Data Sharing Platform for Climate Action in the Maldives

Implementation Roadmap

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Digital Maldives for Adaptation, Decentralization and Diversification Project

Developed by

D4DINSIGHTS
Data For Development

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1 Introduction

As one of the world's most climate-vulnerable nations, the Maldives faces profound challenges that threaten its social, environmental, and economic future. Its low-lying islands are acutely exposed to rising sea levels, coastal erosion, and increasingly severe weather events—direct consequences of global climate change. To secure the long-term survival and well-being of its people and ecosystems, the Maldives has made climate resilience and mitigation efforts a cornerstone of its national strategy.

Data is central to these efforts. Effective climate action depends on accurate, timely, and accessible data that empowers decision-makers at both national and local levels to act with precision and foresight. However, the Maldives faces significant barriers that hinder its ability to fully leverage data. These include fragmented governance systems, inadequate infrastructure for data management, and limited human and institutional capacity to translate data into actionable insights.

In collaboration with the World Bank, the **Foundations for Developing a Shared Data Platform for Climate Action** project seeks to address these barriers by laying the groundwork for the establishment of a unified data-sharing platform. This foundational work involves conducting a comprehensive diagnostic readiness assessment, preparing a phased roadmap, and developing guidelines for the Terms of Reference (ToR) that will guide the platform's future implementation.

By leveraging insights from the diagnostic readiness assessment, this roadmap provides a phased strategy to implement the data-sharing platform over a two-year period. It addresses both technical factors and enabling conditions, such as governance, capacity-building, and stakeholder engagement, to ensure a holistic approach. The roadmap aligns efforts with national priorities and international best practices, preparing the Maldives to initiate the platform's procurement and implementation in a sustainable and scalable manner, while supporting long-term climate resilience and development goals.

2 Maldives Readiness Assessment

2.1 Background

The "Foundations for Developing a Shared Data Platform for Climate Action" project began with a critical first step: designing a diagnostic tool to evaluate the foundational building blocks necessary for establishing a shared data platform. This tool was designed with usability in mind, offering clear definitions for each assessment question and an intuitive scoring guide. Its primary purpose was to identify strengths, weaknesses, and gaps across key categories identified as necessary for the establishment of the shared data platform, including governance, data availability, standards and quality, institutional capacity, digital infrastructure, technology and tools, and stakeholder engagement.

In the Maldives, this diagnostic tool was deployed across 14 agencies. Complete responses were received from 9 agencies, while 5 agencies provided partial or no responses. The results revealed a diverse landscape of capabilities for implementing a shared data platform (Appendix 1). While some agencies exhibited advanced capabilities in digital infrastructure, significant challenges were identified in governance, stakeholder engagement, and institutional capacity. These findings underscore the need for targeted interventions to address critical weaknesses while leveraging existing strengths to build a robust data-sharing ecosystem.

On a scale of 1-5, a low score indicates minimal progress, whereas a higher score denotes a more mature state. The descriptions below detail the placement within this scoring range:

- **Score 1-2: Early Stage with Critical Gaps**

  A score in this range indicates that your entity is at an early stage of readiness for data sharing. Significant gaps exist that may severely hinder your ability to effectively collaborate on data for climate action. Key areas of governance, technical infrastructure, and capacity require urgent attention to establish the foundational systems and practices necessary for effective data management and sharing. Immediate steps are needed to improve coordination, invest in technical infrastructure and build institutional capabilities to support meaningful climate action.

- **Score 3: Foundational with Opportunities for Strengthening**

  A score in this range suggests that your entity has taken important steps toward readiness for data sharing but still faces notable challenges. Basic frameworks and systems are in place, yet inconsistencies or underdeveloped areas remain. Your entity demonstrates the potential to engage in data sharing effectively, but further improvements in consistency, infrastructure, and skills development are required to fully optimize data sharing capabilities. Continued effort will be needed to ensure your entity can meet future demands and support national and international climate initiatives.

- **Score 4-5: Advanced and Functioning Well**

  A score in this range reflects strong readiness for data sharing. Your entity has established effective systems, frameworks, and practices that support efficient and reliable data collaboration. With a solid foundation in place, your entity is well-positioned to contribute to national and global climate data-sharing efforts. At this stage, the focus should be on maintaining high standards, embracing innovation, and preparing for emerging challenges to ensure ongoing effectiveness in data sharing and climate action.

2.2 Country Assessment

Maldives Country Score	2.27

This overall score, derived from averaging the overall score from each agency, provides a snapshot of the Maldives' readiness to operationalize a unified data-sharing platform. Overall, this score is indicative of the upper end of the 'Early Stage with Critical Gaps' category.

Assessment Category Averages

- Digital Infrastructure: 3.08
- Data Availability, Standards, and Quality: 2.95
- Technology and Tools: 2.43
- Governance: 1.67
- Institutional Capacity: 2.11
- Stakeholder Engagement: 2.04

2.2.1 Strengths: Foundations to Build On

Digital Infrastructure (Score: 3.08)

Digital infrastructure refers to the technological systems that support data sharing and processing, including internet connectivity, computing power, bandwidth, and data centers. A robust digital infrastructure is critical for enabling seamless and efficient data exchanges between agencies.

The Maldives demonstrates significant strengths in this area:

- Over 80% penetration in key areas, with good reliability and rare outages reported by multiple agencies.
- Bandwidth is generally sufficient to support most data-sharing and processing activities, providing a strong foundation for connectivity.
- Computing power ranges from moderate to significant, though some agencies report minimal capacity for handling complex analyses.

Implications:

While the existing infrastructure supports reliable connectivity and bandwidth, enhancing computing capacity is essential to unlock the full potential of data-sharing platforms. Investments in scalable computing solutions, such as cloud-based infrastructure and high-performance computing capabilities, will enable agencies to process large datasets and support advanced analytical needs.

