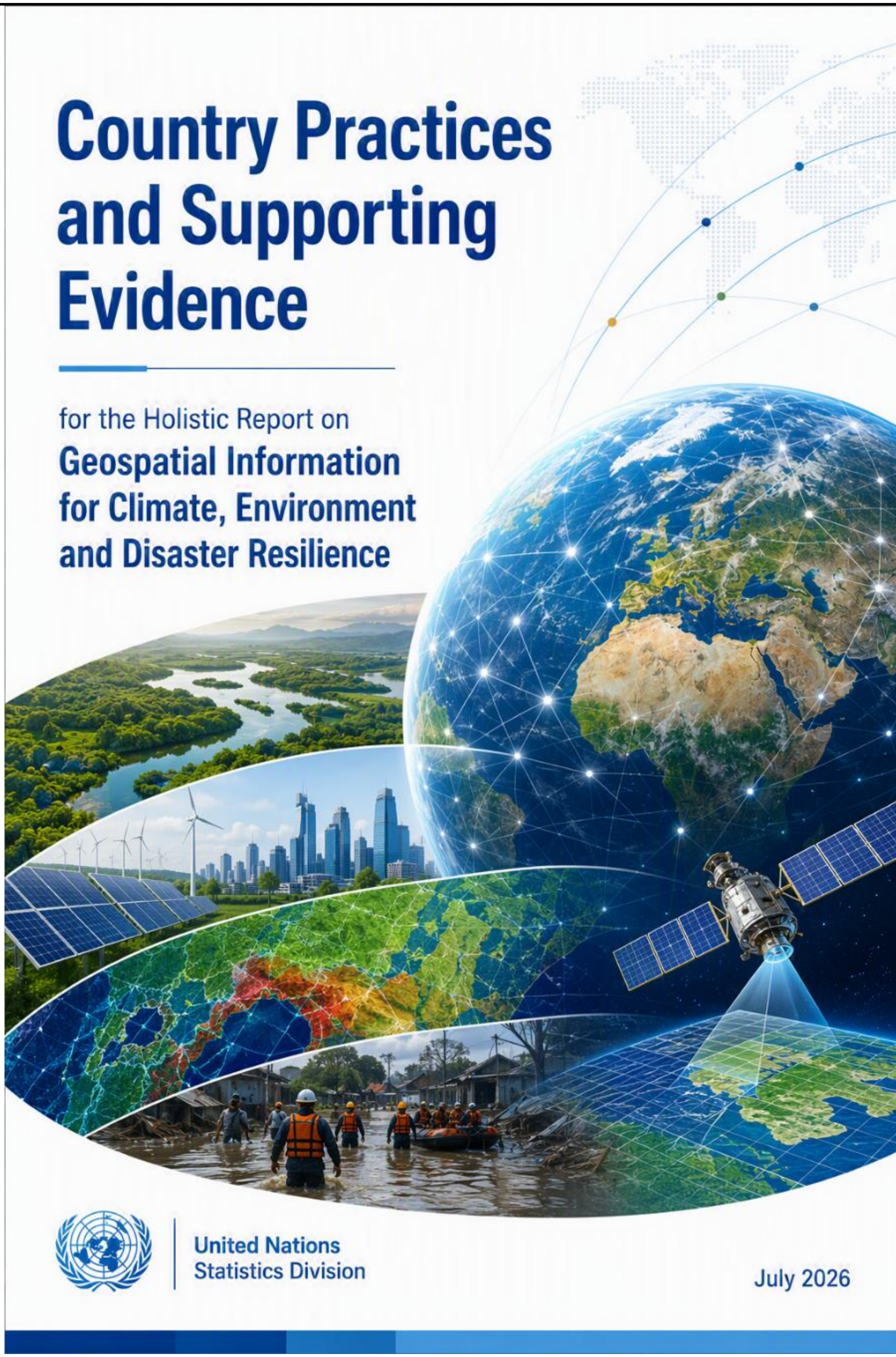

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Background document
to report E/C.20/2026/11/Add.1

Country practices, and supporting evidence for the holistic report on geospatial information for climate, environment and disaster resilience

Committee of Experts on Global Geospatial Information Management
Sixteenth session
New York, 5-7 August 2026
Item 10 of the provisional agenda
Geospatial information for climate, environment and disaster resilience

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I. Purpose and use of the compendium

1. This compendium supports the holistic report by preserving practical evidence from Member States, United Nations entities and partner institutions. It illustrates how geospatial information, Earth observation, integrated spatial data systems and decision-support tools are being applied to strengthen climate adaptation, environmental monitoring, disaster preparedness, early warning, risk-informed decision-making and resilient recovery.

2. The compendium provides a practical background and evidence base while allowing the main report to remain concise and policy focused. This document is to be further developed as a living document, during the intersessional period, with additional submissions from Member States, regional committees, United Nations entities and partners.

3. The examples provided are illustrative, not exhaustive. They are included to support peer learning, technical exchange and further refinement of the 2026 to 2030 workplan. They should be read together with the main report's policy messages on governance, interoperability, decision-ready information, capacity development and responsible innovation.

II. Insights from the pre-sixteenth session webinar

4. The pre-sixteenth session webinar on geospatial information for climate, environment and disaster resilience was convened to support the preparation and refinement of the holistic report and the proposed 2026 to 2030 workplan. It provided a focused opportunity to test the strategic framing of the report, gather inputs from Member States, United Nations entities and partner institutions, and identify practical lessons for the intersessional period.

5. The webinar highlighted the increasing convergence of climate, environmental and disaster risks and the need to avoid fragmented responses across separate information systems, institutions and communities of practice. The central framing was that connected risks require connected information: one risk landscape, one evidence base and one resilience agenda.

6. The opening framing and the overview of the holistic report emphasized that geospatial information should move from being a supporting input to becoming a foundational layer for policy, planning, investment, preparedness, response, monitoring and reporting. The webinar therefore reinforced the main report's proposition that geospatial information should be understood as implementation intelligence for sustainable development, climate adaptation, environmental stewardship, disaster risk reduction and resilient recovery.

7. United Nations system inputs provided a broader institutional perspective. Disaster risk reduction inputs emphasized geographic disaggregation, official disaster data, early warning and links to reporting across frameworks. Environmental inputs demonstrated how geospatial analytics support near real-time and historical monitoring of planetary change. Weather and climate inputs highlighted the dependence of forecasts on global observing networks, open standards and sustained real-time data exchange. Land degradation inputs demonstrated the role of harmonized geospatial methods in standardized reporting and restoration targeting.

> *"Technology alone does not build resilience; institutions, partnerships, local capacity, and governance turn data into action."*

8. Member State inputs provided operational evidence of the practical use of geospatial information. Ecuador and the Philippines illustrated disaster preparedness and response applications,

including satellite activation, national geoportals, hazard platforms and post-event assessment. India, Türkiye and Jamaica emphasized governance, interoperability, decision-ready information, data-sharing instruments, foundational data and the need to connect technical capabilities to policy and operational decisions. These country-specific lessons are recorded in section III to avoid duplication in the webinar synthesis.

