details | A-1, A-2 B-1, B-2 D-2, D-4, D-5, D-7 E-1, E-2 F-1, F-2, F-3, F-3, F-4, F-5, F-6, F-7, F-8 G-1, G-2 | | | User / Regulator / Producer | Form via email and phone. Covid data management through several online platforms like outbreak system, Haalubelun, Sampler, Dhifaau, IMUGA, Covid safe. | Data management training |
| Indhira Gandhi Memorial Hospital | Disaster Risk Disaster Effect | Patient name, Age, Sex, Nationality, OP/IP, Event, Location, #of cases, date of onset, signs and symptoms, clinical details, laboratory details | A-1, A-2 B-2 | | | Producer | Google form, excel sheet | MS Spreadsheet, pivot tables, use formulae |
| Maldives Bureau of Statistics | Disaster Risk Disaster Effect | Households suffered from disasters - HEIS | B-3<br>C-1<br>D-1, D-4 | | | | By a household survey questionnaire | STATA |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Socio Economic level - Census survey<br>Poverty indicators - Census | | | | | | |
| Maldives Meteorological Services | Disaster Risk | Temperature (ave. min & max) Humidity Wind (ave, min & max) Air Pressure Rainfall Sunshine data Cloud coverage Earthquake and tsunami data Current weather situation Temp (balloon data). | F-1 G-1, G-2, G-3 | Atmospheric | By locality | User / Supplier / Producer | Through various equipment and related systems established in the office. | Data analysis, data management, database skill, data communications skills, data quality, data integrity |
| Maldives National Defence Force (FRS & CGS) | Disaster Risk Disaster Effect | Incident type location household vehicle time date deaths injuries rescued insurance details etc Distress vehicles missing person details medical | A-1, A-2, A-3 B-1, B-2, B-3, B-4, B-5 D-1, D-2, D-3, D-4, D-5, D-6, D-7, D-8 F-1, F-2, F-3, F-4, F-5, F-6, F-7, F-8 G-1, G-2, G- | Geologic Atmospheric Other Natural and manmade disasters | By age, gender, Island, atoll, hazard type | User / Regulator / Supplier / Producer | Excel Form | MS Access, SPSS, STATA, R and Data related training |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | evacuations accidents etc | 3, G-4, G-5,G-6 | | | | | |
| Ministry of Education | Disaster Risk Disaster Effect | Fire, laboratory chemicals, flooding, building Damage and other Disaster Incident reports on Fire, lab chemical, flood, damages (to school properties) due to natural hazard. evacuation drill data | D-3, D-6, D-8, F-1-7 | | | Supplier / Producer | Form, reports & google sheets, incidents Reports and writing | DRR Data management and analysis and also DRR Training |
| Ministry of Finance and Planning | Disaster Effect Disaster Impact | Expenditures, Revenues, Budget utilization by office, difficult to identify specifically disaster related data. Maintains covid related data such as covid-19 expenses | C-1, C-3, C-4, C-5 F-1, F-2, F-3, F-4, F-5, F-6, F-7, F-8 | | | Supplier | through public accounting system | Data Structure Analytics, R training, Advanced statistical tools training |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | separately from the fund allocated for covid-19 related expenses. | | | | | | |
| National Social Protection Agency | Disaster Effect | Providing financial aid to vulnerable population to cater basic needs on a monthly basis with regard to the programs they are registered at the agency. | F-1, F-2, F-3 | | | Supplier | For applications related to the programs of the agency: by form | |
| Solarelle Insurance Pvt Ltd | Disaster Effect | Property Name Location Value of Property Extent of Damage (Monetary Value) | C-3, C-4, C-5 | | | User / Producer | Form and Investigation | Statistical Data Analysis Skills |
| Agro National Corporation | Disaster Risk Disaster Effect | Land resource capacity Production per plant Production per cycle Disaster Pest | B-1, B-5 C-2 D-1, D-4 | Insect infestation Geologic | By locality | Collector / fund | Google form, videos, pictures and direct communicatio n | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | and plant disease damage | | | | | | |
| Ministry of Tourism and Environment (tourism sector) | Disaster Risk Disaster Effect | Economic and tourism loss/value pertaining to disasters, Disaster incident records (Deaths, fire etc.), Stranded tourists, Age, nationality, check-in date Cancellation and reservation data after an incident Incident/accident statistics Infrastructure damage, size, location, | A-1, A-2, A-3 B-1, B-2, B-3, B-4, B-5 C-1, C-3, C-5 D-1, D-4, D-5, D-8 | Geologic | By locality, Age, Nationality | Regulator / Supplier / Producer | Jot form, Google form, Manual formats to email | Data analytics of disasters |
| Ministry of Tourism and Environment (environment sector) | Disaster Risk Disaster Effect Disaster Impact | Coastal Erosion Vegetation loss habitat loss chemical related incidents Water and Sewerage Service Data | A-1, A-2, A-3 B-1, B-2, B-3, B-4, B-5 D-1, D-4, D-5, D-8 F-1, F-2, F-3, F-4, F-5, F-6, F-7, F-8 G-1 | Atmospheric Geologic' | By locality | User / Producer | kobo toolbox, conducting baseline studies, requesting stakeholders for data, through forms, | Survey Methodologies, Data Analytics Knowledge, Use of Open-source analytics tools, Report Writing and |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | field visits, published literature | Development, Use of Mapping Software Data processing and management, statistical software applications management etc. |
| Maldives Police Service | Disaster Risk Disaster Effect Disaster Impact | Number of affected people Effected properties Possibilities of escalations Environmental impact | A-1, A-2, A-3 B-1, B-2, B-3, B-4, B-5 D-1, D-2, D-3, D-4, D-5, D-6, D-7, D-8 E-1 F-1 G-1, G-2 | Geologic Atmospheric Other Natural and manmade disasters | By age, gender, Island, atoll, hazard type | Supplier | case based / from relevant stake holders | Extended knowledge and experience in the field of Data Collection / Management and Analysis |
| Maldivian Red Crescent | Disaster Risk Disaster Effect Disaster Impact | Vulnerability and Capacity Assessment process carried out by MRC in communities | A-2 D-1, D-4, D-5, D-8 F-1, F-2, F-3, F-5, F-6, F-7, F-8 | Geologic Atmospheric Other Natural and manmade disasters | By age, gender, Island, atoll, hazard type | User / Producer | | Managing big data, data analysis, spatial data collection and analysis |
| Male' Water and Sewerage Company Ltd | Disaster Effect | Data related to power/ water/ sewer/ waste management documents / Log sheets, | A-1, A-2, A-3 B-1, B-2 C-5 F-1, F-4, F-6 | | | User / Producer | log sheets, forms, check list, applications, | Training related to maintain quality and accuracy of data |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Weekly reports/ monthly and annual reports with data related to our operations | | | | | hard and soft copies | |
| State Electricity Company Ltd | Disaster Effect | Electricity generated in units by atoll and Powerhouse, Consumed, Consumption, Demand, preventive measures are taken during the planning and designing of the power plants which meets international standards and guidelines | A-1, A-2, A-3 B-1, B-2 C-5 F-1, F-4, F-6 | | | Producer | Report and apps | training related with data collection and analysing |
| Utility Regulatory Authority | Disaster Effect | Interruption to utility services being provided; cause, actions carried out, whether and how issue was | A-1, A-2, A-3 B-1, B-2 C-5 F-1, F-4, F-6 | | | Producer | By form submitted via email | Methods of statistical data and probability analysis |

