CLIMAAX
climate ready regions

Deliverable Phase 3 – Climate risk management

CLIMAAXKòrsou

Curaçao

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Table of Contents

Document Information 3
List of figures 6
List of tables 6
Abbreviations and acronyms 7
International – UN system, treaties, financing bodies 7
Climate science and hazard modelling 8
Other 8
Executive summary 9
1 Introduction 11
1.1 Main objectives of the project 11
1.2 Project team 12
1.3 Outline of the document's structure 12
2 Local profile 13
2.1 Summary of Key Risk Assessment results 13
2.2 Key implementation mechanisms and policy context for CRM 14
2.3 Key actors and systems for CRM 16
2.4 Lessons learned from past events 21
3 Climate risk management 24
3.1 CRM objectives 24
3.2 Supportive elements for effective CRM 25
3.3 Potential CRM measures 28
Structural, non-structural, nature-based and governance categories 33
Equity and justice implications of the measures 34
Mainstreamed investments — adaptation integrated into ordinary construction and infrastructure decisions 34
3.4 Integration into planning and decision making 34
4 Project Evaluation 38
4.1 Usability of the results 38
4.2 Lessons learned 39
Is learning ensured? 41

How did you communicate your final outcomes? 41
What worked well? What did not? 44
How efficiently did you use resources (time, staff, cost)? 45
How would you value the impact of CRM on improved understanding of risk? 45
5 Conclusions Phase 3 46
5.2 Key results from the CLIMAAXKòrsou research 47
5.2.1 Inter-institutional data governance is the binding constraint on Curaçao climate risk work; a shared data commons is the enabling instrument 47
5.2.2 — Climate risk on Curaçao is inseparable from tourism-sector risk; the sector is a natural adaptation partner rather than a bystander 47
5.2.3 — A green-ratio requirement in the building code and land-clearing regulation is the single instrument capable of delivering cross-hazard co-benefits at design stage 48
5.2.4 — The multi-hazard programme needs its outstanding data and modelling upgrades to move from strong first-cut to operational second-cycle 48
5.2.5 — Curaçao's CLIMAAXKòrsou outputs are directly transferable to Dutch Caribbean and wider Caribbean SIDS peers; the international pathway sits inside the UN system and reinforces the SNIJ / SIDS-equivalent recognition case 48
6 Progress evaluation 49
6.1 Project outputs 49
6.2 K4 prototype evidence 51
7 Supporting documentation 53
Main report 53
Annex documents (attached / cross-referenced) 53
Visual outputs 53
Communication outputs 54
Datasets and documents on the CLIMAAX GeoNode Portal 54
8 References 56
CLIMAAX Framework 56
Climate Science 56
Data Sources 56
UN System / Kingdom-of-the-Netherlands cooperation 56
Regional Studies 57
Local — Curaçao 57

Software and Tools 58

List of figures

Figure 2-1 — UN Annual Results Report 2025: SDG bottlenecks and accelerators for Curacao. 16
Figure 2-2 — Banda Abou extreme-rainfall event, 4 May 2024. 22
Figure 2-3 – Waaigat, Willemstad 17 November 2024. 23
Figure 3-4 — CRM concern area hotspot overview: dominant hazard per neighbourhood 29
Figure 3-5 – On island examples of coastal buffer measures brought forward through stakeholder engagement 33
Figure 3-6 — Impacts of the four priority hazards on government ministries. 35
Figure 4-7 — The importance of smaller steps. 40
Figure 4-8 — Governer briefing, 21 January 2026. 42
Figure 4-9 — CCCP Werkgroep Klimaatverandering visit to the Staten Parliament, week of 27 February 2026. 43
Figure 6-10 — Climate Imp[act Atlas Korsou (prototype) — landing page. 51
Figure 6-11 — Climate Impact Atlas Korsou (prototype) — per hazard story page. 51
Figure 6-12 — Climate Impact Atlas Korsou (prototype) — landing page scroll view. 52

List of tables

Table 2-1 — Priority climate risks and resilience capacity for Curaçao 13
Table 2-2 — Key actors and systems for CRM summary 17
Table 3-3 — Primary objectives table 24
Table 3-4 — Secondary objectives table 24
Table 3-5 — Supportive elements for effective CRM 26
Table 3-6 — Main CRM analysis results 30
Table 3-7 — Proposed fill of Kaderbeleid Bijlage I with CLIMAAXKòrsou evidence 36
Table 6-8 — Overview Key Performance Indicators 49
Table 6-9 — Overview milestones 50
Table 7-10 — CLIMAAXKòrsou datasets published on the CLIMAAX GeoNode portal 55
Table 7-11— CLIMAAXKòrsou deliverable documents 55

Abbreviations and acronyms

Abbreviation / acronym	Description
MDC	Meteorological Department Curaçao
CCCP	Curaçao Climate Change Platform
VVRP	Ministerie van Verkeer, Vervoer en Ruimtelijke Planning — Ministry of Traffic, Transport and Urban Planning
Beleid	Directie Beleid — spatial-planning-policy directorate within VVRP; drafts and revises the *Zonaal Ontwikkelingsplan* (ZOP), building-code instruments and land-use regulations. When a measure "goes into law" through spatial planning, it is Beleid within VVRP that enacts it.
GMN	Gezondheid, Milieu en Natuur — Health, Environment and Nature
MEO	Ministerie van Economische Ontwikkeling — Ministry of Economic Development
DRR	Directie Rampenbeheersing — Directorate of Disaster Management
CBS	Centraal Bureau voor de Statistiek — Central Bureau of Statistics (Curaçao)
CBCS	Central Bank of Curaçao and Sint Maarten
CPA	Curaçao Ports Authority
CTB	Curaçao Tourism Board
CMC	Curaçao Medical Center
SVB	Sociale Verzekeringsbank — Social Insurance Bank
Kranshi	Civil registry / bevolkingsregister
DCBD	Dutch Caribbean Biodiversity Database
Kadaster	Cadastral records office
OWCS	Onderwijs, Wetenschap, Cultuur en Sport — Ministry of Education, Science, Culture and Sport
ZOP	Zonaal Ontwikkelingsplan — island spatial development plan
BES	Bonaire, Sint Eustatius, Saba — Dutch Caribbean public entities of the Netherlands
KvK	Kamer van Koophandel — Chamber of Commerce
MKB	Midden- en Kleinbedrijf — Small and Medium Enterprises

International – UN system, treaties, financing bodies

Abbreviation / acronym	Description
UNESCO	United Nations Educational, Scientific and Cultural Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
NDC-NL	National Ocean Decade Committee — Netherlands
WMO	World Meteorological Organization
IPCC	Intergovernmental Panel on Climate Change

UNFCCC	United Nations Framework Convention on Climate Change
MSDCF	Multi-Country Sustainable Development Cooperation Framework
ITLOS	International Tribunal for the Law of the Sea
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SNIJ	Subnational Island Jurisdictions
KNMI	Koninklijk Nederlands Meteorologisch Instituut — Royal Netherlands Meteorological Institute

Climate science and hazard modelling

Abbreviation / acronym	Description
SLR	Sea Level Rise
SSP	Shared Socioeconomic Pathway (used with scenarios: SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP5-8.5)
CMIP6	Coupled Model Intercomparison Project Phase 6
DEM	Digital Elevation Model
LiDAR	Light Detection And Ranging (high-resolution elevation sensing)
LST	Land Surface Temperature
SPI	Standardized Precipitation Index
IDF	Intensity-Duration-Frequency (rainfall curves)
NDVI	Normalized Difference Vegetation Index
FEWS	Flood Early Warning System (Curaçao hydrological modelling series)
BAU	Business As Usual

Other

Abbreviation / acronym	Description
ABC islands	Aruba, Bonaire, Curaçao
ISLA	Former Curaçao oil refinery (now context for the tourism-economy pivot)
LNOB	Leave No One Behind (UN 2030 Agenda principle)
MSME	Micro, Small and Medium Enterprises

Executive summary

Curaçao's 2045 climate ambition — set out in the concept national climate policy framework *Kaderbeleid Curaçao en klimaatverandering* (CCCP, November 2025) — is *"In 2045, Curaçao is a resilient society with an abundant biodiversity and a key player in renewable energy."* CLIMAAXKòrsou contributes the quantified climate-risk evidence base on which the *resilient society* and *abundant biodiversity* elements of that ambition depend.

What this report covers. This deliverable presents the Climate Risk Management (CRM) work carried out under CLIMAAXKòrsou, building directly on the earlier project research that produced Curaçao's quantitative multi-hazard risk assessment. The underlying risk analysis covers the four priority climate hazards facing Curaçao — coastal flooding, pluvial flooding, heat stress and drought — at neighbourhood resolution, calibrated against MDC observations, and openly deposited across five DOIs.

What this report does. It translates those hazard, exposure and vulnerability products into a prioritised list of CRM measures across nature-based, grey-infrastructure, regulatory, operational and cross-cutting categories (§ 3.3, Table 3-4); connects the measures to concrete national policy vehicles through direct integration into the Kaderbeleid framework (§ 3.4); and carries the results forward in a coordinated series of three high-level H1 2026 briefings: to HE Mauritsz de Kort, Governor of Curaçao (21 January 2026, jointly with Beleidsdirecteur Miriam Jonker of VVRP); to the Staten Werkgroep Klimaatverandering and Statenvoorzitter Fergino Brownbill (week of 27 February 2026, as CCCP workgroup chair); and to the directors of all involved ministries in the interministerial overleg (29 May 2026). Additional engagements include the CBCS Board + Climate Workgroup (4 February 2026), the Commissie Integraal Watermanagement (5 February 2026), the heat coalition with Kranshi + CMC + SVB + GMN gezondheid, sustained bilateral consultations with Beleid (VVRP) across H1 2026, and an active regional-capacity partnership with Bonaire (BES) on heat.

Cross-cutting finding. The single most persistent limitation for climate risk work on Curaçao is the **fragmentation of climate-relevant data across institutional silos**. This structural pattern is developed in § 4.2 (lessons learned) and formalised in § 5.2.1 (Curaçao data commons) — the highest-priority CRM measure emerging from the work.

Key results (§ 5.2). Five key results stand out from the CLIMAAXKòrsou research:

1. Inter-institutional **data governance framework** — the Curaçao data commons
2. Communication of climate risk to the **tourism sector**, treating climate as economic and cultural risk to the dominant sector and its UNESCO-inscribed heritage
3. **Green-ratio requirement** in the building code and land-clearing regulation
4. **Continuation of the multi-hazard programme** with the outstanding data and modelling upgrades — higher-resolution LiDAR-based DEM, geolocated CBS census, operational NDVI vegetation drought monitoring, heat-health surveillance
5. **Position Curaçao as a role model** for sister islands in the Dutch Caribbean, and bring the CLIMAAXKòrsou analytical outputs into the UN Decade of Ocean Science discussion via MDC's IOC membership and NDC-NL workgroup role

Positioning for what's next. The Kaderbeleid framework is the primary integration vehicle at national policy level; the MDC-hosted Climate Impact Atlas is under active development on MDC's institutional website as the public-facing dissemination platform (the principal open item at time of submission); MDC's own internal data-governance project is under development as the first concrete step toward the Curaçao data commons; and MDC is actively supporting Bonaire (BES) with the transfer of its calibrated heat methodology and heat-coalition experience. External validation of the results set is provided by the UN 2025 Annual Results Report — Dutch Islands, whose SDG bottlenecks-and-accelerators mapping for Curaçao (§ 2.2 Figure 2-8) converges independently on the same short list of instruments identified by this work, and whose 2025 priority-resource allocation figures (in § 2.2, 1.9 % to climate resilience) frame the fiscal case behind § 5.2.5.