9. Across the webinar, several strategic gaps were repeatedly identified: fragmented governance, data silos, uneven access to timely and authoritative data, weak interoperability, limited local capacity, insufficient foundational datasets, gaps between technical products and policy needs, and limited readiness for major events. The common message was that more data alone will not resolve these constraints unless the data is trusted, interoperable, governed, translated and connected to decisions.

10. The webinar inputs point to practical implications for the 2026 to 2030 workplan, including the need to document operational experiences and good practices; sustain technical dialogue on standards, methodologies and governance frameworks; strengthen data-sharing instruments and institutional arrangements; improve access to Earth observation and geospatial platforms; support small island developing States, least developed countries and local institutions; use emerging technologies responsibly; and improve decision-ready information for policymakers, planners, emergency managers and communities.

III. Country and Member State practices

11. This section records Member State and regional practice evidence. It draws from the initial full report, the country practice material and the webinar inputs, while separating country-specific experience from the broader webinar synthesis. The examples are illustrative and are included to support peer learning, technical exchange and further refinement of the workplan.

Türkiye: integrated geospatial ecosystems for environmental monitoring and disaster risk management

12. In Türkiye, Earth observation and geospatial technologies are increasingly integrated within broader geospatial ecosystems to support environmental monitoring, climate resilience and disaster risk management. Remote sensing data, including satellite imagery and aerial surveys, is used to generate up-to-date spatial information for monitoring land-use change, environmental pressures and spatial patterns of risk.

13. These approaches are supported through nationally defined standards, governance arrangements and institutional coordination mechanisms that facilitate data-sharing and integration within a common geospatial framework. Centralized geospatial platforms and decision-support systems enable the integration, visualization and operational use of spatial data from multiple institutions, improving access to critical information and supporting coordinated decision-making.

14. The webinar input from Türkiye reinforced that climate, environment and disaster risk management are often treated as separate domains although they affect the same spaces, communities, information infrastructure and ecosystems. It emphasized that the key gap is not always the absence of data, but whether data can be trusted, combined, shared between institutions and used in time for decisions. The example illustrates the importance of standards, national coordination and operational platforms that can be applied across the climate, environment and disaster resilience nexus.

India: geospatial applications and decision-ready information across sectors

15. India's experience demonstrates the use of remote sensing, aerial photogrammetry, geographic information systems, spatial modelling and decision-support platforms across climate adaptation, environmental management and disaster resilience. Coastal hazard line delineation, vulnerability mapping and high-resolution elevation contour mapping are used to support coastal zone management, protection of coastal communities and infrastructure, and sustainable development planning in coastal regions.

16. Hydrological analysis, high-resolution digital elevation models, GIS-ready databases and environmental monitoring are being used to improve the extent, quality and accessibility of water resources information, strengthen river basin management, support pollution abatement and environmental rejuvenation efforts, and enable GIS-supported planning, monitoring and decision-making processes.

17. India's webinar input emphasized that the challenge is no longer only the availability of geospatial technologies and data, but their effective adoption and integration into governance, policy and decision-making. It stressed the need to translate complex geospatial information into intuitive, accessible and actionable products for policymakers, planners and field administrators. The key lesson is that the future of geospatial information lies not only in creating better data, but in creating better decisions.

Fiji and small island developing States: coastal adaptation and relocation planning

18. In Fiji and other small island developing States, hazard mapping, coastal exposure analysis and elevation-based assessments are being used to identify areas vulnerable to sea-level rise and flooding, support the identification of at-risk communities and inform the selection of safer relocation sites.

19. These approaches also support the assessment of environmental conditions at potential relocation locations to ensure that new settlements remain viable and resilient over time. Geospatial tools enable the integration of environmental, social and infrastructural data to strengthen understanding of exposure and vulnerability patterns, support informed land-use planning and improve alignment between climate adaptation strategies and spatial planning policies.

20. The SIDS experience demonstrates that climate resilience requires more than individual projects. It requires strong national information systems, coordinated institutions and the ability to use geospatial evidence in everyday planning and investment decisions, not only during emergency response.

Jamaica: governance, foundational data and resilient reconstruction

21. Jamaica's experience illustrates the connection between climate adaptation, environmental protection and disaster recovery. Geospatial information, storm-surge modelling and satellite-based damage assessments are applied to support coastal climate adaptation and post-disaster recovery planning, including the assessment of exposure, infrastructure vulnerability and natural coastal buffers such as coral reefs and mangroves.

22. Jamaica's webinar input highlighted that many gaps are institutional before they are technical. Data may exist, but without robust legal instruments, data-sharing arrangements and trusted institutional roles, it may not move quickly or responsibly when required for disaster response. The intervention also emphasized the importance of foundational data, including addressing, building footprints and baseline imagery.

23. The Jamaica experience shows the value of preparing data governance instruments, data-sharing agreements and emergency geospatial teams before events occur. Preparing such mechanisms during non-crisis periods is a relatively low-cost action with high value during emergencies and recovery.

Ecuador: satellite-based flood mapping and institutional coordination

24. Ecuador's webinar contribution demonstrated the importance of clear institutional roles, international cooperation and operational geospatial capacity in disaster response. During flood and landslide events associated with Cyclone Yaku, satellite imagery and official cartographic information were used to support rapid flood delineation, identification of affected areas, assessment of exposed populations and infrastructure, and prioritization of emergency response.

25. The example illustrates how international Earth observation resources, national mapping institutions and disaster risk management authorities can work together to transform raw satellite data into decision-support information. It also confirms that technology is most effective when supported by clear activation protocols, institutional responsibilities and technical capacity.

26. Ecuador's experience is relevant to the Committee because it demonstrates the operational value of connecting international mechanisms, authoritative national data and local emergency operations in a single information workflow.

Philippines: national geoportals, hazard platforms and proactive disaster risk management

27. The Philippines webinar contribution illustrated the value of nationally coordinated geospatial platforms in supporting disaster preparedness, hazard assessment and response. National geospatial infrastructure, hazard assessment tools and multi-agency coordination arrangements are used to provide location-specific risk information, support local planning, inform tsunami and earthquake preparedness, and assist post-disaster damage assessment.

28. The GeoPortal Philippines was presented as a foundational one-map platform that helps address data fragmentation across government departments and local units. GeoRiskPH and related hazard tools provide location-specific information on seismic, tsunami, volcanic and hydrometeorological hazards for planning, warning, local decision-making and post-event assessment.

29. The Philippines example shows how authoritative geospatial data, institutional collaboration, scientific agencies and local government users can support a shift from reactive disaster response to proactive disaster risk reduction and resilience planning.

South Africa: integrated geospatial climate resilience

30. South Africa's iSimangaliso Wetland Park case study demonstrates the use of integrated geospatial information workflows to support climate resilience, environmental management and disaster risk reduction. Earth Observation, UAV/drone imagery, GIS analysis, Survey123 field data, specialist studies and stakeholder inputs are combined within a shared spatial evidence base to monitor environmental change, assess flood exposure, identify vulnerable communities and support evidence-based planning and adaptation interventions.