| | | | | | | | | |
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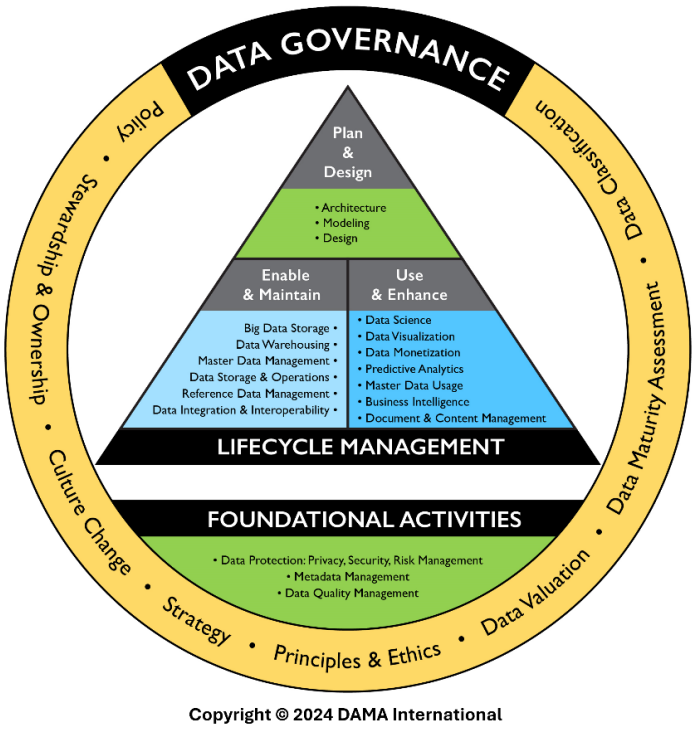
| | | resolved, duration of interruption to service | | | | | | |

## 9.3. Appendix: Data governance definitions

The definitions and implementation of data governance vary and evolve across the public and private sector as shown in Table 6.