KPIs and milestones (§ 6). KPI K3 (stakeholder meetings) and K5 (15 unique stakeholders) are both exceeded — the deliverable evidences nine or more distinct engagements this cycle, and the sustained CCCP platform sessions engaged over 35 organisations across all sectors. Milestone M5 (presentation of results to policy / decision-makers) is achieved at head-of-state, legislative-branch and executive-ministerial-branch levels via the H1 2026 briefing series.

1 Introduction

1.1 Main objectives of the project

> **"In 2045, Curaçao is a resilient society with an abundant biodiversity and a key player in renewable energy."** — Curaçao's 2045 climate ambition, as set out in the concept national climate policy framework (Kaderbeleid Curaçao en klimaatverandering; see § 2.2).

The 2045 horizon is not arbitrary. It is the end of the current Kaderbeleid plan under a 5-year milestone cadence (2030, 2035, 2040, 2045), with 2030 as the first milestone. Both anchor dates sit inside the UN-system architecture: 2030 aligns with the SDG 2030 Agenda and with the end of the *UN Decade of Ocean Science for Sustainable Development* (2021–2030); 2045 aligns with the UN centenary (the UN Charter was signed 26 June 1945). Curaçao's national planning cadence therefore steps in phase with the UN's own development-framework timeline — a relevant framing for the Kingdom-of-the-Netherlands cooperation instruments and Ocean-Decade-adjacent pathways picked up later in § 2.2 and § 4.1.

CLIMAAXKòrsou is Curaçao's participation in the CLIMAAX Financial Support to Third Parties (FSTP) programme and contributes the quantified climate-risk evidence base on which the *resilient society* and *abundant biodiversity* elements of that 2045 ambition depend. The overall goal of the project is to enhance climate resilience in Curaçao through multi-risk assessment and management, aligned with the standardised CLIMAAX framework and adapted to the Small Island Developing State context of the region.

MDC's ambition beyond the immediate project scope is that Curaçao — through this work and its continuation — becomes a role model in the Dutch Caribbean and the wider Caribbean region for how a small island can transition from characterising climate risk to actively managing it. The islands of the region face closely related climate challenges (SLR-exposed coastal economies, heat vulnerability, drought dependence, hurricane-belt proximity), and the methodologies, institutional partnerships and open-data practices developed here are directly transferable. MDC is committed to opening the outputs, methods and lessons of the project to investors, research partners, sister-island meteorological and climate agencies, and any organisation exploring novel implementations of climate adaptation. This posture — regional leadership by example, coupled with openness to external contribution — is a design principle of the project, not a byproduct.

CLIMAAXKòrsou is delivered as one integrated body of work with two visible outputs: the earlier *refined multi-risk assessment* — quantitative modelling of four priority hazards (coastal flooding, pluvial flooding, heat stress, drought) at neighbourhood resolution, with open publication of methodology and data — and this *Climate Risk Management (CRM) deliverable*, which transitions from characterising risks to acting on them through stakeholder-driven definition of CRM objectives and measures, integration into planning and policy, and closing of the commitments around public dissemination and inter-institutional data-sharing. The CRM work builds directly on the same evidence base: the risk products, methodology and open datasets are the inputs to CRM decision-making, not repeated technical work.

A cross-cutting finding that emerged consistently across all four hazard workflows and again through the CRM analysis is that the single most persistent limitation for climate risk work on

Curaçao is the fragmentation, incompleteness and coarse resolution of the underlying data. Each hazard has its own specific data-gap signature — DEM resolution for pluvial-flood modelling, siloed institutional archives for heat-health attribution, missing NDVI baseline for vegetation drought, absent LiDAR for coastal exposure — but the pattern is common, and it is the pattern that a small-island context makes especially acute. Consequently, the key results give particular weight to inter-institutional data governance and coherent, repository-based improvements that serve both MDC's own product-generation cycle and the follow-up CLIMAAX workflows that will build on this foundation. This cross-cutting theme runs through § 2.1, 3.2, 3.3 (cross-cutting enablers Table 3-4), § 4.2 (lessons learned) and § 5.2 (§ 5.2.1).

1.2 Project team

CLIMAAXKòrsou is led by the Meteorological Department Curaçao (MDC) with the Curaçao Climate Change Platform (CCCP) providing the multi-agency coordination context in which the results are integrated at national policy level. The project has been executed largely in-house by MDC, building lasting institutional capacity in climate risk analysis, spatial data engineering, and cross-agency coordination. All engaged institutional actors — including the ministries participating through CCCP, sectoral partners across health, water, financial supervision, spatial planning and tourism, and international partners including UNESCO on cultural-heritage and scientific tracks — are listed in § 2.3.

1.3 Outline of the document's structure

The deliverable is organised as follows:

§ 2 Local profile — risk-assessment recap, resilience-capacity assessment, policy context and implementation mechanisms, key actors and systems, and lessons from past events.

§ 3 Climate risk management — CRM objectives and indicators, supportive elements, prioritised CRM measures across the four hazards, and integration into planning and decision-making.

§ 4 Project Evaluation — usability of the results and reflection on lessons learned.

§ 5 Conclusions — main findings and challenges addressed.

§ 6 Progress evaluation — status of Key Performance Indicators and Milestones against the Individual Follow-up Plan.

§ 7 Supporting documentation — outputs produced during CLIMAAXKòrsou, openly published for reuse.

§ 8 References.

2 Local profile

This chapter sets the local ground on which the CRM measures in § 3 are built. § 2.1 summarises the priority climate risks quantified by CLIMAAXKòrsou and evaluates Curaçao's current resilience capacity to cope with them. § 2.2 describes the specific policy instruments through which the CLIMAAX results feed into national action. § 2.3 lists the actors and institutional systems that carry those results forward. § 2.4 draws the lessons already emerging from recent climate events on the island itself.

2.1 Summary of Key Risk Assessment results

The four priority climate risks addressed by CLIMAAXKòrsou — coastal flooding, pluvial flooding, heat stress, and drought — were selected at project inception on the basis of their relevance to Curaçao's SIDS context and were quantified at neighbourhood resolution using locally downscaled data. Each risk workflow produced a hazard layer (calibrated against MDC observations where possible), an exposure overlay against building footprints, and a risk-density metric combining hazard with population density. All four workflows are openly reproducible from published datasets.

Table 2-1 evaluates, for each priority risk, Curaçao's current resilience capacity — the ability to cope, adapt and transform in the face of the risk — using the four-level qualitative scale defined in the CLIMAAX Handbook. The classification reflects the *current* state of preparedness and institutional capacity, not the level of activity being invested in improving it: several of the "low" classifications correspond to areas where the CRM analysis has already built active coalitions or scoped active infrastructure programmes, which are treated in § 3.3. A recurring theme across all four hazards is that the principal gap is not conceptual but empirical — the fragmentation, incompleteness or coarse resolution of the underlying data, as framed in § 1.1.

Table 2-1 — Priority climate risks and resilience capacity for Curaçao

Priority climate risk	*Resilience capacity*	*Description of the resilience capacity (such as existing knowledge, planned measures, gaps)*	*Stakeholders, experts and priority groups involved in the key risk assessment & modality of engagement*
Coastal flooding	**Low**	Worst-case parcel exposure (SSP5-8.5, 2100) concentrated on the leeward coast around Willemstad — the UNESCO Historic Area of Willemstad, the Handelskade waterfront, Fort Amsterdam (seat of government), the Mega Pier and Mathey Wharf cruise terminals, and the Spaanse Water lagoon are all in the highest SLR-exposure zone. Adaptation constrained by heritage-preservation rules for Willemstad and by the 40–50-year lock-in horizon of cruise-terminal design decisions.	MDC, CBS, CBCS, Beleid + VVRP, Curaçao Ports Authority, Rif Mangrove Park operator, hospitality sector

Pluvial flooding	**Low**	3Di hydraulic baseline scaled by the Clausius–Clapeyron climate signal identifies worst-case building exposure at > 50 cm depth. Highest risk densities in Kustbaterij, Cabo Verde and Nooit Gedacht. Principal gap: DEM resolution (current 10 m limits street- and drainage-corridor detail). LiDAR-based DEM upgrade and IDF-curve refinement are the future-capability path that will feed finer-scale simulation with VVRP + developers.	MDC, Aqualectra, MEO, GMN, VVRP — Commissie Integraal Watermanagement; DRR for emergency response
Heat stress	**Low**	Calibrated 250 m air-temperature product (R^2=0.70 against 12 MDC stations, corrected for LST–air-temperature decoupling under wind-dominated conditions) combined with CMIP6 scenarios identifies the full population as crossing the hazard threshold under SSP5-8.5 2100. Highest exposure: Brievengat and downtown Willemstad. Multi-agency heat coalition forming (Kranshi civil-registry, CMC hospital, SVB social-insurance, GMN gezondheid public-health) — no operational heat-health surveillance system yet integrates the currently-siloed institutional data.	MDC, GMN gezondheid, Kranshi, CMC, SVB, Beleid
Drought (vegetation)	**Medium**	Precipitation decline of up to −31 % under high-emissions scenarios (SPI record + CMIP6 downscaling). Potable-water supply protected by desalination — substantial resilience on the human-consumption dimension. Low on the ecological dimension: no operational NDVI vegetation-drought baseline; brackish-habitat salinity increasing (Waaigat, Spaanse Water) but unmonitored; no integration between potable-water and ecological-water planning.	MDC, GMN, DCBD, Aqualectra

2.2 Key implementation mechanisms and policy context for CRM

The following policy instruments are the specific mechanisms into which the CLIMAAXKòrsou technical results feed:

- **Kaderbeleid Curaçao en klimaatverandering** (November 2025, concept — CCCP). Curaçao's national climate policy framework; six chapters plus four annexes covering the threat-category-vs-security-interest matrix (Bijlage I — populated by CLIMAAXKòrsou results, see § 3.4) and the ministerial-participation matrices for mitigation (Bijlage II) and adaptation (Bijlage III). Bijlage III assigns MDC together with DRR the specific action *"Identificatie risicogroepen op basis van realiteit/kans impact analyse"* — the CLIMAAXKòrsou output.
- **Curaçao Climate Change Platform (CCCP)** — coordinating body under which the Kaderbeleid is developed. Established via *landsbesluit* 21/2569 (2019, joint initiative of

MDC and the Curaçao National Commission for UNESCO), extended by *landsbesluit* 24/2179 (October 2024).