31. The South African experience highlights that climate, environmental and disaster risks are interconnected and cannot be addressed through fragmented sectoral responses. The case demonstrates the value of integrating climate, environmental and disaster risk information within a single analytical

Sub-Saharan Africa: drought monitoring, agricultural monitoring and early warning

32. Across drought-prone regions, particularly in Sub-Saharan Africa, Earth observation data and geospatial monitoring systems are increasingly being used to support drought assessment, agricultural monitoring and early warning processes. Satellite-derived indicators, including vegetation indices, soil moisture and rainfall estimates, support the monitoring of environmental stress, land degradation and crop conditions, especially in areas where ground-based monitoring capacities remain limited.

33. Initiatives such as global agricultural monitoring integrate multiple geospatial datasets to support timely assessments of drought impacts, food security risks and agricultural conditions, enabling more proactive preparedness and response.

34. This example illustrates how geospatial information can support both climate resilience and food security, particularly where ground-based monitoring systems are sparse or uneven.

IV. United Nations system and partner inputs

33. This section records selected United Nations system and partner inputs from the webinar. These inputs are separated from country and Member State practices to avoid duplication and to clarify the different role played by United Nations entities and technical partners in supporting the holistic agenda.

UNDRR: disaster risk data, early warning and geographic disaggregation

34. The input from the United Nations Office for Disaster Risk Reduction (UNDRR) highlighted that disaster risk is inherently geospatial. Disaster risk reduction depends on knowing where hazards, exposure, vulnerability, affected populations, losses and capacities are located. Geographic disaggregation is therefore central to stronger risk

understanding, early warning, preparedness and recovery.

35. The discussion noted progress in disaster risk governance and early warning, while also highlighting continuing data gaps, uneven reporting and the growing complexity of disaster risk. It emphasized the need for granular, interoperable and use-case oriented disaster data that can support national action and reporting across frameworks. This input demonstrates how geospatial information can reduce reporting burden, improve coherence across global frameworks and strengthen the link between official statistics, disaster data and operational decision-making.

UNEP: environmental monitoring, planetary change and near real-time data

36. The input from the United Nations Environment Programme (UNEP) demonstrated the value of geospatial data analytics for monitoring environmental change, including ocean currents, sea ice extent, forest fires, deforestation, conflict-related impacts and other indicators of changing planetary conditions.

37. These examples show that geospatial information is not only a mapping tool. It is a means of monitoring trends, detecting change, identifying emerging pressures and supporting timely environmental analysis. The ability to compare conditions across time and geography is essential for environmental governance and evidence-based policy. The UNEP input reinforces the need to link environmental data systems with climate, disaster and development decision-making, particularly where environmental degradation increases risk and undermines resilience.

WMO: weather and climate observations, data sharing and open systems

38. The input from the World Meteorological Organization (WMO) emphasized that weather and climate systems do not follow national borders. Forecasting depends on sustained international cooperation, shared observations and global data exchange. For meaningful forecasts, countries depend on data from beyond their own territories.

39. The discussion highlighted the importance of observing networks, open standards, open architecture and data-sharing systems, including the modernization of meteorological information systems. It also emphasized continuing observation gaps, particularly for small island developing States and least developed countries. This input shows that geospatial resilience depends on sustained observing infrastructure, common standards and international cooperation, not only on national platforms.

UNCCD: land degradation, drought and standardized reporting

40. The input from the United Nations Convention to Combat Desertification (UNCCD) demonstrated the role of geospatial information in reporting on land degradation neutrality, drought impacts and the living conditions of affected populations. It highlighted the use of geospatial information for reporting under SDG indicator 15.3.1, including land cover, land productivity and soil organic carbon.

41. The contribution emphasized the value of standardized and harmonized geospatial methods that allow countries to report and compare land degradation trends across regions and over time. It also highlighted the importance of free and open geospatial information, tools and algorithms that countries can use to assess data and support reporting decisions. The UNCCD example shows how geospatial information can produce policy-relevant evidence, support global reporting and provide a basis for restoration targets and drought resilience.

V. Summary of practice evidence and lessons

42. Table 1 summarizes the practice evidence retained in the compendium and the main lesson each example contributes to the holistic report and workplan refinement. The table is intended as a navigation aid and should be read together with the preceding practice entries.

Practice / source	Primary focus	Main lesson for the report
Türkiye	Integrated platforms and standards	Coordinated platforms enable integrated resilience decisions.
India	Decision-ready geospatial information	Geospatial value depends on adoption and usable products.

Fiji and SIDS	Coastal exposure and relocation	SIDS need geospatial evidence for everyday planning.
Jamaica	Governance and foundational data	Pre-positioned governance improves emergency and recovery use.
Ecuador	Flood mapping and satellite activation	International imagery works best through national workflows.
Philippines	Geoportals and hazard platforms	Authoritative platforms support proactive local risk planning.
South Africa	Geospatial Climate Resilience Integration	Building Resilience requires integrated geospatial data and collaboration
Sub-Saharan Africa	Drought and food security monitoring	Earth observation fills gaps where ground data is limited.
UNDRR	Disaster data and early warning	Geographic disaggregation supports action and reporting.
UNEP	Environmental monitoring	Geospatial analytics detect trends and planetary change.
WMO	Weather and climate observations	Forecasting depends on open, sustained global data exchange.
UNCCD	Land degradation and drought reporting	Harmonized geospatial methods support comparable reporting.

VI. Consolidated lessons for the 2026 to 2030 workplan

43. **First**, geospatial information has greatest value when it is embedded in governance, planning, financing and operational systems rather than treated as a stand-alone technical product. The practice examples show the importance of clear institutional roles, data-sharing arrangements, standards, national platforms and operational workflows.

44. **Second,** interoperability remains the central enabling condition. Climate, environmental, disaster, statistical, infrastructure and socio-economic information must be capable of being combined across institutions and scales if Member States are to create a shared evidence base for resilience.

45. **Third,** decision-ready information is as important as data availability. Policymakers, planners, emergency managers and field administrators require products that are timely, trusted, accessible and understandable. The workplan can therefore support the translation of complex geospatial information into usable decision-support products.

46. **Fourth,** foundational data readiness is a resilience issue. Addressing systems, building footprints, baseline imagery, authoritative administrative units, critical infrastructure datasets and local place information are essential before major events occur and cannot be assembled effectively only during crises.

47. **Fifth,** the wider United Nations system provides important entry points for alignment. Disaster risk reduction, environmental monitoring, climate observations, desertification, biodiversity, agriculture, water, oceans and sustainable development processes all require spatially explicit data. The Committee's geospatial value proposition lies in governance, standards, interoperability and knowledge exchange across these processes.

48. **Sixth,** capacity development should be operational. Training remains important, but countries also require standing technical teams, pre-positioned data-sharing agreements, activation protocols, baseline datasets, practical tools, open standards and sustained access to Earth observation and decision-support systems.

49. **Seventh,** emerging technologies should be applied responsibly and in context. Earth observation, artificial intelligence, digital twins, spatial modelling and advanced analytics can strengthen resilience, but only when supported by governance, ethics, standards, capacity and national priorities.