Recent incidents, such as the fire (in December 2024) that destroyed critical data storage, including Maldives' primary environmental data repository, also highlight the importance of data resiliency and redundancy. Building geographically redundant cloud systems and improving data continuity protocols will help safeguard against future disruptions. Combined with increased computing capacity, these measures will ensure that the Maldives' digital infrastructure can effectively support its climate resilience goals and advanced data-driven decision-making.

Data Availability, Standards, and Quality (Score: 2.95)

This category encompasses the availability, accessibility, accuracy, and consistency of data across agencies. High-quality data with standardized formats is essential for effective decision-making and collaboration on a shared platform.

Agencies were asked through a proposed data framework for climate action what datasets they are the custodians of (Appendix 2). The response highlights good data coverage with some potential issues on redundancy, data sources or custodianship:

- Generally, there was good data coverage across all the thematic areas. Gaps existed for the following data types:
    - Ocean salinity
    - Ocean pH and carbonate chemistry
    - Land surface temperature
    - Soil moisture
    - River flow and discharge
    - Groundwater levels
    - Phenology
    - Building and infrastructure
- This, however, does not imply that such data are nonexistent. It's possible that the respondents did not recognize these data types in the context of their work, or that other agencies holding these data were not included in the current assessment. This issue will be explored further during the in-person roadmap consultation.
- Several data types were identified as being under the custodianship of more than one agency. This situation could arise from various scenarios: one agency might be producing the dataset and sharing it with others; the data could be sourced from multiple organizations; the data topic might be broad, leading different agencies to capture various aspects of the data; or there could be redundancy in the production and maintenance of these data. Each of these possibilities will need to be explored to understand the overlaps and streamline data management practices. These include the following:
    - Ocean currents (2 agencies)
    - Biodiversity and ecosystem health (4 agencies)
    - Coral reef, mangroves and seagrass (3 agencies)
    - Fisheries data (2 agencies)
    - Population and demographics (4 agencies)
    - Economic data (3 agencies)

- Vulnerability and exposure (3 agencies)
- Damage and loss (2 agencies)
- Climate policies and commitments (3 agencies)
- Adaptation and mitigation (3 agencies).

Looking across standards and quality, the assessment indicates the weakest areas to be in compliance with international data standards and metadata standards.

Implications:
Low scores on metadata standards and compliance with international metadata standards contribute to challenges in data interoperability, discoverability, and usability. These shortcomings can limit the ability to share and integrate data effectively across agencies and with international partners, reducing the platform's overall utility and impact. To address this, a targeted strategy should be developed to standardize metadata practices. This could include adopting international standards such as ISO 19115 or the Dublin Core Metadata Initiative (DCMI) and providing training on metadata creation and management for relevant personnel. Establishing clear metadata guidelines and ensuring compliance through governance frameworks will enhance data quality, accessibility, and interoperability, driving more effective decision-making and collaboration.

Technology and Tools (Score: 2.43)

Technology and tools refer to the systems and applications that support data integration, analysis, and visualization. These tools play a critical role in enabling agencies to process, understand, and disseminate data effectively.

The Maldives shows a mixed capacity in this area:

- Tools for analysis including data integration and dissemination are available but vary in ease of use and functionality. While some agencies can access platforms for integrating data from multiple sources, others report a lack of user-friendly tools that support efficient workflows.
- Analytical tools are present across most agencies but are often limited in advanced capabilities, such as machine learning or big data analysis. Customization and flexibility to meet diverse analytical needs remain challenges.
- Data visualization tools are underutilized, with many lacking interactive features or advanced export and sharing capabilities, limiting their utility for data exploration and stakeholder engagement.

Implications:

The uneven availability and effectiveness of technology and tools create disparities in how agencies engage with data, leading to fragmented efforts and reduced platform impact. Limited access to advanced analytics and visualization tools constrains data-driven decision-making and hinders collaboration. Customization and flexibility challenges restrict agencies' ability to adapt tools to their needs, diminishing opportunities for innovation. Additionally, underutilized

data visualization tools weaken stakeholder engagement and communication. Balancing investments in advanced tools that offer capabilities like predictive analytics, with financial priorities will be critical to addressing these gaps while ensuring sustainable progress.

2.2.2 Weaknesses: Key Opportunities for Growth

Governance (Score: 1.67)

Governance refers to the frameworks, agreements, and leadership required to coordinate data-sharing initiatives across agencies. Effective governance ensures accountability, trust, and alignment among stakeholders.

- Significant gaps exist in this area across all subcategories. Low scores across key governance topics, including data policies, legal frameworks, and institutional roles, highlight significant gaps that hinder effective data sharing and management.
- The absence or weakness of foundational elements such as data sharing agreements, open data policies, and data ethics frameworks creates challenges in ensuring data accessibility, security, and accountability.
- Similarly, limited progress on legal frameworks for data security and privacy laws raises concerns about data protection and compliance with international standards.
- Furthermore, weaknesses in roles and responsibilities, data governance frameworks, and political buy-in point to a lack of clear ownership, coordination, and leadership to drive data governance initiatives.

Implications:
Addressing these gaps will require prioritizing the development of robust policies, legal instruments, and governance structures, while securing institutional and political support to ensure effective and sustainable data management practices.

Institutional Capacity (Score: 2.11)

Institutional capacity encompasses the skills, training, and resources required to manage and sustain data-sharing systems. It is vital for ensuring long-term success and adaptability.

- Low scores in training programs, data science skills, funding and resources, and sustainability reveal critical weaknesses in capacity development and long-term operational support.
- The limited availability of training programs and insufficient data science expertise hinder the ability of stakeholders to effectively manage, analyze, and utilize data for decision-making.
- These gaps are compounded by a lack of adequate funding and resources to support the development and maintenance of critical infrastructure and capacity-building efforts.
- Furthermore, the absence of a clear plan for sustainability raises concerns about the long-term viability of these initiatives

Implications:
Expanding training programs and building technical expertise across agencies is critical for the long-term sustainability of a unified data-sharing platform. Partnerships with educational institutions can further bolster capacity.

Stakeholder Engagement (Score: 2.04)

Stakeholder engagement measures the extent to which agencies collaborate, consult stakeholders, and form partnerships. Strong engagement practices promote alignment and resource sharing.