- **Zonaal Ontwikkelingsplan (ZOP)** — island spatial development plan. Entry point for the coastal-setback measure and the proposed green-ratio building-code instrument (§ 3.3).
- **Building code and land-clearing regulation** — *gap identified during the CRM analysis*: new construction and land-clearing are not currently required to preserve or replant a minimum green fraction. Introducing a green-ratio requirement is proposed as a Beleid instrument in § 3.3.
- **International frameworks — UNFCCC (Netherlands 1994) and Paris Agreement (Netherlands 2017).** Kaderbeleid Chapter V articulates co-financing opportunities and structural barriers (Curaçao's middle- or higher-income classification limits access to multilateral funds; see § 5.2 for SNIJ/SIDS advocacy).
- **UN Multi-Country Sustainable Development Cooperation Framework (MSDCF) 2027–2031.** UN-endorsed cooperation framework covering the three Dutch-Caribbean constituent countries of the Kingdom of the Netherlands. CLIMAAXKòrsou's outputs position MDC to contribute the Curaçao technical evidence layer to this framework's climate-adaptation programming.
- **CLIMAAX FSTP / EU level** — the methodological framework this project itself implements; the CLIMAAXKòrsou workflows are the CLIMAAX-standard hazard, exposure and vulnerability layers, openly published for reuse.

UN-system framing of Curaçao's development situation. The 2025 Annual Results Report on the Dutch Islands (§ 8) accompanies the MSDCF cooperation framework with an SDG-based mapping of Curaçao's bottlenecks and accelerators across four development dimensions. Under *Environmental Sustainability & Climate Resilience*, the named bottleneck is "high climate vulnerability, water scarcity, coral reef stress" and the accelerators are "renewable energy, marine protection, climate finance". Under *Institutional Capacity & Partnership*, the bottleneck is "implementation gaps and financing constraint" and the accelerators are "integrated planning, data governance, blended finance". These are the UN system's own identification of the levers on which Curaçao's development progress depends, and they align closely with the CRM instruments this deliverable identifies as key results (§ 5.2 § 5.2.1 (data governance), § 5.2.3 (green-ratio building instrument) and § 5.2.5 (SNIJ / SIDS-equivalent climate-finance access)). The corresponding 2025 fiscal reality is stark: the same report records that of a total USD 466,107 allocated to the four priority areas for Curaçao, only USD 8,675 — 1.9 % — was directed to *resilience to climate-change shocks and sustainable natural-resource management* (Aruba allocated 0.8 % of a larger envelope; Sint Maarten allocated 0.2 %). The strategic plan is present; the current resourcing is not — the practical case that recurs in § 3.2 (Finances) and as § 5.2.5.

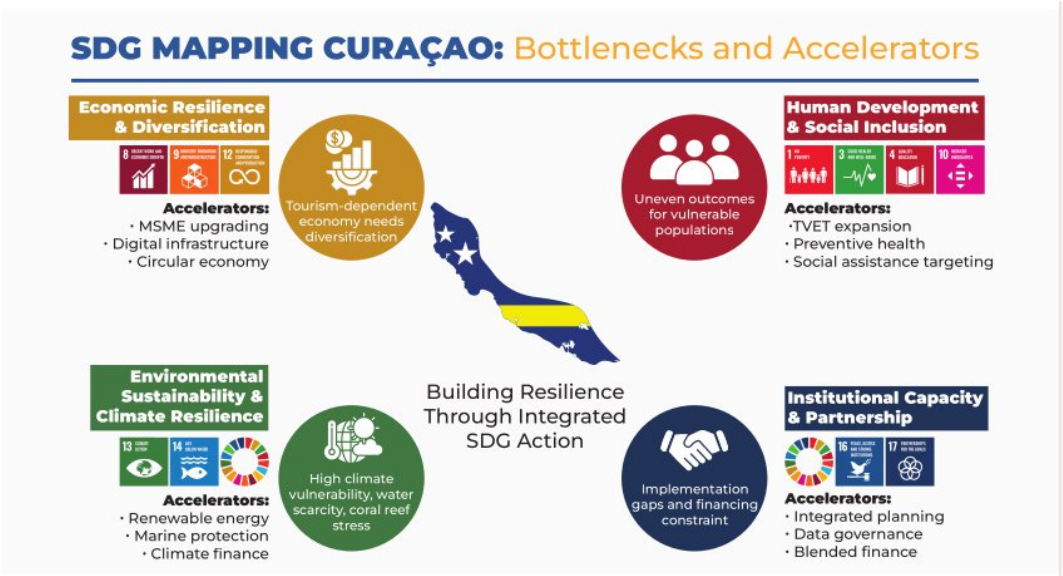


Figure 2-1 — UN Annual Results Report 2025: SDG bottlenecks and accelerators for Curacao.

UN system mapping of Curacao's development situation accross four dimensions (Economic Diversification & Competitiveness; Environmental Sustainability & Climate Resilience; Institutional Capacity & Partnership; Social Inclusion & Human Development).

2.3 Key actors and systems for CRM

The actors and systems that carry the CLIMAAXKòrsou results into national CRM span five broad groups: *national-government mandates* (ministries and public bodies with a direct policy, data or operational role — VVRP, and specifically its spatial-planning-policy directorate Beleid that drafts and revises the *Zonaal Ontwikkelingsplan* (ZOP), together with GMN, MEO, DRR, CINEX (Curaçao Investment & Export Promotion Agency) and others); *data and analytical partners* (agencies whose information is needed to complete the exposure–vulnerability picture — CBS, Kranshi, CMC, SVB, Kadaster, DCBD); *sectoral and market actors* (Aqualectra, CBCS, Ennia and other insurance actors, Vidanova Bank and other financial-sector actors, the Curaçao Tourism Board and the wider tourism sector, the Curaçao Ports Authority, the Rif Mangrove Park operator); *NGOs and civil-society organisations* (Amigu di Tera, EcoVision, Fundashon Nos Grandinan, CARMABI, the Dutch Caribbean Nature Alliance (DCNA), Uniek Curaçao); and *international partners* (UNESCO on cultural-heritage and scientific tracks, IOC of which Curaçao is a member, NDC-NL, and Bonaire as an active regional-capacity-transfer counterpart). The Curaçao Climate Change Platform (CCCP) is the multi-agency coordinating body under which most of these actors are convened; the recurring CCCP platform sessions across the project cycle engaged over 35 organisations across all sectors.

Table 2-2 — Key actors and systems for CRM summary

Key actors	*Role and responsibility*	*Motivation and needs*	*Opportunities related to their active involvement in CRM*	*Barriers related to their active involvement in CRM*	*Type of engagement*
MDC	Producer of hazard and climate change evidence; national meteorological authority; CCCP lead	Warning and climate-services mandate; scientific credibility; represents Curaçao at WMO, IOC/UENSCO	Hosts Climate Impact Atlas; NDC-NL workgroup team; IOCARIBE / UN, WMO HPC chair role	Limited staff time	Lead — all phases; briefing lead across H1 2026
Beleid (VVRP)	Spatial-planning-policy directorate within VVRP; drafts and revises the ZOP, building code and land-clearing regulations	Integrate climate risk in ZOP; introduce coastal-setback rule and green-ratio requirement	Multiple bilateral consultations across H1 2026; joint Governor briefing (21 January 2026); ZOP revision cycle	—	Consultation; co-briefer at head-of-state level
VVRP	Infrastructure and urban-planning policy; developer requirements	Ensure future development is climate-adapted	Consumer of CLIMAAXKòrsou flood-scenario outputs to define design requirements	Coordination across sectoral mandates	Bilateral consultation
CBS	Statistical authority; census-based exposure and vulnerability data	Add spatial value to census through integration	Data-sharing MoU discussion (2026-07-06)	Data confidentiality; aggregation thresholds	Bilateral consultation
Kranshi	Population records	Enable heat-impact population studies	Formal data-sharing for heat coalition	Legal / privacy frameworks around registry data	Bilateral consultation at senior-institution level
CMC	Main hospital; admissions and clinical outcome data	Understand and reduce heat-related morbidity	Data-sharing on hospital admissions during heat episodes	Data confidentiality; workflow integration	Bilateral consultation
SVB	Social-insurance	Understand and reduce heat-	Data-sharing on mortality	Data confidentiality;	Bilateral

	authority; mortality records	attributable mortality	records for the heat coalition	attribution methodology	consultation
GMN	Public-health mandate on climate impacts	Stake in heat, drought-health, water safety	Heat coalition coordination; vegetation / drought health links	—	Bilateral consultation / commission member
CBCS	Financial-sector regulation; supervision of banking and insurance exposure	Portfolio-level climate risk; understanding pluvial-flooding financial-sector exposure via mortgage / collateral risk	Board / Climate Workgroup briefing; joint pluvial-flood risk-density work for supervised institutions	Alignment of scenario horizons with supervisory reporting cycles	Board briefing + active bilateral technical collaboration
Aqualectra	Potable water supply (desalination); drainage	Sustain supply under drought; reduce pluvial flood impact	Commissie Integraal Watermanagement; joint scenario simulation	—	Workshop / commission member
MEO	Sectoral mandate for business, industry, energy and state-utility infrastructure; oversight of Aqualectra	Ensure economic development on the island incorporates climate risk in energy + infrastructure planning	Commissie Integraal Watermanagement member; coordination partner on the pluvial-flood scenario programme	Alignment of sectoral development plans with climate scenarios	Commission member; sectoral consultation
DRR	Disaster-response and emergency-management authority; on-the-ground response to floods, extreme rainfall, coastal inundation	Pre-configure response protocols for the recurring extreme events projected by CLIMAAXKòrsou; integrate MDC hazard products into operational readiness	Overnight / off-hours emergency-response protocols (Banda Abou 2024 lesson); integration of CLIMAAXKòrsou flood-risk products into disaster-response planning	Resourcing + rehearsal capacity for community-level response	Bilateral coordination; joint operational planning with MDC
GMN	Environmental protection; ecosystem management	Sustain vegetation + biodiversity under drought	NDVI monitoring pilot; drought impact on brackish habitats	—	Commission member
DCBD	Biodiversity and ecosystem data custodian	Track ecosystem impact of climate change	NDVI × biodiversity correlation studies	—	Data provider

CCCP Platform	Multi-sector climate coordination body	Align actions across agencies	Ongoing multi-agency coordination for the Kaderbeleid roll-out	Continued CCCP institutional continuity and mandate clarity	Standing member
UNESCO	Cultural-heritage + scientific-cooperation partner on two tracks (Commissie is CCCP member; WH Centre oversees Historic Area of Willemstad, 1997)	Preserve WH integrity of Historic Willemstad under climate change; strengthen scientific cooperation	Heritage-compatible adaptation for Historic Willemstad; peer-learning with other UNESCO coastal-heritage sites	Coordination across UNESCO substructures	Institutional partnership
IOC	International body coordinating ocean science; Curaçao is a member; MDC contributes national ocean-observation and climate-service expertise	Bring Curaçao's regional Caribbean expertise into the IOC agenda; participate in Ocean Decade-adjacent initiatives	MDC contributes regional climate-observation, calibrated hazard products, small-island adaptation practice	Alignment of national scheduling with international IOC processes	Direct membership; expertise contribution
Bonaire (BES) public entity	Meteorological and public-health authorities; regional partner receiving MDC heat-methodology transfer in 2026	Establish local heat-risk analysis capability; reduce cross-island health-system dependence (patients airlifted to Curaçao for heat treatment)	Active partnership 2026 — transfer of calibrated heat methodology + heat-coalition experience	Institutional coordination across BES / Curaçao sovereignty boundary; data availability on Bonaire	Regional capacity-transfer partnership
NDC-NL	Kingdom-of-the-Netherlands Ocean Decade coordination body	Contribute Kingdom-level results to UN Ocean Decade; connect Dutch Caribbean adaptation work to Dutch and international ocean-science networks	CLIMAAXKòrsou material aligns with the five NDC-NL-selected Decade Challenges; SDG 14 alignment	Workgroup activities + funding still being consolidated	Workgroup-team membership
Kadaster	Cadastral records office; parcel-level property data	— (commercial provider)	Procurement of specific datasets if a future analysis	Cost	None active; procurement as-