50. The compendium supports the proposed 2026 to 2030 workplan by identifying practical areas where Member States and partners can cooperate, including evidence baselines, country practice and peer learning, governance and interoperability, capacity development, partnerships, Earth observation access, artificial intelligence, spatial analytics and decision-support systems.

51. During the intersessional period, this compendium may be expanded through additional Member State and partner contributions. It may also be used to support regional exchanges, practical guidance notes, technical dialogue and capacity development activities, where appropriate and subject to available resources and respective mandates.

52. The compendium should therefore remain available as a background document to the main report and may be further developed as a living evidence base for peer learning, technical cooperation and refinement of the 2026 to 2030 workplan.

Country Case Practices

List of Countries

1. Jamaica
2. Türkiye
3. South Africa

JAMAICA

Hurricane Melissa: A Case Study in Geospatial-Led Disaster Response

How national geospatial leadership and international partnerships delivered a first-of-its-kind nationwide damage assessment after the strongest hurricane in Jamaica's history

On 28 October 2025, Hurricane Melissa made landfall in Westmoreland Parish, Jamaica, as a Category 5 storm with sustained winds of 185 mph the strongest hurricane ever to strike Jamaica and tied for the strongest landfalling Atlantic hurricane on record. The storm caused 45 deaths in Jamaica, damaged over 150,000 structures, and generated total losses of US$12.2 billion, equivalent to 56.7% of Jamaica's 2024 GDP[1]. The name Melissa was retired by the World Meteorological Organization in March 2026. Climate scientists attributed the hurricane's rapid intensification to record sea surface temperatures driven by human-caused climate change, making Melissa a defining example of the climate–environment–disaster nexus that this holistic report addresses.

Element	Description
Theme	Disaster resilience – hurricane preparedness, response, recovery, and resilient rebuilding following a Category 5 climate-intensified event
Frameworks	Sendai Framework on Disaster Risk Reduction; SF-GISD (Strategic Framework on Geospatial Information and Services for Disasters); ABAS Resilient Prosperity for SIDS; Early Warnings for All (EW4All); Paris Agreement; UN Space Charter; International Charter "Space and Major Disasters"; UN-IGIF
Geospatial application	**Pre-hurricane:** The National Emergency Operations Centre (NEOC) was activated as the central command structure, with international partnership programmes engaged in parallel to provide real-time data and technical assistance. The National Emergency Response GIS Team (NERGIST) led the geospatial response, convening stakeholders around the standing ArcGIS Online infrastructure, where authoritative datasets were consolidated and role-based user groups established for timely access. Operational dashboards covering shelter activation, evacuation routes and real-time hurricane tracking, alongside story maps, were deployed through this platform to provide a common operating picture for responding agencies. **During:** Real-time storm tracking via WMO and NOAA satellite/radar feeds integrated with national hazard data; activation of the International Charter "Space and Major Disasters"; coordination of national emergency operations through GIS-based common operating pictures. **Post:** First-of-its-kind nationwide satellite-based damage assessment of 960,000+ buildings using ICEYE synthetic aperture radar (88% confidence), identifying approximately 191,000 damaged structures of which 146,000 sustained major to severe damage. Copernicus Emergency Management Service rapid mapping (Activation EMSR487) across 76 communities in western Jamaica. The NASA Disasters Programme provided landslide hazard maps (LHASA model), Black Marble nighttime light data for power outage mapping, and NDVI analysis from Landsat and Planet Labs imagery for crop and

[1] https://jis.gov.jm/media/2026/03/PM-Budget-Debate-2026-Final.pdf

	forest damage. NOAA conducted nine aerial survey missions, producing nearly 15,000 image frames covering 1,573 square miles. These datasets were collated and shared within Hurricane Melissa NERGIST AGOL group in the GOJ AGOL platform. Drone-based post-disaster assessments formed a critical part of Jamaica's Hurricane Melissa response. Led by CDEMA and Jamaica Flying Labs, with coordination support from the Jamaica Civil Aviation Authority (JCAA), ODPEM and NERGIST, the National Drone Response Team captured high-resolution imagery across some of the most severely impacted communities. This locally led, public-private collaboration marked a first-of-its-kind model for the Caribbean, using drones, geospatial data and coordinated field intelligence to strengthen situational awareness, support rapid damage assessment, and guide humanitarian response teams operating on the ground. Imagery was also disseminated through the ArcGIS Enterprise Portal, hosted on Amazon Web Services, and via open mapping platforms to support wider analysis, planning and recovery coordination.
Real-world impact	● **Reduced loss of life:** The WMO credited integrated geospatial early warning and evacuation planning for keeping fatalities in the dozens rather than the thousands that historical comparable events would suggest. ● **Faster resource deployment:** Geospatial damage data was integrated into the Post-Disaster Needs Assessment within days, not weeks, enabling rapid prioritization of relief, clearing of blocked roads, and targeted humanitarian access to isolated communities. ● **Evidence-based recovery:** The 960,000-building damage layer supported government allocation of J$10 million in housing reconstruction, a moratorium on 20,000 mortgages, and the spatial prioritization of school and health-facility rebuilding.
Cross-cutting value	Hurricane Melissa demonstrates the climate–environment–disaster nexus operating in real time: record sea surface temperatures fuelled rapid intensification from tropical storm to Category 5 in 39 hours; the storm devastated coral reefs, mangroves and watersheds, with the Forestry Department of Jamaica reporting damage to approximately 51 per cent of national forest cover, or more than 270,000 hectares, with some forests sustaining 76 to 100 per cent damage, reducing natural buffers against future events; and geospatial information was the integrating layer enabling response, recovery and resilient rebuilding. The case illustrates why this holistic report's interconnected framing is not just conceptually correct but operationally essential.
Lessons learned & challenges	● **Pre-existing geospatial infrastructure was decisive.** Jamaica's National Spatial Data Infrastructure, coordinated through the NSDMB, was the foundation that enabled rapid response. Countries without such infrastructure would not have been able to mobilize at this speed. ● **International data partnerships must be pre-arranged.** Activations of ICEYE, Copernicus, NASA, and NOAA occurred within hours, but only because prior agreements, contacts, and data-sharing protocols were already in place. ● **Capacity constraints persist.** Even with strong infrastructure, the volume of data and the speed required exceeded national absorptive capacity at peak. Surge support from international partners was essential but is not guaranteed for future events. ● **Standards and interoperability matter.** Data from over a dozen international and national sources could be integrated quickly because they conformed to common geospatial standards—validating UN-GGIM's investment in standardization.

Submitted by Jamaica | Alicia Edwards, National Spatial Data Management Branch (NSDMB), Ministry of Economic Growth and Infrastructure Development

TÜRKIYE

In Türkiye, geospatial information has been increasingly applied in monitoring land cover change and supporting environmental observation processes. National initiatives focusing on land cover mapping, desertification risk assessment and environmental monitoring demonstrate how geospatial data can be systematically integrated into decision-making frameworks. These applications enable the identification of spatial and temporal changes in land use, support the assessment of land degradation and desertification risks, and strengthen monitoring capacities related to climate, emission tracking and pollution hotspots. As such, they provide practical examples of how geospatial information can be utilized to address environmental challenges and support evidence-based climate and environmental policies.