- Low scores in collaboration processes, incentive structures, user engagement, public-private partnerships, and communications teams point to challenges in fostering effective coordination, participation, and communication among stakeholders.
- Weak collaboration processes and insufficient user engagement limit the adoption and use of data sharing initiatives, while the absence of clear incentives discourages participation and contributions from key partners.
- The lack of established public-private partnerships hinders opportunities to leverage expertise, funding, and innovation from the private sector.
- Furthermore, the absence of a dedicated communications team restricts the ability to promote awareness, build trust, and demonstrate the value of data sharing.

Implications:
Addressing these gaps will require building structured collaboration mechanisms, creating incentives for participation, enhancing user engagement strategies, fostering public-private partnerships, and establishing a communications team to drive outreach and stakeholder alignment.

3 Priority Use Cases

A cornerstone of this project is its emphasis on using targeted use cases as pilot projects to guide the implementation of the data-sharing process. These use cases have been selected based on their immediate relevance to the Maldives' national priorities and their potential to showcase the value of shared data for addressing critical challenges. Key focus areas include **monitoring coral reefs and other marine ecosystems**, **managing coastal erosion**, **enhancing the utility of Environmental Impact Assessment (EIA) data and enhancing health outcomes** . They will serve as practical pilots to test and refine the process of establishing the enabling environment and technical foundations of the platform. This approach ensures that the platform's development is informed by real-world needs and stakeholder feedback from the outset, creating a solid foundation for its broader adoption.

3.1 Monitoring Coral Reefs and Marine Ecosystems

The Maldives' coral reefs and marine ecosystems are critical to its economy and biodiversity, supporting fisheries, tourism, and coastal protection. However, threats such as climate change, ocean warming, pollution, and overfishing have led to significant degradation. Monitoring these ecosystems is currently fragmented, with data collected by various agencies in silos, resulting in limited insights into ecosystem health.

How a Shared Data Platform Helps:

A shared data platform can unify data collected by agencies such as the Marine Research Institute (MMRI), Environmental Protection Agency (EPA), and Ministry of Fisheries and Ocean, enabling:

- Comprehensive Ecosystem Monitoring: Centralizing data from underwater sensors, satellite imagery, and field surveys to create a full picture of reef health and biodiversity trends.
- Early Warning Systems: Integrating predictive models for threats like coral bleaching events, enabling preemptive conservation actions.
- Cross-Agency Collaboration: Streamlining decision-making by providing all stakeholders with a shared, up-to-date dataset for conservation planning.
- Public and International Engagement: Sharing aggregated insights with local communities and global partners to garner support for marine protection initiatives.

3.2 Managing Coastal Erosion

The Maldives is highly vulnerable to coastal erosion due to rising sea levels and extreme weather events. While agencies monitor erosion and implement mitigation measures, data collection remains inconsistent, and coordination across stakeholders is limited. This hampers the development of cohesive, long-term strategies to protect communities and infrastructure.

As presented during the first stakeholder workshop, Digital Earth programs in Australia, Africa and the Pacific have developed a coastline change data product that measures historical change over a 20 year plus time period. Recently, the Maldives Space Research Organization has launched the Digital Earth Maldives Initiative that will also include a shoreline and coastal erosion product based on historical satellite data. This will adapt proven methods already deployed in these other parts of the world and will likely be a valuable resource to integrate as part of this data sharing initiative.

How a Shared Data Platform Helps:

A shared data platform can integrate geospatial data, historical shoreline records, and climate projections from agencies such as the Ministry of Tourism and Environment, National Disaster Management Authority (NDMA), and Maldives Bureau of Statistics. This enables:

- Risk Mapping and Prioritization: Identifying areas most at risk from erosion and sea-level rise using integrated data layers.
- Optimized Resource Allocation: Guiding investments in coastal defenses like mangroves, seawalls, or beach nourishment based on data-driven priorities.
- Monitoring Interventions: Tracking the impact of mitigation measures to refine approaches and ensure sustainability.
- Improved Policy Coordination: Enhancing collaboration among agencies to align on best practices and resources for addressing erosion challenges.

3.3 Enhancing the Utility of Environmental Impact Assessment (EIA) Data

Environmental Impact Assessments are key to sustainable development in the Maldives, ensuring that projects comply with environmental standards. However, in spite of having over 200 recorded EIAs, EIA data often remains non-standardized, siloed and underutilized, limiting its potential to inform decision-making and enforce compliance effectively.

How a Shared Data Platform Helps:

A shared data platform can transform the way EIA data is collected, accessed, and used. Agencies like the Environmental Protection Agency (EPA), Ministry of Fisheries and Ocean, and Utility Regulatory Authority (URA) can benefit from:

- Centralized EIA Repository: A unified database for storing and accessing past and current EIA reports, enabling easy reference and cross-comparison.
- Enhanced Compliance Monitoring: Real-time integration of EIA data with project monitoring systems to ensure ongoing adherence to environmental standards.
- Data-Driven Planning: Combining EIA insights with other datasets, such as land use and marine ecosystem data, to guide sustainable development decisions.
- Transparency and Accountability: Sharing non-sensitive EIA findings with stakeholders to foster trust and encourage public engagement in environmental governance.
- Data Ownership Policy: It is common practice for the data collected by contracted firms to remain in their possession. To enhance monitoring and efficiency, it is crucial to establish a government-wide policy stipulating that while these companies can retain copies for their records, the ownership of all data collected under these contracts should reside with the government. This policy would ensure that the government maintains control and accessibility of crucial environmental data, facilitating better governance, transparency, and continued utility of the data across different governmental bodies.

3.4 Enhancing Health Outcomes

Environmental factors like variations in temperature and precipitation significantly influence the incidence and distribution of vector-borne diseases such as dengue. Integrating environmental and health data offers opportunities to improve health services and planning in the Maldives.