	as a paid third-party product		requires parcel-level detail beyond the Microsoft building footprints used		needed
Tourism sector	Dominant economic sector; coastal + inland asset owners; employer base	Sustain tourism competitiveness under a changing climate; protect assets from SLR / storm surge; retain destination attractiveness under increasing heat	Consumer of coastal, heat and drought risk maps; adaptation co-investor in urban greening, coastal buffers, cooling	Fragmented ownership; short investment horizons; competitive concerns about publicising destination-level climate risk	Climate Impact Atlas communication; bilateral with CTB / trade bodies
Curaçao Ports Authority	Operator of Mega Pier and Mathey Wharf; cruise-terminal steward under VVRP oversight	Align 40–50-year cruise-infrastructure investment horizon with mid-century SLR + storm-surge scenarios	Design-stage integration of climate scenarios; coordination with cruise-line partners on route resilience	Long lock-in horizons; coordination with international operators	Bilateral consultation; scenario-simulation programme
UNESCO liaison	Coordination with UNESCO + national heritage authority on the WH inscription and its climate-related risks	Preserve UNESCO inscription under climate change; participate in UNESCO climate action programme for WH properties	Consumer of coastal-flood risk maps for the historic districts; partner in heritage-compatible adaptation	Heritage-preservation rules limit modification of protected fabric	Bilateral engagement; UNESCO climate action programme access
Rif Mangrove Park (Otrobanda)	Operator of the island's inward-city mangrove reserve	Sustain and expand nature-based coastal buffer that serves as biodiversity nursery + tourism amenity	On-island example for nature-based coastal protection (Figure 3-3); template for expansion elsewhere	Land availability for expansion; ecological establishment timelines	Partnership candidate
NGOs and civil-society organisations	Ground-level community priorities; environmental stewardship; vulnerable-group advocacy; heritage-value protection	Ensure climate-adaptation strategies reflect community priorities; contribute local knowledge, awareness-raising, volunteer capacity	Community-facing Atlas dissemination; CRM measure prioritisation input; heat-vulnerability outreach; ecosystem stewardship	Volunteer-based capacity; funding uncertainty for sustained engagement	Sustained engagement through the CCCP platform sessions

2.4 Lessons learned from past events

Several recent events on Curaçao demonstrate that climate risks framed as *future projections* in international assessments are already present-day realities on the island. The events described below are drawn from MDC observations, Deltares hydrological modelling, and FEWS documentation.

Record annual temperature — 2024 as a preview of 2050. Average temperature at the Curaçao Airport station reached 29.1 °C in 2024 — a +1.02 °C anomaly relative to the 1993–2020 reference period, the highest in the observation record. Set against MDC's regional temperature projections (calibrated against local observations, consistent with the WorldBank and KNMI ensembles: SSP1-2.6 +0.6 °C, SSP3-7.0 +2.4 °C, SSP5-8.5 +3.2 °C by 2100 relative to the 2015–2024 reference), the 2024 annual temperature is roughly consistent with the projected 2050 average under the SSP2-4.5 moderate-emissions scenario — meaning even under a middle-of-the-road mitigation trajectory that broadly aligns with current global-policy commitments, mid-century conditions on Curaçao would resemble 2024's record year. Under the higher-emissions scenarios the 2050 mid-century average is projected to *exceed* the 2024 level. The Curaçao public was already exposed in 2024 to conditions that are projected to become the *new normal* within a generation.

Lesson: 2024 is not a statistical outlier but a natural experiment on how Curaçao's population, animals, vegetation and infrastructure respond to conditions expected to be routine by mid-century. The incidents, medical admissions, mortality, vegetation stress and ecosystem effects observed during that year form a natural baseline that the heat coalition (Kranshi + CMC + SVB + GMN gezondheid) is now assembling. The CLIMAAXKòrsou calibrated heat product is the operational analysis layer needed to interpret conditions that have already been observed and are on track to recur.

Extreme rainfall event — Banda Abou, 4 May 2024. MDC observation stations in the Banda Abou region directly measured approximately 313.8 mm of rainfall in about three hours in the early morning of 4 May 2024 — an event whose intensity corresponds to an estimated return period on the order of 1-in-100 years for Curaçao under the current climate. Although a weather warning was issued, the event unfolded overnight when most of the population in the affected area was asleep, and the effective response window on the ground was correspondingly narrow. The result was significant flash-flood damage across the affected neighbourhoods (Figure 2-2).



Figure 2-2 — Banda Abou extreme-rainfall event, 4 May 2024.

Photograph of flash flood inundation in Soto during the event. Event occurred around 05:50 local time (09:50 UTC), an intense convective precipitation cell over the western part of Curacao delivering about 313.8 mm/3 hour.

Lesson: two intersecting gaps became visible during the event. First, the current drainage infrastructure was not sized to absorb rainfall of this intensity over such a short duration — flash-flood events at this level exceed the design assumptions embedded in existing systems. Second, an early-warning system is only as effective as the real-world response conditions allow: a warning received in the middle of the night has intrinsically limited practical effect without pre-configured emergency-management protocols. The CRM analysis sets up the pluvial-flood framework to consume higher-resolution DEM data (LiDAR-based) as it becomes available, so that scenario simulations with VVRP can inform design requirements for future urban development. A key implication of the projections is that events like this one are not expected to become more extreme in intensity, but to occur more frequently — meaning Curaçao's spatial planning, drainage design and overnight emergency-response protocols all need to be sized for a *recurring* rather than *exceptional* occurrence.

Coastal inundation — Willemstad (Waaigat, 17 November 2024) — a preview, not yet an SLR event. A high tide combined with elevated water levels — an unfavourable phase of the tidal cycle rather than sea-level rise itself — produced coastal inundation at the Waaigat in Willemstad in the absence of a named storm. The event was recorded at the Bullen Bay tide-gauge station and photographed at the waterfront (Figure 2-3); the imagery has been used by MDC in high-level briefings to government (including the 21 January 2026 Governor briefing and the 27 February 2026 Staten Werkgroep visit) as a concrete illustration of what recurring SLR conditions will look like at this location. The affected area sits within the UNESCO-inscribed Historic Area of Willemstad, overlaps the cruise-terminal footprint, and includes Fort Amsterdam (Forti), which houses the seat of government.

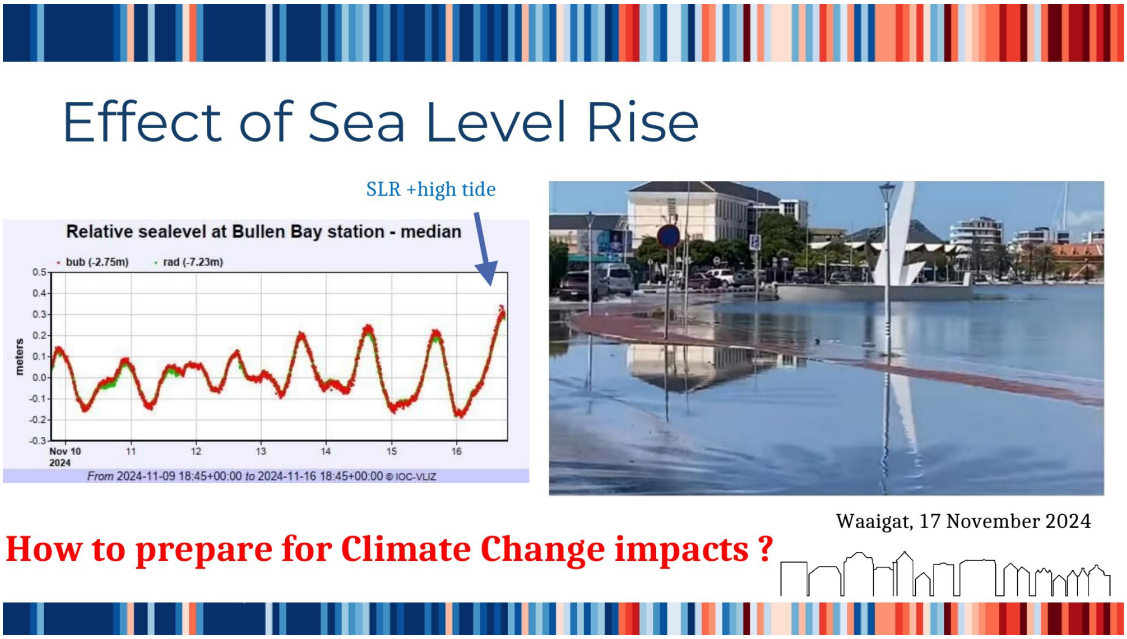


Figure 2-3 – Waaigat, Willemstad 17 November 2024.

MDC presentation slide combining the Bullen Bay tide gauge trace showing the high tide peak and the waterfront photograph of the resulting inundation. Reproduced from the CCCP presentation used by Dr. Albert Martis in the series of H1 2026 high level brievings to government.

Lesson: what happened at the Waaigat on 17 November 2024 was not a sea-level-rise event; it was an unfavourable-tide event on top of already-elevated water levels. Its significance is as a *preview* of the conditions that recurring SLR will bring on top of ordinary tidal cycles. Under future SLR, similar water levels will occur more frequently and last longer, with three cascading consequences that all land in the same physical footprint: tourism impact (cruise-terminal quays and heritage-tourism district lose accessibility during inundation windows); business impact (Punda / Otrobanda commercial districts become intermittently inaccessible); and government-continuity impact (Fort Amsterdam sits directly in the exposure zone).

Coastal impact — Spaanse Water lagoon (SE coast). Documented sea-level-rise impact on the Spaanse Water lagoon, affecting low-lying residential development, yacht infrastructure and shoreline habitats.

Lesson: site-specific SLR impacts are already visible on Curaçao's semi-enclosed coastal systems, not only on the open coastline. Options such as a controlled water-management structure (dam / regulated inlet) at Spaanse Water are among the range of engineered measures that could be evaluated — reinforcing that CRM planning must move from island-average projections to site-specific adaptation design (see § 3.3).

Cross-cutting lessons

- **Data-sparse damage recording.** For each event above, a systematic and quantified record of damage — parcels affected, economic loss, medical impact — is not consistently captured. This limits what past events can teach us and blocks trend detection.

- **Fragmented institutional response.** Historically, response to hazard events has been distributed across ministries without a single coordinating body. The Curaçao Climate Change Platform (CCCP) was established to address exactly this fragmentation.
- **Reactive posture.** Historic response has been event-triggered rather than anticipatory. The CRM measures (LiDAR-DEM scenario programme with VVRP, heat coalition study, Climate Impact Atlas) collectively aim to shift the island toward a proactive posture: identify the exposure before the event, communicate to the responsible actors, and build in adaptation at the design stage rather than after the loss.

3 Climate risk management

3.1 CRM objectives

The CRM objectives elaborated here address the four priority climate risks quantified by CLIMAAXKòrsou (coastal flood, pluvial flood, heat stress, drought) and are consistent with the national *Kaderbeleid Curaçao en klimaatverandering* framework (§ 2.2), which sets the four national *doelstellingen* for Curaçao's climate response and structures adaptation planning around three already-observable consequences (heat, extreme rainfall, sea-level rise) — the same drivers behind the CLIMAAXKòrsou hazard modelling.