*Table 6: Data governance definitions*

| Definition | Source | Comment |
|---|---|---|
| The exercise of authority, control, and shared decision-making (planning, monitoring, and enforcement) over the management of data assets.<br>DAMA Wheel Evolved<br>(see also Figure 11 Context Diagram following this table)<br>  <br><br>*Figure 9: Data governance wheel Source: DAMA International* | DAMA International. The DAMA Guide to the Data Management Body of Knowledge (DAMA-DMBOK2R). 2nd ed, revised. Sedona, AZ: Technics Publications, LLC, 2024. https://www.dama.org/cpages/dmbok2r-wheels and https://www.dama.org/cpages/dmbok2r-infographics | DAMA International – Data Management Association.<br>Publishes DMBOK – Data Management Body of Knowledge. |
| Data governance is the specification of decision rights and an accountability framework to ensure the appropriate behaviour in the valuation, creation, consumption and control of data and analytics.<br>Data governance core areas | United Nations. (2020). Data Strategy of the Secretary-General for Action by Everyone, Everywhere with Insight, Impact and Integrity 2020-22. | |

| | | |
|---|---|---|
|  <br>*Figure 10: Data governance core areas Source: United Nations Data Strategy* | https://www.un.org/en/content/datastrategy/images/pdf/UN_SG_Data-Strategy.pdf | |
| Strong data governance is a subsystem of organizational decision rights and accountability framework. Data governance is the pillar that supports interoperability of the diverse programmatic data collection and storage processes, streamlines programmatic data work, and helps to realise cost savings. | United Nations Office for Disaster Risk Reduction. (2023). UNDRR Data Strategy and Roadmap. https://www.preventionweb.net/media/88385/download?startDownload=20241229 | |
| Data governance can be described as the policies, guidelines, standards, procedures and practices that regulate the generation, management, use and reuse of data. It addresses the overarching vision for data within a system and how it is shared, accessed and integrated while mitigating risks and maintaining trust. The implementation of data governance strategies differs across domains and is dependent on national practices. It is essential for the global statistical community as the data space evolves in a dynamic fashion to discuss different ways of handling data governance and explore commonalities that can help define the role and the strategies of the national statistical offices within the larger landscape of data governance across the whole system.<br>Data governance has been discussed across various groups at the national and international levels. It applies to data | United Nations Statistical Commission. (2024). Data Governance across systems: exploring strategies for official statistics. Seminar on emerging issues. https://unstats.un.org/UNS | |

| | | |
|---|---|---|
| within the private and public sectors and on how data is exchanged between them. | DWebsite/events-details/un55sc-23022024-M-data-governance/ | |
| Data governance refers to the comprehensive framework that encompasses the people, policies and processes overseeing how data decisions are made and implemented throughout the data lifecycle. It includes strategic, legal, and regulatory considerations to minimise risks, ensure accountability, and optimise data assets. It is important to note that there may be similarities and variations in how different countries define concepts related to data governance. For example, the definition of "personal data" or "sensitive data" may differ from one country to another, impacting data governance practices. | Digital Regulation Platform. (2024). Navigating Data Governance: A Guiding Tool for Regulators. https://digitalregulation.org/navigating-data-governance-a-guiding-tool-for-regulators/ | |
| Data governance and management means having processes, roles, policies, standards, and metrics in place that ensure the effective and efficient use of data to meet the agency's goals and ensure the quality and security of data, while also providing clarity on who can take what action, with what data, in what circumstances, using what methods.<br><br>Implementing the Data Governance Framework that sets out the rules, processes and roles that help us ensure robust data management and governance practices. This will minimise risk, establish rules for using data, help us meet compliance requirements, improve communication, increase the value of data, and reduce the cost of managing data. | Australia National Emergency Management Agency. (2023). Data Strategy 2023 - 25. https://www.nema.gov.au/sites/default/files/2024-08/National%20Emergency%20Management%20Agency%20Data%20Strategy%202023-25.pdf | |
| The definition of data governance includes the collection of processes, policies, roles, metrics, and standards that ensures an effective and efficient use of information. This also helps establish data management processes that keep | Microsoft Azure. [2024]. What is Data Governance? | Commercial source |