How a Shared Data Platform Helps:

A shared data platform can transform the way environmental health data are collected, accessed, and used. Agencies like the Health Protection Agency (HPA), and the Ministry of Health can benefit from:

- Disease Tracking and Prediction: Combines climate data (e.g., temperature, precipitation) with health data to predict outbreaks of diseases like dengue.
- Integrated Decision-Making: Enables health agencies to collaborate with environmental bodies, fostering cross-sectoral action plans for disease prevention and control.
- Resource Allocation: Guides targeted resource distribution, such as vaccination campaigns or mosquito control efforts, based on data-driven insights.
- Community Health Improvements: Engages local stakeholders with accessible, actionable information on environmental health risks to build awareness and resilience.

4 Implementation Approach

Based on the findings from the diagnostic readiness assessment, the process for implementing the data-sharing platform in the Maldives is designed to address the identified gaps and leverage existing strengths. This structured approach ensures progress on multiple fronts simultaneously, tackling both the technical and enabling aspects required for a successful platform.

The process focuses on strengthening the enabling environment through improvements in governance, capacity development, and stakeholder engagement while advancing the technical foundations of the platform. By prioritizing the real-world use cases from the outset, this parallel approach ensures that the platform delivers practical value while building the systems and frameworks needed for long-term sustainability.

The core components of the process are:

- **Platform Development**: This workstream focuses on the technical aspects of the data sharing platform including data, standards, digital infrastructure and technology and tools. This will begin with the integration of foundational datasets and basic functionalities that support the identified use cases. Over time, the platform will be expanded to include more advanced features, such as data visualization and real-time analytics, to meet the evolving needs of climate resilience efforts in the Maldives.

  Key activities in this component include:

  - Designing and building the technical architecture of the data sharing platform, ensuring that it is scalable, secure, and interoperable with existing systems.
  - Identifying and integrating key datasets that support the initial use cases, such as data on coastal resilience, disaster management, and marine ecosystem health.

- Implementing data access protocols that allow authorized users from different government agencies and research institutions to share and retrieve data securely.
- Developing user-friendly tools and interfaces that enable stakeholders to visualize and analyze data for decision-making.

- **Governance**: This includes establishing a supportive policy and regulatory framework, building strong governance structures, and developing the human and institutional capacities needed to manage and sustain data sharing efforts. The enabling environment will create the foundation for effective data sharing by ensuring that the necessary legal, organizational, and operational conditions are in place.

  Key activities will involve:

  - Developing a national data sharing policy that defines roles, responsibilities, and protocols for data sharing across sectors.
  - Strengthening legal and regulatory frameworks to ensure that data is shared securely, with appropriate privacy protections and interoperability standards.
  - Establishing governance structures, such as data stewardship roles and inter-agency coordination bodies, to oversee the platform's use and ensure its alignment with national climate action goals.
  - Building the capacity of government officials, technical staff, and data users through training programs focused on data management, governance, and analysis.

- **Capacity Development:** This component focuses on equipping individuals and institutions with the skills and knowledge needed to effectively use, manage, and sustain the data sharing platform. Capacity development will target key stakeholders, including government officials, technical staff, and end users, to build technical expertise and promote a culture of data-driven decision-making.

  Key activities will involve:

  - Designing and delivering tailored training programs on data governance, sharing, and analysis to ensure all stakeholders can effectively engage with the platform.
  - Establishing mentorship and knowledge-sharing programs to build a pipeline of skilled data professionals within government agencies and partner institutions.
  - Developing educational resources, including manuals, online courses, and workshops, to build awareness of the platform's value and functionality.
  - Facilitating peer-to-peer learning and regional collaboration to share best practices and foster a network of data professionals across similar contexts.

- **Stakeholder Engagement**: Continuous and meaningful engagement with key stakeholders is critical to the success of the data sharing platform. This workstream ensures that the platform is designed and implemented with input from all relevant actors, fostering ownership, trust, and alignment with national and sectoral priorities. Stakeholder engagement will focus on government agencies, international partners, private sector actors, civil society organizations, and academia to create a truly inclusive and demand-driven platform.

  Key activities will involve:

  - Conducting regular consultations and workshops to gather input, validate platform design, and align the roadmap with the priorities of various stakeholder groups. This will ensure the platform addresses real-world challenges and opportunities.
  - Actively involving stakeholders in the co-design of platform features, governance structures, and capacity-building programs. Establishing structured feedback mechanisms, such as surveys and focus groups, to incorporate user input and improve the platform iteratively.
  - Creating targeted communication and advocacy strategies to raise awareness about the platform's purpose, benefits, and use cases. These efforts will help build momentum and buy-in across different sectors, fostering a shared vision for its implementation.
  - Engaging with regional initiatives and international organizations to ensure the platform aligns with global best practices, leverages existing data-sharing frameworks, and supports interoperability with other systems.

This process ensures that all key aspects that are required for a successful data sharing platform - technical platform development, governance, capacity building, and stakeholder engagement, are addressed in parallel, creating a holistic approach to developing a sustainable data sharing ecosystem in the Maldives.

5 Roadmap for Data Sharing Platform Implementation

Building on the insights from the diagnostic readiness assessment, this roadmap outlines a comprehensive two-year plan to develop and implement a national data-sharing platform for the Maldives, centered around four key pillars: **platform development**, **governance**, **capacity development**, and **stakeholder engagement**. The priority use cases namely, monitoring coral and marine ecosystems, managing coastal erosion, and making better use of environmental impact assessments (EIA) serve as pilots to operationalize these pillars, creating a foundation for long-term success.

By integrating foundational datasets, establishing robust governance frameworks, enhancing institutional and technical capacity, and focusing on strategic stakeholder collaboration, this platform will enable efficient data sharing and support evidence-based decision-making.