Table 3-3 — Primary objectives table

Primary objectives	*Examples of assessment indicators*
Decrease coastal flood risk to homes and critical infrastructure	Parcels exposed to > 25 cm SLR flooding; km of protected shoreline
Reduce pluvial flood impact in urban centres	Buildings > 50 cm flood depth (worst case); population in high-risk neighbourhoods
Protect population from heat-related health impacts	Heat-related hospitalisations; population-hours >32°C air temp
Sustain vegetation cover under drought	NDVI trend (annual); precipitation deviation from 1993-2025 baseline

Table 3-4 — Secondary objectives table

Additional objectives	*Examples of assessment indicators*
Public health	Decrease in heat-related hospitalisations
Environmental quality	NDVI stability; protected watershed area (km²)
Justice and equity	Vulnerable groups explicitly considered in prioritisation
Institutional capacity	Trained staff across CCCP member agencies
Public awareness	Curated climate-change, impact and hazard assessments published on the MDC Climate Impact Atlas; breadth of hazards and sectors covered; downstream use by ministries,

	researchers and Caribbean sister services
Sustain tourism competitiveness under climate change	Destination climate-comfort index; heat-adjusted visitor experience metrics; tourism-sector adaptation investment (USD/year); share of tourism assets in climate-resilient locations
Economic resilience of climate-exposed sectors	GDP-share of tourism, water and coastal-development activities under climate scenarios; insurance penetration in coastal properties

Justice and equity dimensions. The CRM objectives explicitly consider vulnerable groups whose exposure and adaptive capacity differ from the island-average picture: *elderly and low-income residents* concentrated in the highest-heat neighbourhoods (Brievengat, downtown Willemstad) — protected under the heat coalition and cooling-centre measures; *outdoor workers* exposed to sustained heat episodes — protected under the occupational heat-safety guidelines; *heritage-adjacent communities* in the UNESCO Historic Area of Willemstad — protected under the heritage-compatible adaptation measures; *heat-affected patients on Bonaire* currently airlifted to Curaçao for treatment — addressed through the regional-capacity partnership. Vulnerability is also *intergenerational*: coastal-heritage and cultural-landscape losses are irreversible on any human planning horizon, and the objectives internalise that time dimension via long-timeline adaptation categories.

3.2 Supportive elements for effective CRM

Effective Climate Risk Management is not a single instrument but a system of enabling conditions that need to be in place together — knowledge and data to characterise the risk, technology and infrastructure to observe and respond, social awareness that translates awareness into behaviour, citizen engagement that gives adaptation legitimacy, financial resources to sustain action, and governance to coordinate the whole.

Curaçao's position across the six dimensions is uneven, and honestly so: several dimensions are strong (knowledge/data at MDC, governance under the CCCP, social awareness of coastal and rainfall risk born of lived experience), several are in active build (citizen engagement through the Climate Impact Atlas, technology for integrated early warning), and one is a structural gap rather than a shortfall — inter-institutional data governance, which surfaces in every cross-agency partnership and is the single most persistent limitation identified across the deliverable (§ 1.1, § 2.1, § 4.2, § 5.2.1). Table 3-5 summarises each dimension with its current state and known constraints; the CRM measures in § 3.3 respond directly to the gaps identified here.

Table 3-5 — Supportive elements for effective CRM

Supportive elements for effective CRM	*Description*
Knowledge and data	Strong — MDC hazard models plus open datasets; residual gaps in LiDAR DEM, sub-hourly rainfall, health impact surveillance and climate services
Tech and infrastructure	Strong operationally — MDC observation network and early-warning function; Climate Impact Atlas in active build
Social-behavioural	Baseline high for coastal + rainfall risk, lower for heat; active work through NGO partnerships to translate general hazard framing into neighbourhood-actionable communication
Citizen engagement	Currently limited to broadcast media; Climate Impact Atlas is the first public-facing entry point; forward goal is a citizen observation database complementing the outward flow
Finances & resources	CLIMAAX FSTP sub-grant funded the technical work; long-term CRM financing not yet secured; SNIJ / SIDS-equivalent recognition is the strategic instrument for opening multilateral channels
Governance & political leadership	Two-layer — MDC on technical evidence; CCCP on multi-agency coordination; Beleid on policy mandate; Kaderbeleid as framework document. Structural gap: no shared inter-institutional data governance yet

Knowledge and data. MDC hazard models, five openly published datasets (DOIs), CBS 2023 census, MS buildings, DCBD, CMIP6. Residual gaps are LiDAR DEM, sub-hourly rainfall, and health surveillance data — each is a future data-availability item, resolvable as those data sources mature.

Tech and infrastructure. MDC operates a national observation network (weather stations and C-band radar) and provides the operational early-warning function on Curaçao as part of its core meteorological mandate. In parallel with the CRM technical work, the Climate Impact Atlas is being prepared for public deployment as the visible entry point to the CLIMAAXKòrsou hazard products, and MDC is developing AI-based weather-projection models to strengthen the medium-range forecast component of the early-warning capability. As higher-resolution LiDAR-based elevation data becomes available, it will feed newer flood maps, better pluvial-flood analysis and finer-scale downscaling of the CLIMAAXKòrsou workflows — the technical pipeline is designed to consume this data as soon as it lands.

Social-behavioural. Baseline: public awareness of coastal and rainfall risk is high on the basis of lived experience; trust in MDC is anchored in the daily weather service; heat risk is less well recognised. Ongoing work: MDC is partnering with NGOs and civil-society organisations and directly with the public to develop multiple communication lines that keep the climate-change signal visible — community events, targeted presentations, and reminders framed around the specific effects of recent past events. The novel step this CRM work introduces is translating the general hazard framing into actionable items — moving from “climate change means warmer /

wetter / drier" to "*this* specific weather situation is likely to affect *this* neighbourhood in *this* way, and here is the recommended action" — combining the CLIMAAXKòrsou hazard products, the CBS-neighbourhood exposure overlay and the operational meteorological service into a form the community can act on.

Citizen engagement. Baseline: currently limited to broadcast media outreach. The Climate Impact Atlas is being introduced as the first public-facing engagement entry point. The forward goal is to develop an event-based citizen observation database in which the public contributes reports of observed weather phenomena and their local effects — flooded street corners, coastal-inundation photographs, timing of unusual events, damage descriptions — that MDC can then correlate to the hazard categories in the CLIMAAXKòrsou workflows. This creates a citizen-science inflow complement to the outward-communication flow: the public feeds observations in, MDC returns actionable neighbourhood-specific advice out. The database is particularly valuable for hazards where individual-scale impact is difficult to capture through station or model data alone — sea-level rise and pluvial flooding are the priority targets, where a photograph of Waaigat inundation or a Soto flash-flood observation carries information the station network cannot record on its own.

Finances & resources. The CLIMAAX FSTP sub-grant has funded the technical work across the whole project cycle, producing the reproducible workflows, the locally-downscaled risk products, and the deliverable reports on which the CRM framing rests. Long-term CRM funding beyond the CLIMAAX FSTP cycle has not yet been secured. The Kaderbeleid Chapter V (Financiering) frames the challenge along the same distinction used in this project: mitigation — dominated by the energy transition and increasingly financeable at declining costs as green-energy technology matures — vs. adaptation — which typically has the character of a public good, is resistant to private financing due to the associated externalities, and therefore depends on public sources. Combined with Curaçao's current classification as a middle- or higher-income country within the Kingdom of the Netherlands — which limits access to multilateral climate financing (Green Climate Fund and similar) — the practical implication is that sustained CRM financing must come from a combination of Kingdom-level cooperation with the Netherlands and structured engagement with multilateral partners. The 1.9 % priority-resource allocation to climate resilience in Curaçao's 2025 UN reporting (§ 2.2) is the concrete fiscal-reality anchor for this landscape.

Curaçao's alignment with the *Subnational Island Jurisdictions* (SNIJ) movement — advocating for recognition of non-sovereign small islands as SIDS-equivalent for climate-financing purposes — is the strategic instrument for opening the multilateral channel. The UN system already frames the three Dutch-Caribbean constituent countries (Aruba, Curaçao, Sint Maarten) as *small island developing states coping with rapid economic, climate and structural change*, with elevated public debt across the Caribbean SIDS constraining fiscal space for climate resilience investment (UN 2025 Annual Results Report — Dutch Islands). This framing supports the SNIJ / SIDS-equivalent recognition case: the analytical treatment of Dutch-Caribbean countries as SIDS is already present in UN-system reporting; the remaining step is to align climate-financing access rules with that analytical treatment. The May 2024 advisory opinion of the *International Tribunal for the Law of the Sea* (ITLOS) — confirming a binding international-law obligation on major greenhouse-gas emitters to protect small island states from catastrophic damage — reinforces the moral and legal basis for that alignment, and the CLIMAAXKòrsou evidence base gives it a concrete Curaçao dimension. The CRM implication surfaces later as § 5.2.5.

Governance & political leadership. The governance architecture around CLIMAAXKòrsou operates on two complementary layers. MDC leads on the technical evidence base — the CLIMAAXKòrsou hazard, exposure and vulnerability products for the four natural hazards evaluated, and their dissemination via the Climate Impact Atlas. Multi-agency dissemination and coordination is anchored in the Curaçao Climate Change Platform (CCCP), in which MDC is the technical lead and through which the risk-map information reaches the ministries and public bodies represented in the actor table. In parallel, Beleid — the spatial-planning-policy directorate within VVRP that drafts and revises the ZOP — carries the policy mandate, and the national *Kaderbeleid Curaçao en klimaatverandering* provides the framework document that structures how the two layers connect — how the technical results are translated into implementation of adaptation and mitigation strategies. The concrete adaptation and mitigation strategies themselves remain to be developed within this framework, and their development is the ongoing programme that CLIMAAXKòrsou contributes to at the technical evidence layer. **Structural gap at the operational level:** no shared inter-institutional data governance framework yet exists to make data exchange between agencies routine rather than bespoke — this is the recurring blocker across all cross-agency partnerships and the subject of § 5.2.1.

3.3 Potential CRM measures

Figure 3-4 opens the CRM discussion with a single-canvas view of how climate risk falls across Curaçao at neighbourhood level. Each dot is one neighbourhood, coloured by the hazard that dominates its risk profile and sized by the magnitude of that dominant risk. Willemstad and its urban surroundings show the dense mixed-hazard cluster where CRM has to work across multiple sectors at once; the rural half of the island is dominated by pluvial and drought concerns at lower magnitudes.