Element	Description
Name of the Good Practice	**The National Land Cover Classification and Monitoring System (UASIS)**
Theme	Land Cover Classification and Monitoring Determining the current state of land cover and monitoring changes in land cover over time are of critical importance for the impact analysis of natural disasters, carbon emission calculations, climate change scenarios, and the formulation of national and international policies. Through the use of Remote Sensing technologies and Geographic Information Systems (GIS), land cover and its temporal changes can be monitored, analysed, and interpreted in a rapid and dynamic manner.
Country Context	In Türkiye, determining the current state of land cover and monitoring changes over time is of critical importance for impact analyses related to natural disasters, carbon emission calculations, climate change scenarios, and the formulation of national and international policies. In this context, the availability of reliable and timely geospatial data, supported by Remote Sensing technologies and Geographic Information Systems (GIS), is essential to enable the rapid and dynamic monitoring, analysis, and interpretation of land cover and its temporal changes.
Issues to be addressed and Challenges	The inability to accurately monitor land cover and its changes over time creates significant challenges in providing timely, reliable, and consistent data to support climate change mitigation, disaster risk analysis, and policy development processes. In addition, supporting carbon emission calculations, drought scenario modelling, flood risk assessments, and landslide monitoring requires the integration of multiple datasets and analytical approaches. Furthermore, producing land reports in accordance with international standards, such as CORINE, in a cost-effective and sustainable manner represents an important operational challenge.

The Solution	UASIS (National Land Cover Classification and Monitoring System) has been developed as a comprehensive geographic information system to identify and monitor land cover across Türkiye by utilizing artificial intelligence and machine learning technologies. The system enables the analysis of land cover changes and supports a range of applications, including carbon sequestration calculations, drought scenario modelling, flood zone simulation, landslide risk monitoring, and the generation of land reports aligned with international standards. Through the integration of geospatial data and advanced analytical capabilities, UASIS provides a structured, cost-effective and efficient approach to supporting environmental sustainability, disaster management, and policy-related processes.
Implementation	UASIS (National Land Cover Classification and Monitoring System) is a comprehensive geographic information system developed to identify and monitor land cover across Türkiye, utilizing artificial intelligence and machine learning technologies.
Achievement and impact	The UASIS (National Land Cover Classification and Monitoring System) Project has a direct and measurable impact on environmental sustainability and disaster management in Türkiye by serving as a critical data source for climate change mitigation. It performs accurate carbon sequestration capacity calculations based on land cover changes, including afforestation and deforestation. The system enables more accurate modelling of drought scenarios through the use of data on the decline of wetlands and surface impermeability (concrete coverage). It also simulates potential flood zones using surface water retention capacity and slope analysis, thereby provides data to support early warning systems. Landslide risks are monitored through the assessment of land-use changes. In addition, UASİS supports the generation of land reports required under international standards, such as CORINE, using national resources at reduced cost.
Cross-cutting value, **Good practice/ Lessons learned**	UASIS acts as an integrative platform linking geospatial data, artificial intelligence, and digital technologies, enabling the transformation of raw data into actionable information. Through semi-automated classification processes of satellite imagery supported by machine learning algorithms, the system reduces manual error and enhances the accuracy of land cover detection and change analysis over time. By leveraging predictive analytics, UASIS enables the use of historical land data to anticipate future trends, such as desertification risks and urban expansion, thereby supporting proactive climate adaptation and informed decision-making processes.
References	https://cem.csb.gov.tr/ulusal-arazi-ortusu-siniflandirma-ve-izleme-sistemi-uasis-113001
Relevant Frameworks	- Sustainable Development Goals (SDGs) - UN Convention to Combat Desertification (UNCCD) - United Nations Framework Convention on Climate Change (UNFCCC) - Land Use, Land-use Change and Forestry
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Element	Description
Name of the Good Practice	**Desertification Model for Türkiye: Sensitivity and Hazard Maps**
Theme	Desertification Model The approach aims to identify areas susceptible to desertification in a more detailed, scientific, and objective manner, while assessing the influence of climate, soil, vegetation cover, and topography indices on desertification processes.
Country Context	In Türkiye, the need to identify areas susceptible to desertification in a detailed, scientific, and objective manner has become increasingly important. Understanding how climate, soil, vegetation cover, and topography influence desertification processes is essential to support evidence-based analysis and inform national efforts related to land management and environmental sustainability.
Issues to be addressed and Challenges	Addressing desertification requires the ability to accurately assess susceptibility and risk levels across different regions and to understand the combined effects of climate, soil, vegetation cover, and topographic conditions. Identifying priority intervention areas and developing land management plans that ensure the sustainable use of natural resources are among the significant challenges encountered in the development of the desertification model. In addition, incorporating climate change projections into risk assessments to support forward-looking planning is a critical requirement.
The Solution	The development and use of desertification sensitivity and hazard maps provide a structured approach to addressing these challenges. By enabling the integrated assessment of climate, soil, vegetation cover, and topographic conditions, these maps support the identification of susceptibility and risk levels across different regions. They further support policy development for combating desertification, enable the identification of priority intervention areas, and contribute to the preparation of land management plans that promote the sustainable use of natural resources. By providing scientific guidance to decision-makers, practitioners, and relevant stakeholders, the approach supports strategic planning and implementation processes, while integrating climate change projections to enable proactive and informed decision-making.
Implementation	Desertification sensitivity and hazard maps are used to determine policies aimed at combating desertification, to identify priority areas for intervention, to develop land management plans and ensure the sustainable use of natural resources. The approach provides scientific guidance to decision-makers, practitioners, and relevant stakeholders, supporting strategic planning and implementation processes.
Achievement and impact	The desertification sensitivity map enables the identification of areas at high risk and the determination of priority intervention zones. In addition, the hazard map utilizes climate projections based on climate change scenarios to indicate regions that are likely to face higher risk in the coming years. This approach supports

	proactive planning by considering the pressures of climate change on land. It enables early intervention before desertification occurs, while also contributing to the mitigation of adverse climate change impacts.
Cross-cutting value, **Good practice/ Lessons learned**	Through the use of Geographic Information Systems and the integration of sensitivity and hazard maps, efforts to combat desertification are enhanced, while the adverse impacts of climate change are reduced. The approach also enables the identification of priority intervention areas and advances sustainable land management practices.
References	https://bulutsehir.csb.gov.tr/share/preview/fpe9uCaWJqFawVFKymheRJq2gu8XuvaE6dw6jfddpPpWxX6xq6 https://bulutsehir.csb.gov.tr/share/preview/DNTjAdggzKEUsVVk9HsnEuVumTBjgM8tgpdMPjJYTeveAxnYJQ
Relevant Frameworks	- Sustainable Development Goals (SDGs) - UN Convention to Combat Desertification (UNCCD)
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Element	Description
Name of the Good Practice	**National Emission Management and Air Quality Modeling System (HEY Portal) – Türkiye**
Theme	Air Quality Integrated air quality management and emission inventory development through geospatial and atmospheric modelling, supporting environmental sustainability and evidence-based decision-making processes in alignment with Net Zero Emission strategies.
Country Context	In Türkiye, integrated air quality management and emission inventory development are essential to support environmental sustainability and evidence-based decision-making processes. In this context, the use of geospatial and atmospheric modelling plays a critical role in aligning national efforts with Net Zero Emission strategies, while enabling the production and use of reliable air quality data across different administrative levels.
Issues to be addressed and Challenges	Ensuring effective air quality management requires the integration of emission inventory data, meteorological models, and air quality modelling within a unified system capable of producing consistent and high-resolution outputs. Supporting national and international reporting obligations, while enabling accurate spatial analysis of sectoral emission distribution and impact, presents a key challenge. In