Timeline	Platform Development	Governance	Capacity Development	Stakeholder Engagement
Year 1				
Q1: Initial Setup and Stakeholder Engagement	Begin by developing clear guidelines and tools for documenting data attributes (e.g., metadata templates) to standardize how datasets are described and organized. Start by applying these tools to datasets related to key priorities use cases, ensuring consistent data quality and easier sharing across agencies.	Start drafting the national data-sharing policy, focusing on legal frameworks and compliance mechanisms to address gaps in governance. Consider ongoing initiatives including the Data Management Framework (DMF) by MMRI and the Data Protection Act, to inform policies and ensure alignment.	Design an introductory capacity-building program focused on metadata creation, international standards, and data cataloging.	Identify and map stakeholders by roles and responsibilities. Conduct initial consultations to gather input on platform needs and expectations.
Q2: Parallel Development and Policy Drafting	Develop core platform functionalities, including data ingestion pipelines and integration for identified use cases. Ensure interoperability for early-stage use cases by adopting international metadata standards.	Finalize the national data-sharing policy and establish a multi-agency governance group with clearly defined roles and responsibilities.	Conduct hands-on workshops for key personnel, focusing on metadata standards, data cataloging, and initial platform features.	Facilitate co-creation workshops to refine platform functionalities and align them with stakeholder feedback and use case requirements.
Q3: Expanding Platform and Governance Structures	Expand platform functionalities to include user management, basic data visualization tools,	Formalize governance structures by finalizing roles for data stewards, legal agreements,	Scale training programs to cover intermediate technical skills like data quality	Conduct targeted workshops with pilot agencies to test collaboration mechanisms and collect feedback

Timeline	Platform Development	Governance	Capacity Development	Stakeholder Engagement
	and data-sharing protocols. Pilot these functionalities with selected agencies.	and policies for data privacy and security.	control, data analysis, and platform operation. Introduce mentoring programs for low-capacity agencies.	for iterative improvement.
Q4: Pilot Use Case Demonstrations	Pilot real-time data integration for key datasets related to priority use cases. Use pilot outcomes to refine platform features and address identified gaps.	Institutionalize governance structures, ensuring accountability and compliance mechanisms are operational. Begin embedding governance practices into agency workflows.	Evaluate the initial capacity-building efforts. Develop advanced training modules tailored to governance roles, data interoperability, and metadata standards.	Share pilot outcomes through advocacy campaigns to build awareness and stakeholder trust. Highlight success stories to promote adoption.
Year 2				
Q1: Platform Expansion and Policy Implementation	Expand the platform to include datasets from underrepresented sectors (e.g., ocean salinity, soil moisture, and river flow/discharge etc.). Add advanced visualization and data modeling capabilities.	Begin implementing the finalized governance framework across all participating agencies. Ensure compliance with international standards for data sharing and ethics.	Roll out advanced training programs covering applied data science skills, metadata compliance, and sustainability planning for platform operations.	Host sector-specific workshops to demonstrate expanded platform capabilities and encourage broader stakeholder engagement.
Q2: Scaling Platform and Use Case Replication	Scale the platform by integrating additional datasets and improving functionalities based on feedback from pilot use cases. Address redundancies and	Institutionalize regular governance reviews to ensure policies remain relevant and effective. Update legal frameworks as needed based on implementation	Develop mentorship programs targeting agencies with limited capacity. Focus on sustainable knowledge transfer and	Convene sectoral working groups to identify and refine new use cases. Publicize platform achievements to reinforce stakeholder

Timeline	Platform Development	Governance	Capacity Development	Stakeholder Engagement
	gaps in critical datasets.	findings.	institutional capacity-building .	confidence and interest.
Q3: Evaluation and Continuous Improvement	Conduct a comprehensive evaluation of platform performance and usability. Use findings to guide updates in metadata practices, technical features, and interoperability.	Review and update governance policies, incorporating lessons learned from initial implementation and ensuring alignment with international benchmarks.	Assess the effectiveness of capacity-building programs and refine training content to address identified gaps in skills and resource allocation.	Share evaluation findings and collaborate with stakeholders to co-develop solutions for remaining challenges.
Q4: Platform Sustainability and Long-Term Planning	Ensure the platform's long-term sustainability by transitioning to scalable infrastructure solutions (e.g., cloud or hybrid models). Finalize plans for ongoing maintenance and updates.	Embed governance frameworks into national strategies to ensure sustainability. Develop a roadmap for long-term evolution of governance structures.	Transition to a self-sustaining capacity-building model by leveraging local institutions for ongoing training and mentorship.	Organize a high-level summit to showcase results, celebrate successes, and foster new partnerships for platform support and growth.