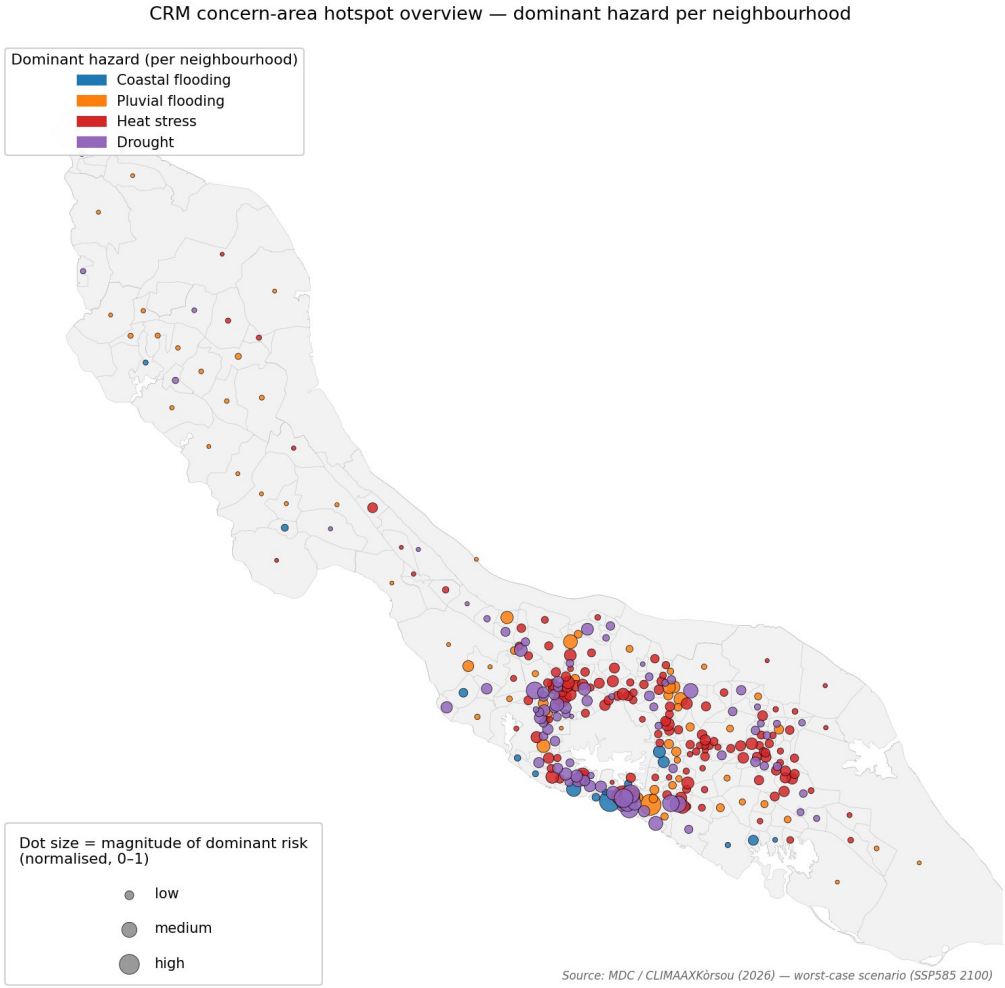


Figure 3-4 — CRM concern area hotspot overview: dominant hazard per neighbourhood

The CRM measures below emerged from the CLIMAAXKòrsou risk analysis carried into stakeholder engagement through CCCP platform sessions and bilateral consultations. Each measure has a named responsible organisation, an assessed effectiveness level, a contribution to the CRM objectives (§ 3.1), expected co-benefits, a timeline horizon (short S ≤ 2 yr, medium M ≈ 2–5 yr, long L > 5 yr) and known adaptation limits. Cross-cutting enablers deliver benefits across multiple hazards. On-island examples of coastal-buffer measures are shown in Figure 3-5 below the table.

Table 3-6 — Main CRM analysis results

Key climate risk	*CRM measure*	*Effectiveness / Risk reduction*	*Contribution to CRM objectives*	*Possible co-benefits*	*Timeline*	*Responsible organisation*	*Possible adaptation limits*
Coastal flood	UNESCO Historic Willemstad heritage-compatible adaptation	H	Protects cultural + tourism-brand foundation	UNESCO status; heritage revenue	M–L	Beleid + heritage authority + UNESCO + MDC + CTB	Heritage rules constrain modification
Coastal flood	Cruise-terminal climate-scenario redesign	H	SLR-proof Mega Pier + Mathey Wharf	Cruise revenue; post-ISLA pivot	M	CPA + VVRP + Beleid + CTB	Long investment cycle
Coastal flood	Nature-based coastal buffers (Rif Mangrove Park example, Fig 3-3)	M–H	Storm-surge and SLR attenuation	Biodiversity; tourism amenity; carbon sequestration	M–L	Rif operator + Beleid + GMN	Site suitability limited
Coastal flood	Engineered wave-breakers (Willemstad Zuid example, Fig 3-3)	M	Wave-energy attenuation at shoreline	Beach amenity; sediment stability	M	Public works + Beleid + hospitality	Design must update for SLR
Coastal flood	Coastal setback zone in ZOP revision	M	Reduces future parcel SLR exposure	Ecosystem + shoreline access	M	Beleid + MDC	Existing development not relocatable
Coastal flood	Spaanse Water lagoon water-management structure	M–H	Controls lagoon water level under SLR	Ecosystem services; marine tourism	M–L	Beleid + public works + GMN	Env permitting; salinity dynamics
Pluvial flood	Higher-resolution DEM scenario simulation programme	H	LiDAR-based design requirements for VVRP	Reduces future retrofit cost	S–M	MDC + VVRP + developers	LiDAR data completeness
Pluvial	Extreme rainfall early	H	MDC network +	Addresses Banda Abou	S	MDC + DRR + Beleid	Depends on public

flood	warning + overnight response protocols		DRR protocols	2024 lesson			uptake
Pluvial flood	Storm-drain capacity upgrade programme	H	Reduces flood duration and peak depth	Everyday drainage; mosquito control	S–M	Aqualectra + public works + VVRP	Funding + disruptive construction
Heat stress	Independent MDC heat-impact study (Kranshi + CMC + SVB)	H	Unlocks heat mortality/morbidity evidence	Enables downstream heat measures	S–M	MDC + GMN gezondheid + Kranshi + CMC + SVB	Data-sharing framework needed
Heat stress	Regional heat-capacity partnership with Bonaire (BES)	H	Transfer of MDC heat methodology	Reduces cross-island health burden	S–M (active 2026)	MDC + Bonaire BES + regional health	Sovereignty boundary; data availability
Heat stress	Heat-health surveillance link with CMC	H	Ongoing evidence base	Feeds risk-update cycles	S	CMC + MDC + GMN gezondheid	Data-sharing framework needed
Heat stress	Cooling centres during projected heat events	H	Reduces heat-mortality risk (elderly, vulnerable)	Uses existing infrastructure	S	Beleid + CMC + GMN gezondheid	Acute events only
Heat stress	Occupational heat-safety guidelines for outdoor workers	H	Worker protection during heat episodes	Employment / insurance alignment	S	Ministry of Labour + employers + SVB	Informal-sector compliance
Heat stress	Urban tree canopy targets in high-heat neighbourhoods (Brievengat, downtown)	M	Local cooling + amenity	Air quality; biodiversity; walkability	M	Beleid + GMN	Drought stress on new trees
Drought	Vegetation drought monitoring — NDVI × SPI correlation study	M	Establishes vegetation baseline + correlation	Multi-purpose ecosystem data	S	MDC + GMN + DCBD	NDVI archive quality

Drought	Brackish-water salinity monitoring under drought	M	Ecological drought resilience	Ecosystem services; biodiversity	M	GMN + DCBD + MDC	Instrumentation not in place
Drought	Rainwater harvesting incentives (households + hospitality)	M	Distributed water resilience	Stormwater runoff reduction	S–M	Beleid + Aqualectra + hospitality	Storage-tank cost
Cross-cutting	Curaçao data commons — inter-institutional data governance framework (§ 5.2.1)	H	Removes per-bilateral negotiation cost	Cross-sector data flows; strengthens all sectoral partnerships	M	MDC + CBS + Kranshi + CMC + SVB + Kadaster + DCBD + Aqualectra + Beleid + VVRP + CCCP	Legal harmonisation; governance ownership
Cross-cutting	Communication of climate-risk results to tourism sector (§ 5.2.2)	H	Tourism as adaptation partner	Protects dominant economic sector	S	MDC + CTB + Beleid + hospitality trade bodies + UNESCO liaison + CPA	Competitive concerns
Cross-cutting	Green-ratio requirement in building code + land-clearing regulation (§ 5.2.3)	H	Cross-hazard design instrument for all new construction	Cooling + infiltration + biodiversity + destination attractiveness	M	Beleid + VVRP + building-code office	Enforcement capacity
Cross-cutting	Climate Impact Atlas on MDC website (closes KPI K4)	H	Public + stakeholder access to risk maps	Transparency; educational value	S (Q3 2026)	MDC	Sustained maintenance
Cross-cutting	CRM concern-area GIS layer — Atlas feature	M–H	GIS overlay of concern areas per hazard	Neighbourhood-level actionable	S–M	MDC + CCCP + sectoral counterparts	Lightweight versioning workflow
Cross-cutting	Integration with CCCP action agenda	H	Aligns products with CCCP planning cycle	Reduces cross-agency coordination cost	S	CCCP + MDC + Beleid	CCCP institutional continuity



Figure 3-5 – On island examples of coastal buffer measures brought forward through stakeholder engagement

Structural, non-structural, nature-based and governance categories

The measures in Table 3-6 span the categories the CLIMAAX Handbook classification asks for: **structural** (Spaanse Water lagoon structure; engineered wave-breakers; storm-drain upgrade; cruise-terminal redesign; cooling centres); **nature-based** (Rif Mangrove Park model buffers; urban tree canopy); **non-structural / governance** (Curaçao data commons; ZOP coastal setback; green-ratio building instrument; heat-health surveillance link; extreme-rainfall early-warning protocols; heat-coalition study; UNESCO climate action programme engagement; Bonaire regional partnership; CCCP integration; Climate Impact Atlas + CRM concern-area GIS layer).

Equity and justice implications of the measures

The measures explicitly consider vulnerable groups: heat coalition + cooling-centre measures protect elderly and low-income populations concentrated in Brievengat and downtown Willemstad; occupational heat-safety guidelines protect outdoor workers; UNESCO Historic Willemstad heritage-compatible adaptation preserves cultural value shared across all Curaçaoans and across generations. The regional-capacity partnership with Bonaire addresses a cross-island health-system inequity (Bonaire heat-affected patients airlifted to Curaçao) through capability transfer rather than one-way service dependence. Green-ratio building requirements internalise cooling and infiltration as *design-stage entitlements* rather than optional retrofits — closing the gap between properties whose owners can afford post-hoc adaptation and those who cannot.

Mainstreamed investments — adaptation integrated into ordinary construction and infrastructure decisions

Two of the highest-effectiveness measures are mainstreamed into ordinary investment decisions rather than requiring standalone adaptation projects: (i) the **cruise-terminal climate-scenario redesign** integrates SLR scenarios into the ongoing 40–50-year Mega Pier / Mathey Wharf investment cycle; (ii) the **green-ratio requirement in the building code** (§ 5.2.3) embeds climate adaptation as a design requirement in every new construction and land-clearing decision. Both deliver climate-adaptation as a by-product of investments that would happen regardless of the CRM programme.

3.4 Integration into planning and decision making

The primary vehicle for integrating the CLIMAAXKòrsou results into national planning is the **Kaderbeleid Curaçao en klimaatverandering** (§ 2.2). In the Kaderbeleid's ministerial-participation matrices, MDC appears as the authoritative data provider (Bijlage II) and — jointly with DRR — as the assigned actor for *"Identificatie risicogroepen op basis van realiteit/kans impact analyse"* (Bijlage III), the specific action that the CLIMAAXKòrsou neighbourhood-level exposure and vulnerability analysis delivers. Figure 3-6 shows the cross-ministerial impact map used in the Kaderbeleid presentation, illustrating how each priority hazard translates into specific portfolio impacts and grounding the case for inter-ministerial coordination.