| | | |
|---|---|---|
| your data secured, private, accurate, and usable throughout the data life cycle.<br><br>A robust data governance strategy is crucial for any organization that uses data to drive business growth, make improved decision-making, and ensure successful outcomes in a competitive market. When collecting vast amounts of internal and external data, you'll need to have a strategy that manages risks, reduces costs, and executes business objectives effectively. | https://azure.microsoft.com/en-ca/resources/cloud-computing-dictionary/what-is-a-data-governance | |
| Data governance is everything you do to ensure data is secure, private, accurate, available, and usable. It includes the actions people must take, the processes they must follow, and the technology that supports them throughout the data life cycle.<br><br>Data governance means setting internal standards—data policies—that apply to how data is gathered, stored, processed, and disposed of. It governs who can access what kinds of data and what kinds of data are under governance. Data governance also involves complying with external standards set by industry associations, government agencies, and other stakeholders. | Google Cloud. [2024]. What is data governance? https://cloud.google.com/learn/what-is-data-governance | Commercial source |
| Data governance is the data management discipline that focuses on the quality, security and availability of an organization's data. Data governance helps ensure data integrity and data security by defining and implementing policies, standards and procedures for data collection, ownership, storage, processing and use. | IBM. [2024]. What is data governance? https://www.ibm.com/topics/data-governance | Commercial source |

DAMA International – Context diagram / infographics https://www.dama.org/cpages/dmbok2r-infographics