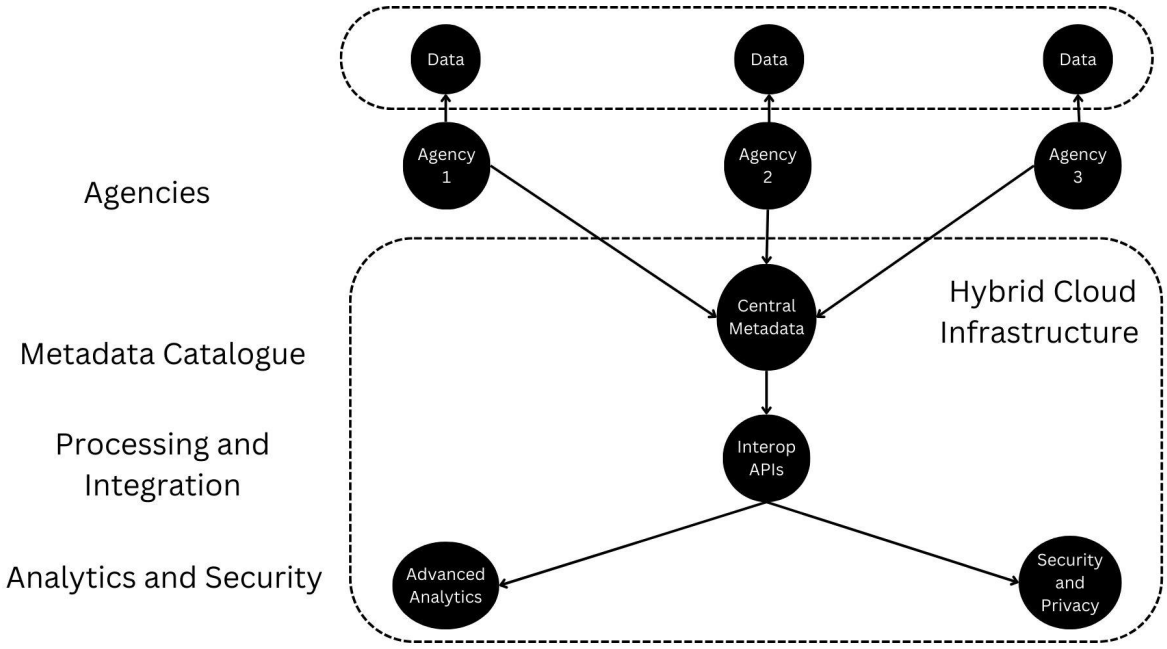
6 Platform Architecture

This section outlines a proposed high-level architectural framework for the data-sharing platform, emphasizing scalability, security, and interoperability. The approach is designed to balance centralized oversight with decentralized control, fostering collaboration while respecting agency autonomy.

Key Architectural Considerations:

- **Centralized Metadata Catalog with Federated Access:** The architecture envisions a centralized metadata catalog to ensure datasets are easily discoverable and described in a standardized manner. At the same time, agencies would retain control over their datasets, allowing them to manage access, updates, and usage independently. This federated access model ensures consistency with national standards while preserving agency autonomy.

- **APIs for Interoperability:** To enable seamless data integration and sharing across agencies, the platform would utilize robust APIs. These APIs would adhere to international standards, facilitating interoperability with existing systems and supporting future scalability. By minimizing duplication of datasets, this approach would enhance efficiency and reduce resource overheads.
- **Scalable and Modular Design:** A microservices architecture is proposed to divide the platform into small, independent modules. This modular approach would allow for incremental development and the addition of new features, such as advanced analytics or visualization tools, without disrupting existing operations. Such flexibility ensures that the platform remains adaptable to evolving needs.
- **Security and Resiliency:** The platform design should include measures for disaster recovery and data resiliency, such as automated backups and geographically redundant storage. Strong encryption, role-based access controls, and audit mechanisms would protect sensitive data and facilitate secure collaboration. Recent incidents highlight the critical need for a resilient infrastructure to safeguard against accidental data loss.
- **Hybrid Cloud Infrastructure:** To combine scalability and reliability, the platform would leverage a hybrid cloud model. Cloud-based solutions would reduce maintenance burdens and support scalability, while on-premises infrastructure would address specific security or accessibility requirements, particularly for agency-specific sensitive datasets.
- **Data Governance Integration:** Embedding governance mechanisms directly into the platform's architecture, such as automated access controls, compliance checks and data-sharing agreements, could improve alignment with national priorities.
- **Advanced Analytics Layer:** Introducing an analytics layer capable of supporting real-time decision-making and predictive modeling would enhance the platform’s utility for the priority use cases and long-term planning.
- **User Feedback and Iterative Improvements:** Establishing mechanisms for collecting user feedback would ensure the architecture evolves based on agency needs and operational insights.



7 Challenges

The following section outlines potential challenges and corresponding mitigation strategies across the four pillars identified in the roadmap. Each pillar represents a critical component of the data-sharing ecosystem in the Maldives, and addressing these challenges is essential to ensuring the successful implementation of the roadmap. As a Small Island Developing State (SIDS), the Maldives faces unique constraints related to its geographic dispersion, limited institutional capacity, and vulnerability to climate change impacts. These challenges, if not proactively managed, could hinder the effectiveness and sustainability of a national data-sharing platform designed to support climate action and broader development goals.

Each of the four pillars in the roadmap present distinct challenges, ranging from fragmented policies and inter-agency coordination gaps to technical limitations and stakeholder engagement barriers. To achieve long-term success, the Maldives will need to overcome these obstacles through targeted interventions that address capacity gaps, build trust across institutions, and ensure the resilience of digital infrastructure. By identifying these challenges early on and proposing practical mitigation approaches, this section aims to equip implementing agencies, policymakers and stakeholders with the tools necessary to navigate potential risks and build a robust, adaptive data-sharing ecosystem that can support national priorities and enhance climate resilience.

7.1 Platform Development

7.1.1 Balancing Ambition with Incremental Progress

Challenge:
Attempting to achieve too much at the outset risks overwhelming agencies with limited capacity, diluting focus, and leading to implementation delays. Without a clear prioritization of steps, there is a danger of overloading stakeholders, undermining early momentum.

Mitigation Options:

- **Phased Implementation:** Begin with a focused, high-impact use case that demonstrates the platform's value while allowing time to refine governance, processes, and technology. For example, a pilot on coral reef monitoring could serve as a manageable entry point.
- **Iterative Development:** Adopt an agile approach to implementation, where features and functionalities are built incrementally. This ensures agencies can adapt and grow alongside the platform without being overwhelmed.
- **Milestone-Based Evaluation:** Regularly assess progress against key milestones to identify challenges early, make adjustments, and celebrate successes to maintain stakeholder enthusiasm.

7.1.2 Vulnerability to Climate Risks, Natural Disasters and Disruptive Events

Challenge:

The Maldives faces significant climate risks like sea-level rise, extreme weather, and coastal erosion. These risks, coupled with vulnerabilities in existing infrastructure, threaten long-term platform sustainability. A fire incident in December 2024 that jeopardized the nation's primary environmental data repository highlights the urgent need to prioritize resiliency in digital infrastructure to prevent catastrophic data loss and ensure continuity.

Mitigation Options:

- **Resilient Infrastructure Design:** Ensure that the data-sharing platform is cloud-based and geographically redundant to protect against localized disruptions.
- **Disaster Recovery and Continuity Planning:** Develop a disaster recovery plan to ensure that the platform remains operational during emergencies. This could include backup data centers in regional partner countries.
- **Climate-Adapted Use Cases:** Ensure that platform use cases prioritize disaster risk reduction, early warning systems, and coastal resilience to align with national priorities.

7.1.3 Limited Connectivity

Challenge:

The Maldives' geographically dispersed islands pose challenges in maintaining digital connectivity and internet access across the nation, which can hinder data-sharing efforts.