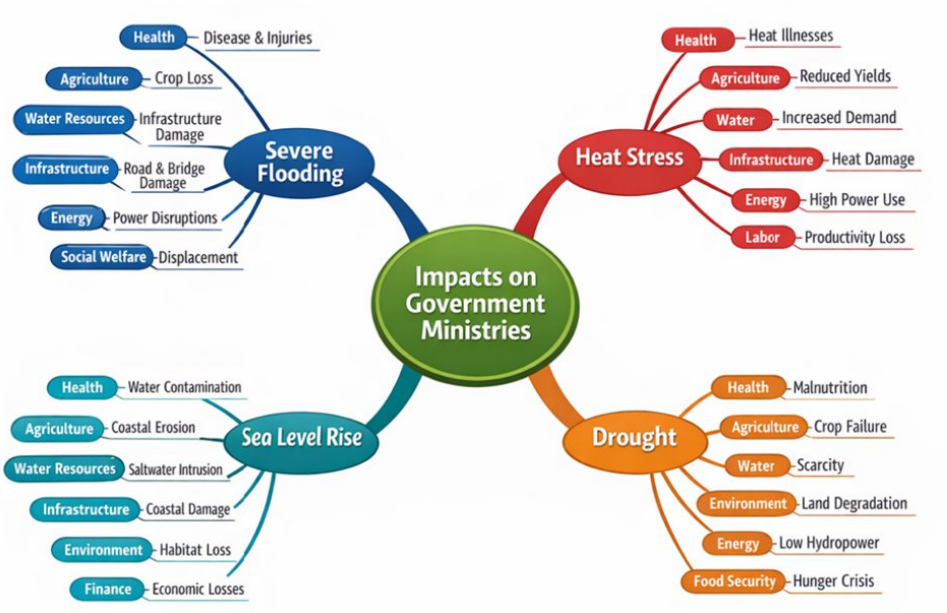


Figure 3-6 — Impacts of the four priority hazards on government ministries.

Cross-ministerial mind map from the Kaderbeleid presentation showing how each hazard (Severe Flooding, Heat Stress, Sea Level Rise, Drought) translates into specific impacts across sectoral portfolios (Health, Agriculture, Water Resources, Infrastructure, Energy, Environment, Finance, Labour, Food Security, Social Welfare). Source: Kaderbeleid presentation used in the H1 2026 briefings (§ 4.2).

Proposed fill of Kaderbeleid Bijlage I with CLIMAAXKòrsou evidence. The Kaderbeleid *Bijlage I* is the concept-stage evidence matrix at the heart of the national policy's threat identification. It cross-references security-interest categories (rows: people, nature, environment, economy, housing, mobility, energy, socio-cultural, government) against threat categories (columns: heat waves, sea-level rise, floods, drought, and several others outside CLIMAAXKòrsou scope). Table 3-7 below proposes a fill for the four columns covered by the CLIMAAXKòrsou workflows, using the quantitative results; it is offered to CCCP as an evidence contribution. This fill is the most concrete instance in D3 of CLIMAAXKòrsou outputs plugging directly into a specific national-policy artefact: a matrix that was empty becomes an evidence-based inventory.

Table 3-7 — Proposed fill of Kaderbeleid Bijlage I with CLIMAAXKòrsou evidence

Security interest	Heat waves *(Hittegolven)*	Sea-level rise *(Zeespiegelstijging)*	Floods — coastal + pluvial *(Overstromingen)*	Drought *(Droogte)*
People *(Mens)*	Population above hazard threshold under worst case; mortality/morbidity attribution study in progress	Population exposed to worst-case SLR flooding; heritage-district population via the Willemstad footprint	Building exposure at > 50 cm depth in worst case; risk-density hotspots in Kustbaterij, Cabo Verde, Nooit Gedacht	Vegetation-mediated health impact — attribution pending; potable supply buffered by desalination
Nature *(Natuur)*	Vegetation stress from combined heat + drought; coastal + terrestrial biodiversity loss	Coastal habitat loss along leeward shore — mangroves, brackish lagoons	Flash-flood erosion of terrestrial habitats; sedimentation of coastal habitats	NDVI signal-loss under drought; brackish-habitat salinity increase
Environment *(Milieu)*	Air-quality feedback; cooling-driven emissions	Saltwater intrusion into groundwater during high-tide events	Runoff pollution; soil + water contamination	Groundwater depletion; desertification pressure
Economy *(Economie)*	Tourism-comfort risk in winter high-season; outdoor-sector productivity loss	Cruise-terminal risk; leeward-coast beach-tourism loss; UNESCO brand damage	Coastal parcel flooding under worst case; extensive pluvial damage in top-risk neighbourhoods	Vegetation-based tourism amenity loss; agricultural stress on limited productive land
Housing *(Wonen)*	Cooling-cost burden; heat-related habitability decline in older stock	Coastal-parcel loss; heritage-fabric constraint on adaptation of the Willemstad heritage	Building damage concentrated in identified pluvial hotspots; green-fraction not yet required in	Structural stress from soil desiccation; potable-water burden on households

		districts	construction	
Mobility *(Mobiliteit)*	Road-surface degradation under sustained heat	Coastal-road inundation on leeward-coast infrastructure; cruise-terminal access	Road closures and drainage failure during extreme rainfall	Few direct mobility impacts; vegetation-related roadside stability affected
Energy / infrastructure *(Energie)*	Peak cooling demand; grid stress	Coastal energy infrastructure and desalination intakes exposed	Substation flooding; drainage-linked power infrastructure exposure	Increased water-treatment / desalination energy demand
Social / cultural *(Sociaal-Cultureel)*	Heat as public-health equity issue — elderly, low-income, outdoor workers	UNESCO World Heritage integrity of Historisch Willemstad under SLR — cultural loss cannot be substituted	Damage to community-facility and school infrastructure in flood zones	Loss of traditional vegetation and cultural landscape values
Government *(Overheid)*	Public-health surveillance load; CCCP coordination role	Coastal-zone planning coordination across ministries and heritage authority	Emergency-response coordination; ZOP revision as instrument	Vegetation and water-management coordination

4 Project Evaluation

4.1 Usability of the results

CLIMAAXKòrsou has produced Curaçao's first neighbourhood-level multi-hazard risk assessment — a new quantitative evidence base directly usable by Beleid (spatial planning), CBCS (financial risk), Aqualectra (water management), GMN gezondheid (public health) and the other sectoral counterparts identified in § 2.3. The four workflows are Python-based and openly deposited under five DOIs (§ 7); MDC now hosts hazard modelling capability in-house, eliminating external-consultant dependency and building lasting institutional capacity.

Policy implications carried by the CRM measures (§ 3.3, Table 3-6): direct integration into the national *Kaderbeleid Curaçao en klimaatverandering* (§ 3.4); the proposed fill of Kaderbeleid Bijlage I with CLIMAAXKòrsou evidence (Table 3-7) as the most concrete national-integration artefact; ZOP revision routes for the coastal-setback rule and the green-ratio requirement; heat-health protocol design; financial-sector portfolio stress-testing; a drought monitoring pilot; and SLR-informed cruise-terminal redesign. Public engagement is served by the MDC-hosted Climate Impact Atlas (under active development at D3 submission — see § 6.3 prototype).

Beyond Curaçao, the methodologies and coalition patterns are directly transferable to sister islands in the Dutch Caribbean and the wider Caribbean region. A live example in 2026 is MDC's regional partnership with Bonaire, transferring the calibrated heat methodology and heat-coalition experience — a partnership motivated by a concrete cross-island burden (heat-affected patients from Bonaire currently airlifted to Curaçao for treatment because Bonaire lacks its own heat-prediction capability). This is the role-model function in operation.

At international level, MDC brings CLIMAAXKòrsou evidence into two complementary UN-system channels: direct membership of the WMO and associate member Intergovernmental Oceanographic Commission (IOC) — a UNESCO body.

For the implementation of the Early Warning for All initiative by the UN — a proven effective and feasible climate adaptation measure which enhances the benefits of other adaptation measures when combined — allows the workflows to enrich the disaster risk knowledge and improve the preparedness and response capabilities through hazard and risk impact assessment at local level for levering action plans and decision making.

Through these channels, the CLIMAAXKòrsou risk maps, exposure and vulnerability assessments, impact scenarios and openly published methodology give MDC substantive material to bring into WMO, IOC and NDC-NL discussions — feeding Dutch Caribbean climate-risk substance into the wider climate change agenda rather than leaving it locally bounded. CLIMAAXKòrsou aligns naturally with several of the WMO RA IV, NDC-NL-selected Decade Challenges (ecosystems and biodiversity; sustainable ocean economy; ocean-based climate solutions; skills and open data; society's relationship with the ocean) and additionally produces community-resilience material directly relevant to the wider CLIMAAX framework. Alignment across initiatives produces better outcomes than parallel-and-unlinked efforts.

4.2 Lessons learned

The Phase 3 CRM analysis built on the CLIMAAXKòrsou risk analysis and was integrated into the ongoing work of the Curaçao Climate Change Platform (CCCP). Four principal lessons emerged, followed by the most significant difficulty.

- **Translating risk maps into decision-ready measures is the hard part.** Producing the quantified hazard, exposure and vulnerability layers was a substantial technical exercise, but the greater effort was turning those layers into concrete adaptation strategies that ministries, operators and civil-society actors can act on. The CRM measures in Table 3-6 are the outcome of that translation, not a straight read-off from the risk maps.
- **Shared quantified evidence is a precondition for productive multilateral discussion.** Without a common quantified reference, every stakeholder brings their own mental model of the risk built from lived experience, past events and institutional priors. Where CLIMAAXKòrsou quantified maps were on the table, discussions moved quickly from "what do we each believe about the risk?" to "which measures should we prioritise?". The core value of the project as a whole is replacing divergent tacit beliefs with a single contestable object.
- **CCCP is the right integration vehicle.** Anchoring the CRM work in CCCP — rather than building parallel governance — meant the prioritised adaptation list connects immediately into the national Kaderbeleid process without a hand-off step.
- **The wider climate-adjacent field on Curaçao is itself fragmented.** Multiple parallel initiatives (climate atlases, hazard maps, sector impact studies) dilute attention rather than concentrating it. MDC's mandate as the authoritative institutional owner (§ 2.2) requires ongoing field-mapping — who is doing what, on which hazard, with which data — to position CLIMAAXKòrsou outputs as the single reference around which the wider field can align.

Most significant difficulty — inter-institutional data silos. Climate-relevant data on Curaçao are held across CBS, Kranshi, CMC, SVB, MDC, Kadaster, DCBD, Aqualectra, DRR, MEO, VVRP/Beleid and others in ways that require bespoke bilateral negotiation for every exchange. Each negotiation succeeded but the cost per bilateral was high and the results are not reusable across future partnerships. What is missing is not willingness to share — that is present in the coalition — but a shared inter-institutional data governance framework. This is the origin of § 5.2.1 (Curaçao data commons).