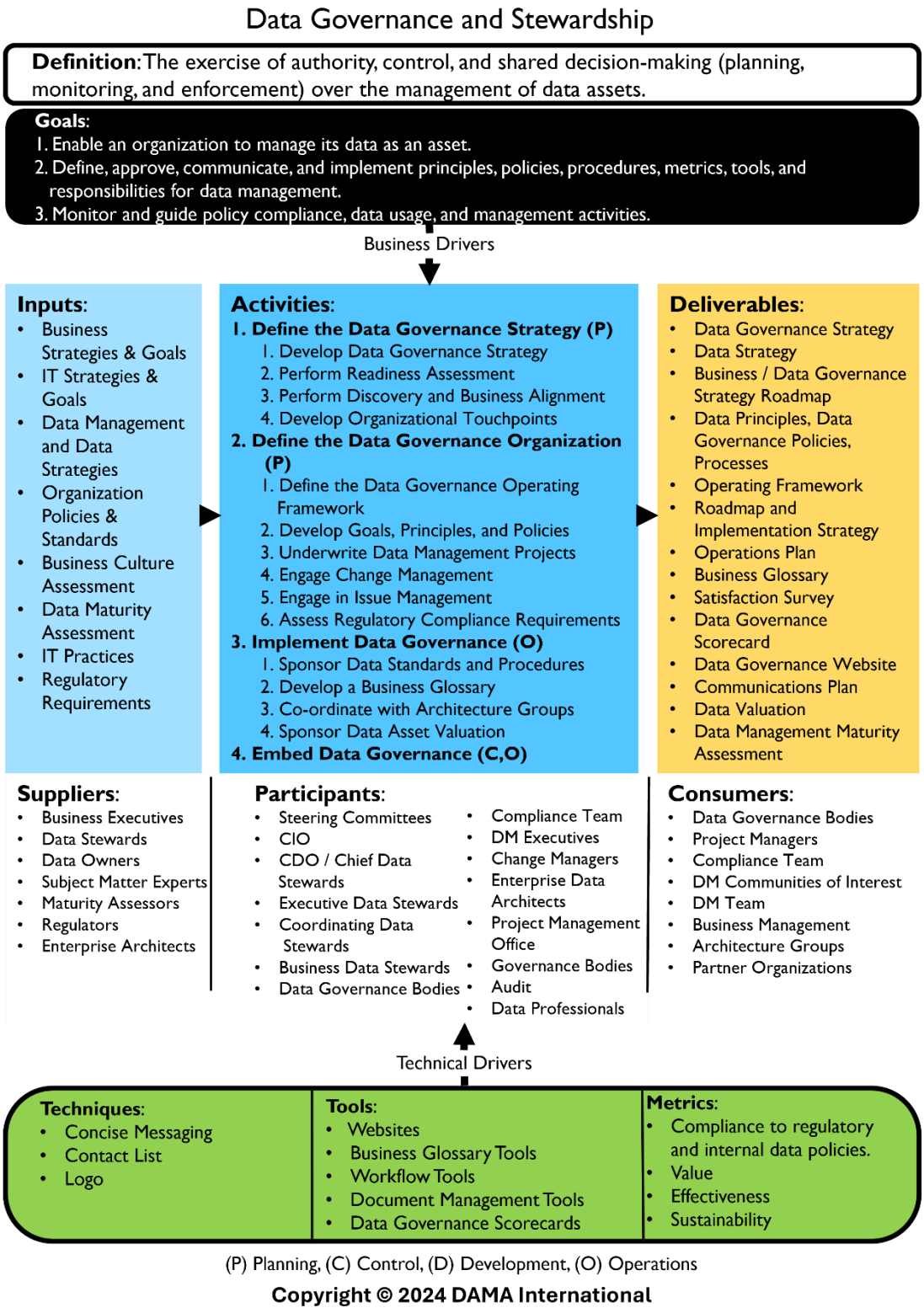



*Figure 11: Data governance context diagram Source: DAMA International*

## 9.4. Appendix: Desired capacity building for disaster data

The NDMA maturity and capacity assessment in 2022 included desired capacity building activities and recommendations.[6,9] This includes:

- To reach for higher levels of maturity & Capacity
  - Build capacity of Island, Atoll and City councils
  - Improve ICT infrastructure
  - For data security, for better data storage, Automation of data collection & Analytical applications, big data capability
  - Invest in data related training for staff, hire data analyst
  - Disaggregate data at NDMA plus all other institutions
  - Disseminate disaster statistics on website and other platforms
- Desired Areas for Data Related Capacity Building
  - Methods of statistical data and probability analysis
  - Analytical Tool: SPSS, STATA, R, MS Spreadsheet
  - Data collection, management, Analysis and Reporting
  - Survey Methodologies, Use of Mapping software, GIS Mapping
  - Data Quality, integrity and accuracy of data
  - Automation of data collection in disasters
  - Disaggregation of data
  - Big Data for Disaster Management
  - Risk Modelling & Impact Assessment
  - DDRRMM

A breakdown of capacity building activities by institution is shown in Table 7 (11) and embedded in Table 5 in Appendix 9.2 on page 26.

*Table 7: Table 11: Desired capacity building listed by staff handling disaster data. Source: NDMA & UNDRR (2022)[6]*

| Institution: | Skills and trainings staff need to manage disaster data at your institution. |
|---|---|
| National Disaster Management Authority | SPSS, STATA, MS Access, R, Data Collection, Management, Data Analysis and Interpretation |
| Male' City Council | Preparedness, Response, and Recovery. |
| Addu City Council | Data analysis and reporting |
| Atoll Councils (Noonu, Alifdhaalu, Faafu& Lhaviyani) | Data collection, analyse and make meaning of it for decision making, GIS mapping |
| Health Protection Agency / MoH | Data management training |
| Indhira Gandhi Memorial Hospital | MS Spreadsheet, pivot tables, use formulae |
| Maldives Bureau of Statistics | STATA |
| Maldives Meteorological Services | Data analysis, data management, database skill, data communications skills, data quality, data integrity |

| | |
|---|---|
| Maldives National Defence Force (FRS & CGS) | MS Access, SPSS, STATA, R and Data related training |
| Ministry of Education | DRR Data management and analysis and also DRR Training |
| Ministry of Finance and Planning | Data Structure Analytics, R training, Advanced statistical tools training |
| Ministry of Fisheries and Ocean Resources | Need training on data management skills using MS Spreadsheet, SPSS |
| Ministry of Tourism and Environment (tourism sector) | Data analytics of disasters |
| Ministry of Tourism and Environment (environment sector) | Survey Methodologies, Data Analytics Knowledge, Use of Open source analytics tools, Report Writing and Development, Use of Mapping Software Data processing and management, statistical software applications management etc. |
| Maldives Police Service | Extended knowledge and experience in the field of Data Collection / Management and Analysis |
| Maldivian Red Crescent | Managing big data, data analysis, spatial data collection and analysis |
| Male' Water and Sewerage Company Ltd | Training related to maintain quality and accuracy of data |
| Solarelle Insurance Pvt Ltd | Statistical Data Analysis Skills |
| State Electricity Company Ltd | training related with data collection and analysing |
| Utility Regulatory Authority | Methods of statistical data and probability analysis |