Mitigation Options:

- **Cloud-Based Platform:** Use a cloud-based data-sharing solution that minimizes the need for on-premises infrastructure and ensures accessibility from all islands.
- **Expand Digital Infrastructure:** Work with telecommunications providers and regional connectivity initiatives to improve internet access and bandwidth in remote areas.
- **Use Low-Bandwidth Solutions:** Design the platform with low-bandwidth requirements to ensure that users on remote islands can access it efficiently.

7.2 Governance

7.2.1 Fragmented Data Governance and Inter-Agency Coordination

Challenge:

Data governance frameworks in SIDS tend to be fragmented, with limited coordination between ministries and agencies. Each entity may hold valuable data but resist sharing due to a lack of trust, clear policies, or incentives.

Mitigation Options:

- **Establish a National Data Governance Framework:** Develop a clear governance framework that outlines roles, responsibilities, and policies for data sharing. This should include data security and privacy guidelines to build trust.
- **Appoint a Coordinating Agency:** Identify a central authority (e.g., the Ministry of Homeland Security and Technology in association with the Ministry of Tourism and Environment) to manage and oversee data-sharing efforts across agencies.
- **Create Incentives for Data Sharing:** Develop policies that reward agencies for sharing data, such as through improved budget allocations or recognition.

7.2.2 Inclusive Governance for Decision-Making

Challenge:

Ensuring an inclusive governance process for decision-making is critical to the success of a national data-sharing platform. However, there is a risk that decision-making processes may become centralized within a few institutions, excluding key stakeholders such as local

communities, civil society organizations, and the private sector. This can lead to a lack of trust, reduced stakeholder buy-in, and ultimately hinder the platform's effectiveness.

Mitigation Options:

- **Develop a Multi-Stakeholder Governance Framework:** Establish a governance structure that includes representatives from government agencies, local communities, civil society, and the private sector. This framework should ensure that all relevant voices are heard in the decision-making process.
- **Create Advisory and Working Groups:** Form advisory groups and thematic working groups to ensure that diverse perspectives are considered in policy and technical decisions. These groups should include gender-balanced representation and reflect the diverse interests of stakeholders.
- **Promote Transparent Decision-Making:** Implement mechanisms for transparent decision-making, such as publishing meeting minutes, policies, and data-sharing agreements. Transparency can build trust and accountability among stakeholders.

7.2.3 Unclear Roles and Responsibilities Across Agencies on Data Custodianship

Challenge: The roles and responsibilities for data custodianship across agencies remain unclear, leading to confusion, duplication of efforts, and gaps in data management. Without clearly defined custodianship roles, agencies may be unsure of their responsibilities regarding data collection, maintenance, sharing, and security. This lack of clarity can hinder the efficient operation of a national data-sharing platform.

Mitigation Options:

- **Develop a Data Custodianship Framework:** Establish a clear framework that defines the roles and responsibilities of each agency in relation to data custodianship. This should include guidelines on data ownership, maintenance, access rights, and sharing protocols.
- **Appoint Data Custodians:** Designate specific agencies or departments as data custodians for different types of data. These custodians should be responsible for ensuring the accuracy, security, and availability of their datasets.
- **Create Standard Operating Procedures (SOPs):** Develop SOPs for data management processes, including data collection, validation, storage, and sharing. These procedures should be standardized across agencies to ensure consistency and accountability.
- **Monitor and Review Roles Regularly:** Establish a mechanism to regularly review and update the roles and responsibilities of data custodians to ensure they remain relevant and effective as the data-sharing platform evolves.

7.3 Capacity Development

7.3.1 Limited Institutional Capacity and Technical Expertise

Challenge:

Small island developing states (SIDS) like the Maldives often face capacity constraints in government institutions, particularly in areas like data management, governance, and digital infrastructure. Many agencies may lack the expertise to manage complex data-sharing platforms or understand how to utilize the data for climate action.

Mitigation Options:

- **Capacity Development:** Develop a comprehensive capacity-building program targeting technical skills (e.g., data governance, analytics, cloud infrastructure) and institutional processes (e.g., inter-agency data-sharing policies).
- **Partnerships with Regional/International Organizations:** Leverage partnerships with trusted and aligned regional organizations like to provide ongoing technical support and training.
- **South-South Cooperation:** Facilitate knowledge exchange with other SIDS that have implemented similar platforms.

7.3.2 High Dependence on External Funding

Challenge:

As a SIDS, the Maldives depends heavily on external funding to implement large-scale projects. This reliance can create uncertainty, particularly if donors have different timelines or reporting requirements.

Mitigation Options:

- **Diversified Financing Models:** Engage multilateral institutions, bilateral donors, philanthropic foundations, and the private sector to create a robust funding base. Public-private partnerships (PPPs) with industries such as tourism can anchor the platform's financial sustainability.
- **Secure Multi-Year Funding:** Prioritize multi-year funding agreements that align with the roadmap's implementation timeline to ensure sustainability.
- **Integrating into National Strategies:** Embed the platform's operations into national climate resilience and digital transformation strategies to ensure ongoing government commitment and budgetary support.

- **Establishing Trust Funds:** Pool contributions from multiple stakeholders into an endowment fund to provide sustained financial resources that align with the Maldives' long-term goals.

7.4 Stakeholder Engagement

7.4.1 Cultural and Political Barriers

Challenge:

There may be cultural or political resistance to openly sharing data, particularly if certain agencies or actors perceive data as a source of power or influence.

Mitigation Options:

- **Stakeholder Engagement:** Conduct consultative workshops with government agencies, local communities, and the private sector to build trust and promote buy-in.
- **Data Sharing Agreements:** Develop legal data-sharing agreements that clarify ownership, access rights, and data use to alleviate concerns over loss of control.
- **Promote Success Stories:** Share success stories of how data sharing has improved decision-making and climate resilience efforts to build confidence.