	addition, managing large volumes of environmental data and ensuring their accessibility for analysis, modelling, and visualization within a centralized digital infrastructure are critical requirements.
The Solution	The HEY Portal has been developed as a national, centrally managed software platform that integrates emission inventory data, meteorological models, and air quality modelling to generate consistent and high-resolution air quality outputs across Türkiye at provincial and district levels. The system provides km-scale air quality concentration maps, supports national and regional atmospheric modelling studies, and enables short-term air quality forecasting. It facilitates the spatial analysis of sectoral emission distribution and impacts through geospatially referenced datasets, while supporting national and international environmental reporting processes. Through the integration of large-scale environmental data within a centralized digital infrastructure, the platform supports analysis, modelling, visualization, and location-based air quality assessments for environmental management and decision-making processes.
Implementation	The HEY Portal is a national, centrally developed software platform that integrates emission inventory data, meteorological models, and air quality modelling to generate air quality maps across Türkiye at provincial and district levels. The system provides km-scale air quality concentration maps, supported by national and regional atmospheric modelling studies, and enables air quality forecasting for up to five days. Enabling spatial analysis of sectoral emission distribution and impact through geospatially referenced datasets. The platform supports location-based air quality analysis outputs and integrates large volumes of environmental data within a centralized digital infrastructure for analysis, modelling, and visualization.
Achievement and impact	The HEY Portal provides a scientific and technical basis for national air quality policies and environmental management processes, supporting decision-making through integrated modelling and mapping capabilities. By digitizing emission inventories and enabling electronic data storage, management, and archiving, the system reduces bureaucratic processes, improves efficiency, and supports effective use of human resources. The platform contributes to national and international reporting obligations and supports policy, technical, and scientific processes by providing centralized, model-based, and map-supported outputs.
Cross-cutting value, Good practice/ Lessons learned	The HEY Portal demonstrates the critical role of geospatial technologies in environmental monitoring, air quality management, and climate policy implementation through an integrated system combining environmental data management and atmospheric modelling. It provides a unified digital infrastructure that supports environmental governance, evidence-based decision-making, and cross-sectoral policy development. The platform facilitates data sharing and institutional collaboration, while enabling academic and scientific research through structured data provision and supporting local governments with location-based data for sectoral planning. In doing so, it bridges environmental sustainability, climate action, and public administration within a single operational framework.

	Furthermore, the system supports long-term strategic planning by aligning with national artificial intelligence initiatives and emission reduction objectives, including Net Zero targets, while enabling continuous system development and enhancing the efficiency and sustainability of environmental management processes.
References	https://cygm.csb.gov.tr/haberler/hava-emisyon-yonetim-portali-kapsaminda-hava-kalitesi-modelleme-egitimleri-basladi-235289
Relevant Frameworks	- Sustainable Development Goals (SDGs) - Paris Agreement on Climate Change (UNFCCC) - Sendai Framework for Disaster Risk Reduction (UNDRR) - UN-SPIDER / International Charter - European Environment Agency (EEA) reporting mechanisms - United Nations Convention on Long-range Transboundary Air Pollution
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Element	**Description**
Name of the Good Practice	**NEFES: New Emission Forecast Evaluation System (3D Air Quality and Digital Twin-Based Decision Support Mechanism)**
Theme	Air Quality and Digital Twin Air quality management and environmental monitoring through advanced geospatial technologies, with a focus on the integration of 3D city models, digital twins, and high-resolution spatial data to support evidence-based environmental policies and urban planning processes.
Country Context	In Türkiye, air quality management and environmental monitoring have become increasingly important in supporting evidence-based environmental policies and urban planning processes. In this context, the use of advanced geospatial technologies, including 3D city models and digital twins, enables the integration of high-resolution spatial data to support multi-scale analysis and decision-making across national and local levels.
Issues to be addressed and Challenges	Air quality management requires the integration of diverse spatial datasets, including urban topology, road networks, traffic density, emission data, land use, and terrain characteristics, within a unified analytical framework. Producing reliable air pollution distribution maps at different spatial resolutions and supporting neighbourhood-level analysis are among the key elements that need to be addressed in air quality management. In addition, supporting decision-making processes across public institutions, local governments, and planning authorities, while ensuring the effective use of high-resolution data and advanced visualization techniques, is a critical requirement.

The Solution	The NEFES system has been developed as a geospatial decision-support mechanism that utilizes high-resolution spatial data and 3D digital city models to monitor and analyse air quality in a three-dimensional environment. By integrating diverse urban and environmental spatial datasets within a unified analytical framework, the system generates reliable air pollution distribution maps at different spatial resolutions, extending to neighbourhood-level analysis. Operating on digital twins of cities, it enables spatially explicit assessment of air quality values and supports advanced visualization and data processing techniques. Through these capabilities, the system provides a structured approach to supporting environmental planning, policy formulation, and decision-making processes across public institutions, local governments, and planning authorities.
Implementation	The NEFES system utilizes high-resolution geospatial data and 3D digital city models to monitor and analyse air quality in a three-dimensional environment. It integrates multiple spatial datasets, including urban topology, road networks, traffic density, emission data, land use, and terrain characteristics, to generate air pollution distribution maps at national (12 km resolution) and regional (4 km resolution) scales, extending to neighbourhood-level analysis and decision-support tools. The system operates on digital twins of cities. It enables spatially explicit assessment of air quality values and supports visualization through advanced mapping interfaces and intelligent data processing techniques.
Achievement and impact	The system provides high-resolution air quality data that supports decision-making processes across public institutions, local governments, and planning authorities. It enables more effective environmental planning, urban development prioritization, and policy formulation by offering location-based insights. The outputs contribute to environmental impact assessment processes and have the potential to replace or enhance baseline condition analyses. Additionally, the integration of health indices allows policymakers to evaluate environmental and public health impacts in a combined framework, improving the effectiveness of mitigation strategies and reducing long-term health-related costs.
Cross-cutting value, **Good practice/ Lessons learned**	The NEFES system demonstrates the integration of geospatial information, environmental monitoring, and public health analytics within a unified decision-support framework. It supports cross-sectoral policy development by linking environmental data with socio-economic and health-related indicators. The platform enhances data-driven governance by enabling multi-scale analysis, from national to neighbourhood level, and supports academic research, institutional collaboration, and local planning processes. It contributes to improved efficiency in data processing and policy implementation, while facilitating evidence-based decision-making in climate resilience and environmental management contexts.