7.4.2 Stakeholder Alignment and Communication

Challenge:

Misaligned expectations among stakeholders can lead to inefficiencies and delays. Poor communication exacerbates misunderstandings, reducing trust and collaboration.

Mitigation Options:

- **Dedicated Engagement Teams:** Establish a team to manage stakeholder communication, ensuring consistent updates on progress, challenges, and next steps.
- **Feedback Loops:** Create structured mechanisms, such as surveys or consultations, to gather input from stakeholders and adjust plans accordingly.
- **Communication Strategies:** Develop targeted messaging to emphasize the platform's shared benefits, using accessible language to engage diverse audiences.

8 Conclusion and Next Steps

The successful development and implementation of a unified data-sharing platform in the Maldives will be instrumental in enhancing the country's capacity to respond to climate change, strengthen resilience, and support sustainable development. By addressing both the **enabling environment**—through the establishment of governance frameworks, capacity-building initiatives, and strategic stakeholder engagement—and the **technical infrastructure**, this project provides a strong foundation for long-term climate action and informed decision-making.

This roadmap outlines a clear, phased approach to operationalize a functional data-sharing platform over the next two years. Supported by robust governance structures and enhanced stakeholder capacity across key sectors, the platform will enable effective data sharing and utilization. Early use cases, such as **coastal resilience planning, environmental impact assessment (EIA) integration, and marine ecosystem monitoring**, will serve as proof of concept, demonstrating the platform's value and encouraging broader adoption. Together, these efforts will position the Maldives as a leader in leveraging data for climate resilience and sustainable development.

Next Steps:

1. **Consultative Process for Broad Agreement**: This roadmap is the first step in what will be an ongoing, inclusive process. It will be shared with all the participating stakeholders to ensure that it reflects the priorities and needs of all involved parties. Stakeholder consultations will be conducted to gain consensus on the key components of the roadmap, ensuring alignment with national climate strategies and development goals.
2. **Guidelines for Terms of Reference (ToR)**: Following the consultative process, the roadmap will be used to provide guidelines for a Terms of Reference (ToR). The ToR will outline the specific requirements, roles, and responsibilities for the development and implementation of the data sharing platform. It will provide clarity on the scope of work, deliverables, timelines, and performance metrics, ensuring that all parties involved in the platform's development are working towards a common vision.
3. **Procurement of Implementing Organizations**: Once the ToR is finalized, the World Bank, in collaboration with the Ministry of Homeland Security and Technology in association with the Ministry of Tourism and Environment, will initiate the procurement process. One or more organizations will be selected to implement the roadmap. These organizations will be responsible for delivering the technical, governance and capacity-building components of the project, ensuring that the platform is built to the highest standards, and that the governance and capacity development aspects are fully institutionalized.
4. **Ongoing Oversight and Adjustment**: Throughout the two-year implementation process, the roadmap will be regularly reviewed and updated as necessary, based on feedback from stakeholders and real-world implementation experiences. This iterative approach will ensure that the roadmap remains flexible and responsive to changing circumstances, new opportunities, and evolving national priorities.

By following this consultative, structured approach, the Maldives will be well-positioned to build a sustainable, scalable data sharing platform that can serve as a model for other Small Island Developing States (SIDS) facing similar challenges. The integration of this platform into the broader national and regional climate action framework will ensure that it not only addresses the immediate needs of the Maldives but also contributes to the global effort to tackle climate change.

8 Appendices

8.1 Appendix 1 - Agency Score Comparison

	1. Governance	2. Data Availability, Standards and Quality	3. Institutional Capacity	4. Digital Infrastructure	5. Technology and Tools	6. Stakeholder Engagement	Agency overall score
Climate Change	1.64	3.38	2.75	3.00	2.82	2.40	2.54
Environment	1.27	1.75	1.75	2.86	2.09	1.40	1.72
Environmental Protection Agency (Maldives)	1.36	2.63	2.50	3.43	2.64	1.40	2.18
Maldives Bureau of Statistics	2.09	3.88	2.50	3.43	3.00	3.20	2.87
Maldives Meteorological Services	1.00	3.25	2.00	4.00	1.91	1.80	2.12
Marine Research Institute (MMRI)	2.27	2.50	1.75	2.29	2.27	1.80	2.17
Ministry of Fisheries and Ocean	2.55	4.00	3.00	3.14	3.91	3.00	3.17
National Centre of Information Technology	1.82	2.75	1.50	3.29	2.27	1.80	2.13
National Disaster Management Authority (MV)	1.00	2.38	1.25	2.29	1.00	1.60	1.51

8.2 Appendix 2 - Data Availability Across Agencies

	Ministry of Fisheries and Ocean Resources	Marine Research Institute	Maldives Meteorological Service	National Disaster Management Authority	National Centre of Information Technology	Environmental Protection Agency	Environment Department	Climate Change Department	Bureau of Statistics	Health Protection Agency
Atmospheric Data										
Temperature records			X							
Greenhouse gas concentrations								X		
Precipitation data			X							
Humidity			X							
Wind			X							
Oceanographic Data										
Sea surface temperature			X							
Sea level			X							
Ocean salinity										
Ocean currents			X				X			
Ocean pH and carbonate chemistry										
Terrestrial Data										
Land surface temperature										
Soil moisture										
Vegetation indices							X			
Land use and land cover						X	X			
Coastline change						X	X			
Hydrologic Data										
River flow and discharge										
Groundwater levels										
Water quality (surface and ground)						X				
Biological Data										
Biodiversity and ecosystem health	X	X				X	X			
Phenology										
Coral reef, mangroves and seagrass		X				X	X			
Fisheries data	X	X								
Socioeconomic Data										
Population and demographics	X				X				X	X
Economic data	X							X	X	
Buildings and infrastructure										
Disaster and Risk Data										
Extreme weather events			X							
Vulnerability and exposure			X	X	X					
Damage and loss			X	X						
Health Data										
Public health records										X
Morality and morbidity										X
Policy and Governance Data										
Climate policies and commitments			X				X	X		
Adaptation and mitigation projects			X				X	X		
Other										
Air pressure			X							
Radiation			X							