References	https://ced.csb.gov.tr/haberler/sehirlerin-hava-kalitesi-nefes-ile-tespit-ediliyor-288254
Relevant Frameworks	- Sustainable Development Goals (SDGs) - Paris Agreement on Climate Change (UNFCCC) - European Environment Agency (EEA) - UN Convention on Long-range Transboundary Air Pollution - National air quality management frameworks - Early Warning for All (EW4All)
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SOUTH AFRICA

Title: Harmonising Climate Resilience in iSimangaliso: Integrating Climate, Environmental and Disaster Risk Information Through Geospatial Workflows

The iSimangaliso Wetland Park case study demonstrates how climate resilience can be advanced through an integrated geospatial information workflow that brings climate, environmental and disaster risk information into a single evidence base for decision-making. Located within a highly sensitive coastal estuarine landscape, the iSimangaliso system is affected by climate-driven hydrological disruption, sediment accumulation, vegetation proliferation, persistent back-flooding, settlement exposure, agricultural impacts and livelihood vulnerability. The case study uses Earth Observation, GIS-based spatial analysis, Survey123 field data, land-use and land-ownership datasets, specialist studies and stakeholder participation to create a shared spatial intelligence platform for planning, environmental management and risk reduction.

The central lesson is that connected problems need connected solutions. Climate resilience in the iSimangaliso region cannot be achieved through siloed interventions; it requires coordinated action across environmental management, disaster risk reduction, spatial planning, agriculture, settlement planning and community development. By connecting evidence, institutions and communities, the geospatial workflow strengthens the ability of decision-makers to understand risk, prioritise interventions, monitor implementation and adapt actions over time.

Element	Description
Name of the Good Practice	**Harmonising Climate Resilience in iSimangaliso: Integrating Climate, Environmental and Disaster Risk Information Through Geospatial Workflows**
Theme	The case study shows how geospatial information can transform fragmented climate and environmental evidence into decision-ready spatial intelligence. The methodology integrates Earth Observation, UAV/drone-based imagery, GIS analysis, Survey123 field data, specialist studies, land-use and land-ownership analysis, and participatory inputs into one coherent workflow. AI-assisted spatial analytics may be used as an additional support layer to interpret large Earth Observation and UAV-derived datasets, particularly for patterns such as vegetation hotspots, sediment accumulation, flood exposure and settlement-risk relationships.

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<td>Country Context</td>
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iSimangaliso Wetland Park is located on the north-eastern coast of South Africa in KwaZulu-Natal Province. The park extends from the Mozambique border in the north to Maphelane in the south and includes Lake St Lucia, one of Africa's most significant estuarine systems. The area lies predominantly within uMkhanyakude District Municipality, with key access points near St Lucia, Mtubatuba and Hluhluwe (iSimangaliso Wetland Park Authority, 2016 & iSimangaliso Wetland Park Authority. 2016).

The park is a UNESCO World Heritage Site and is also recognised as a wetland of international importance under the Ramsar Convention(IUCN, 2020).. It is a globally significant coastal system where ecological value, climate exposure, rural livelihoods, agricultural production, conservation management, tourism and settlement development intersect.

The landscape has experienced significant climate variability, including prolonged drought conditions followed by intense rainfall events (iSimangaliso Panel of Experts, 2022). These climatic shifts have contributed to persistent back-flooding, water ingress into settlements and widespread agricultural land loss within the Mfolozi floodplain, (DALRRD , 2024). The impacts are not isolated environmental events; they affect ecosystem functioning, agricultural productivity, settlement stability, food security, lease commitments, tourism access and community livelihoods.
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<td>Issues to be addressed and Challenges</td>
<td>The iSimangaliso case is characterised by complex and interconnected risks. Persistent flooding, sediment accumulation, vegetation proliferation and altered hydrological flows have affected both ecological systems and human settlements. Prolonged waterlogging has rendered</td>
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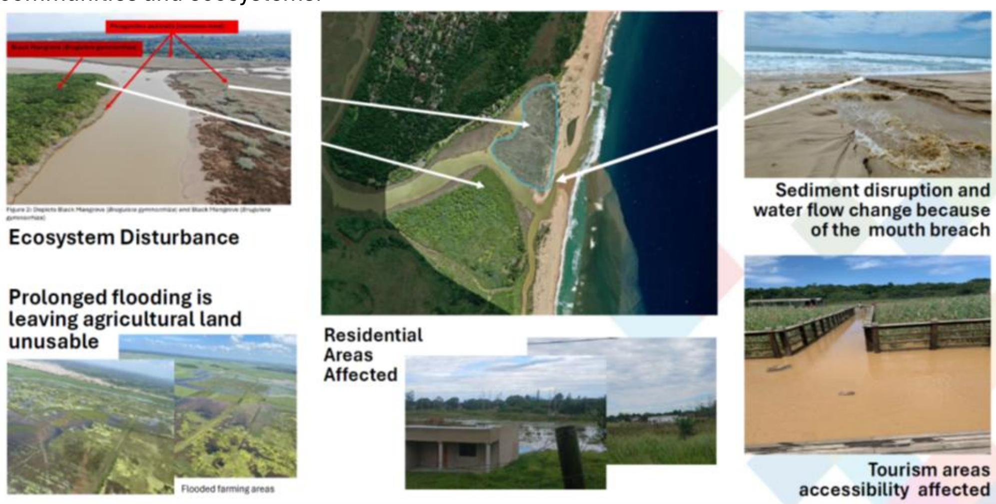
agricultural land unusable in some areas, while residential areas and tourism access routes have also been affected.
The core challenge is that climate risk in iSimangaliso is spatial, systemic and cumulative. Flood vulnerability follows topography and natural drainage pathways, while land use and settlement patterns overlap with low-lying and environmentally sensitive areas. This means that disaster risk cannot be addressed only through emergency response; it must be analysed together with land use, hydrology, ecosystem condition, spatial planning and community exposure.
As illustrated in figure 3.1, the iSimangaliso Wetland Park ecosystem is experiencing interconnected environmental and disaster risk challenges, including ecosystem disturbance, sediment disruption, prolonged flooding, and altered water flows, which are negatively affecting agricultural productivity, residential areas, and tourism infrastructure. These impacts are exacerbated by changing hydrological conditions and flooding pressures, resulting in land becoming unusable, damage to settlements, restricted access, and increasing vulnerability of communities and ecosystems.


Figure 3.1 Addressing the Convergence of Climate, Environmental and Disaster Risk Challenges
Source: UAVs, 2023,2025 & 2026; Pictures: DLRRD, 2025 7 iSimangaliso Wetland park Authority, 2025

The main issues may therefore be summarised as follows:

Persistent back-flooding in the Mfolozi and Msunduzi floodplains
Sediment accumulation and reed or vegetation proliferation obstructing natural streamflow.
Waterlogged commercial and subsistence agricultural land, including land linked to state land reform farms.
Settlement exposure in low-lying and hydrologically constrained areas.
Ecosystem disturbance, declining ecosystem services and altered estuarine functioning.
Tourism accessibility impacts linked to flooding and environmental disruption Figure
Fragmented governance and limited integration between conservation planning, agricultural support, spatial planning and disaster risk management.

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<td>The Solution</td>
<td>The iSimangaliso response is based on the principle that complex resilience challenges require integrated, multi-stakeholder solutions. Several stakeholder groups, including the iSimangaliso Wetland Park Authority, national and provincial government departments, local municipalities, environmental authorities, traditional leadership, community representatives, scientists, industry role players, farmers, tourism stakeholders and civil society organisations were identified.</td>
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	The solution is not limited to one technical intervention. It combines geospatial information, policy engagement, specialist science, local knowledge and decision-maker participation. This allows policy and technical actors to work from a common evidence base when identifying flood-risk areas, ecological constraints, affected communities and priority intervention zones. **The specialist geospatial solution includes the following components:** • Earth Observation and remote sensing to support analysis of environmental change, floodplain dynamics, vegetation condition and landscape-scale risk • UAV/drone imagery to capture fine-scale evidence of channel blockages, vegetation proliferation, sedimentation and floodplain conditions. • GIS-based spatial analysis to overlay hydrological risk, land use, land ownership, settlement exposure and ecological sensitivity. • Survey123 field data collection to document household-level and livelihood-related flood impacts. • Specialist studies covering hydrology, ecology, coastal processes and related environmental considerations. • Story maps and geospatial communication tools to communicate risks, scenarios and proposed spatial responses in a transparent and accessible manner. The methodology may be expressed in a specialist resilience-planning sequence as follows: before a hazard event, geospatial information can support hazard mapping, critical infrastructure exposure analysis, evacuation route planning and shelter siting using GIS; during an event, real-time storm tracking and satellite or radar data integration can support situational awareness; after an event, rapid damage assessment using satellite imagery and drone surveys can support recovery prioritisation. The iSimangaliso case study particularly demonstrates the post-impact and planning value of UAV imagery, GIS, Survey123, specialist studies and spatial analysis for identifying flood impacts and prioritising adaptation interventions. By overlaying topographic information with settlement locations, stakeholders were able to determine which houses were situated within low-lying areas, drainage corridors, and other flood-prone zones. This evidence-based approach provided a clear understanding of the spatial relationship between settlements and flood risk, enabling government departments, iSimangaliso Wetland Park, municipalities, disaster management authorities, and local communities to work from a shared and scientifically validated information base.
Implementation	The implementation approach is structured around a geospatial workflow that converts climate-risk evidence into adaptation planning and community outcomes. The workflow begins by defining system pressures, including altered sediment regimes, blocked channels, vegetation proliferation, persistent back-flooding and waterlogging. It then integrates multiple spatial datasets to identify where risk, ecological condition, land use, settlement exposure and livelihood dependence overlap. The workflow uses multi-source data integration as the foundation for coordinated decision-making. Land-use and land-ownership data, Survey123 results, UAV imagery and specialist studies are consolidated into a single spatial evidence base. This enabled the identification of reed and vegetation proliferation hotspots along the uMsunduzi and lower uMfolozi River channels, where excessive growth has obstructed natural streamflow. Spatial analysis and risk synthesis translate the integrated datasets into decision intelligence. Flood and sediment modelling, composite risk mapping and spatial overlays were used to prioritise intervention areas and sequence actions. These outputs supported a phased approach

	that links immediate flow-restoration actions with longer-term land-use, planning and ecosystem management considerations. The workflow also includes a stakeholder and community interface. Community survey results highlighted uneven access to support programmes, particularly where farmers in severely waterlogged areas could not access fields or meet programme requirements. This evidence strengthened the rationale for revising assistance mechanisms and incorporating livelihood impacts into broader intervention planning. A key specialist insight is that climate resilience is not a once-off intervention. It is a continuous decision process involving shared understanding, data integration, spatial analysis, phased interventions, monitoring, feedback and adaptive management.
Achievement and impact	The assessment highlighted excessive sediment accumulation, invasive reed growth, channel blockages, and vegetation encroachment that were restricting water flow and contributing to flooding within the St Lucia Estuary system. As a result, a phased implementation approach was developed, including vegetation clearing, sediment dredging, debris removal, and ongoing maintenance activities. The environmental authorisation process ensured that these interventions were scientifically informed, environmentally responsible, and supported by specialist studies, providing a coordinated pathway for improving river flow, reducing flood risk, restoring ecosystem functioning, and enhancing the long-term resilience of the iSimangaliso Wetland Park and surrounding communities. Twelve specialist studies found that long-term sustainability will require broader floodplain and ecosystem recovery interventions (Afzelia Environmental Consultants. 2023). This is an important specialist conclusion because it confirms that channel clearing and dredging are necessary but not sufficient on their own; durable resilience requires system-wide ecological and spatial planning responses.
Cross-cutting value, **Good practice/ Lessons learned**	**Connected Problems Need Connected Solutions** The strongest lesson from iSimangaliso is that connected problems need connected solutions. Flooding, ecosystem disturbance, sedimentation, waterlogging, settlement exposure, tourism disruption and livelihood impacts are interdependent. Treating them as separate sectoral problems would weaken resilience outcomes. **Resilience Requires a Single Analytical Ecosystem** The case demonstrates that resilience requires integration of environmental, climate and disaster risk information into a single analytical ecosystem. In iSimangaliso, GIS, Earth Observation, UAV imagery, field surveys, specialist studies, land-use data and land-ownership data were combined to understand interconnected risks and support targeted interventions. **Shared Geospatial Evidence Enables Governance Alignment** Shared geospatial evidence provided a common platform for policy-makers, technical specialists, communities and sector departments to understand risk and agree on priorities. This is important where mandates for conservation, agriculture, water management, spatial planning and disaster response are distributed across different institutions. **Working Together with Policy and Decision Makers Is Essential** The case shows that geospatial information only becomes transformative when it is connected to decision-making. The workflow supported policy and decision makers by translating complex climate and environmental evidence into spatially explicit intervention areas, phased actions and practical planning considerations. **Specialist Data Must Be Grounded in Community Reality**

	The integration of Survey123 community data and participatory inputs ensured that the analysis did not remain purely technical. Community surveys documented how flooding affected access, livelihoods and support mechanisms, thereby grounding the intervention plan in lived experience and improving the legitimacy of proposed responses. **Resilience Transformation Requires Cooperation Across Sectors** The iSimangaliso case confirms that no single sector can manage growing climate and disaster risks alone. Resilience transformation requires alignment between disaster risk reduction, climate adaptation, environmental management, spatial planning, agricultural support and community development through shared data, governance and cooperation.
References	https://storymaps.arcgis.com/stories/c807d73197e04fa7b23bf8d9ac2a04ff
Relevant Frameworks	- Sustainable Development Goals (SDGs) - Paris Agreement on Climate Change (UNFCCC) Kunming-Montreal Global Biodiversity Framework (GBF).
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