Stakeholders played three roles: (i) *information providers* contributing sector data, operational knowledge and lived experience; (ii) *constraint flaggers* independently identifying inter-institutional data access as the persistent constraint (validating § 5.2.1 before it was formalised); and (iii) *validators* of the CRM prioritisation, weighing candidate measures against their own mandates and operational capacity. MDC produces the evidence; the levers for action sit with VVRP/Beleid, Aqualectra, CBCS, GMN gezondheid, CPA and the other sectoral counterparts identified in § 2.3.

Feedback on the CRM results (§ 5.2):

- **Data commons (§ 5.2.1)** — independently raised by nearly every sectoral stakeholder as their own primary blocker on climate-related work. Strongest cross-cutting endorsement across the coalition.

- **Tourism-sector engagement (§ 5.2.2)** — CTB, hospitality trade bodies, CPA receptive; nuance is balancing risk transparency with destination-brand management.
- **Green-ratio building instrument (§ 5.2.3)** — VVRP / Beleid receptive; practical constraints are enforcement capacity and existing property rights. More likely to land as part of the ongoing ZOP revision than as a standalone instrument.
- **Coastal / heritage / cruise-terminal SLR-informed redesign** — technical direction confirmed with CPA, VVRP, UNESCO liaison; investment horizons and international-operator coordination are the practical bottlenecks.
- **Heat-impact study (Kranshi + CMC + SVB + GMN gezondheid + MDC)** — all parties aligned; operational constraint is exactly the data-access issue § 5.2.1 addresses.

The Kaderbeleid's vertical-slice methodology (Figure 4-7) is the pattern to carry forward: each CRM measure should be brought forward as its own vertical slice — one bounded problem, named specific stakeholders, driven end-to-end — rather than queued behind a portfolio-wide master design.

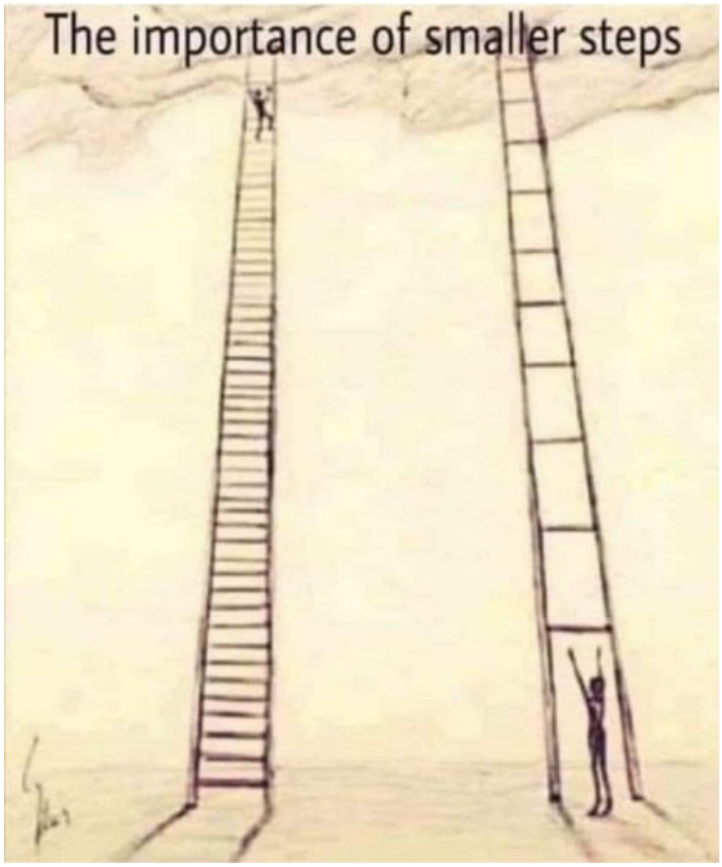


Figure 4-7 — The importance of smaller steps.

The operational metaphor for the vertical slice methodology: many small, bounded problems, each solvable end to end with a named stakeholder set, move further up the climate action ladder than a small number of large, portfolio wide architectural desgins.

Is learning ensured?

Yes, at five complementary layers: (i) **codified methodology** — four hazard workflows in Python, openly deposited (5 DOIs, § 7), rerunnable by any successor; (ii) **§ 5.2.1 (Curaçao data commons)** carries the primordial data-access lesson as a concrete follow-up action rather than folklore; (iii) **MDC as persistent institutional carrier** — in-house execution means the technical knowledge lives inside a permanent public institution with the mandate to apply it; (iv) **CCCP as ongoing coordination venue** — permanent structure via *landsbesluit* 21/2569 (2019, extended 2024) in which the CRM measures remain a live agenda item; (v) **rerunnable evidence base** — workflows are designed to consume higher-resolution DEM (LiDAR), refreshed CBS census cycles, extended MDC sub-hourly rainfall records, and revised CMIP6 ensembles as they land. Successor work (CCCP impact assessment, Bonaire heat-capacity transfer, parallel MDC hazard early-warning) is already building on the CLIMAAXKòrsou base rather than duplicating it.

How did you communicate your final outcomes?

Three complementary channels, each addressing a different audience. The distinguishing feature is that every audience receives not only the risk products but also MDC's institutional role in producing and stewarding them — the authoritative-figure dimension.

1. Direct institutional briefings — MDC Director as principal spokesperson. Coordinated series of three high-level H1 2026 briefings delivered by Dr. Martis:

- Governor of Curaçao HE Mauritsz de Kort (21 January 2026) — joint briefing with Beleidsdirecteur Miriam Jonker (VVRP) on the climate-change risks facing Curaçao and the concept Kaderbeleid (Figure 4-8).
- Staten Werkgroep Klimaatverandering + Statenvoorzitter Fergino Brownbill (week of 27 February 2026) — CCCP Werkgroep work visit chaired by Martis (Figure 4-9).
- Directors of all involved ministries — interministerial overleg (29 May 2026).

Additional Phase 3 engagements: Council of Ministers (via CCCP-aligned briefings), CBCS Board / Climate Workgroup (4 February 2026), Commissie Integraal Watermanagement (5 February 2026), CBS data-sharing (6 July 2026), NDC-NL online meeting (6 July 2026), heat coalition (Kranshi, CMC, SVB), Bonaire (BES) regional partnership, and sustained sector-counterpart bilaterals (VVRP + Beleid, CPA, GMN gezondheid, Aqualectra, DRR).



Figure 4-8 — Governer briefing, 21 January 2026.

Dr. Albert Martis (Director MDC), HE Mauritsz de Kort (Governor of Curacao), and Beleidsdirecteur Miriam Jonker (VVRP) on the handelskade after the briefing on climate-change risks and the concept Kaderbeleid. Source: Gouverneur van Curaçao official page, public post 22 January 2026.



Werkgroep Klimaatverandering bij de Staten

WILLEMSTAD — De werkgroep Klimaatverandering was eerder deze week bij de Staten voor een werkbezoek. De werkgroep heeft als taak meegekregen om Curaçao voor uitdagingen op het gebied van klimaatverandering. Tijdens het bezoek werden de werkgroepleden in staat gesteld om kennis te maken met Statenvoorzitter Fergino Brownbill (MFK), terwijl zij ook een presentatie hielden van hun missie en werkzaamheden. Ook werd er van gedachten gewisseld hoe de Staten de werkgroep bij de uitvoering van haar werkzaamheden zal kunnen bijstaan. Aan het eind van het werkbezoek kreeg werkgroepvoorzitter Alfred Martis een aandenken van Brownbill mee. Martis is tevens de directeur van de Meteorologische Dienst van Curaçao, maar ook de permanente vertegenwoordiger van Curaçao bij de World Meteorological Organization.

Figure 4-9 — CCCP Werkgroep Klimaatverandering visit to the Staten Parliament, week of 27 February 2026.

Dr. Albert Martis (Director MDC) receiving a token from Statenvoorzitter Fergino Brownbill at the close of the work visit. Source: Amigoe di Curaçao (2026-02-27); photo credit “Foto: Staten Curaçao”

2. MDC Climate Impact Atlas — public-facing platform (in development). The MDC-hosted Climate Impact Atlas is the persistent public-facing artefact citizens, researchers, ministries, journalists and Caribbean sister-services can reach without an intermediating request. Design intent: *curated and evaluated* climate-risk evidence, not a raw-data dump. The prototype is documented as Figure 6-1 and Figure 6-2 in § 6.3; the full MDC-hosted Atlas is the principal open item at D3 submission.

3. Open-repository access — external DOI deposits + MDC-internal data-governance repository. The five DOI deposits (Foundation + four hazard-specific, § 7 and § 8) allow external researchers and Caribbean sister meteorological services to inspect, re-run or contest the analysis. In parallel, MDC’s internal data-governance project — the first practical seed of the Curaçao data commons

proposed as § 5.2.1 — packages curated results so they flow into other MDC and inter-ministerial projects without repeating the manual per-request cycle.

What worked well? What did not?

Worked well.

- **In-house technical adaptation and calibration.** MDC's own capacity to adapt the CLIMAAX workflows to Curaçao conditions and calibrate the risk products locally — heat reference calibrated against MDC observations combined with wind and terrain features (R^2=0.70), IDF Gumbel-fitting against the MDC sub-hourly rainfall archive, CMIP6 bias-correction against the Curaçao Airport record — without external consultant dependency.
- **Reproducibility discipline.** Four workflows in Python, openly deposited with DOIs, enabling successor work (CCCP impact assessment, Bonaire heat-capacity transfer, parallel MDC hazard early-warning) to build on the CLIMAAXKòrsou base rather than duplicate it.
- **Stakeholder receptivity around concrete measures.** Once discussions moved from bilateral consultations to multilateral engagements structured around concrete measures, stakeholder interest was clear and consistent across sectors.
- **First concrete progress against inter-institutional data silos.** Each successful bilateral data-exchange negotiation produced a reusable arrangement; the accumulated experience is now the seed of MDC's internal data-governance project — the practical embryo of the Curaçao data commons proposed as § 5.2.1.

Did not work as planned.

- **CLIMAAX default workflows did not map one-to-one onto Curaçao's data availability.** Designed against EU data density; adapting to Curaçao required substantial data preparation, interpolation and downscaling. Slowed the pace of substantive analysis.
- **A subset of Handbook workflows could not be run at all** for Curaçao at this stage — required inputs are absent rather than sparse. These workflows are paused rather than abandoned: MDC will revisit each as Curaçao data infrastructure matures (LiDAR-DEM, NDVI baseline, extended observation archives).
- **Dissemination pathway pivot (KPI K4)** — the originally-planned external climate-atlas platform was repointed to MDC's own institutional website, preserving MDC's authoritative-figure role. The MDC Atlas is under active development at D3 submission and is the principal open item on KPI K4 (§ 6.3).
- **Communicating in a crowded, non-authoritative field** — Curaçao hosts parallel climate-adjacent efforts producing overlapping material; positioning CLIMAAXKòrsou outputs as the authoritative reference has required more care than a simple publish-and-announce cycle.
- **Early-project stakeholder engagement was thin relative to intent** (D2 review). The project reached the expected engagement level only once bilateral coalitions solidified around specific CRM measures. That coalitions-around-concrete-measures mode is the baseline going forward.

How efficiently did you use resources (time, staff, cost)?

Time. A substantial share of the analytical time was consumed by data preparation and workflow adaptation rather than by substantive risk modelling — the data-density mismatch with CLIMAAX Handbook defaults pushed against the original schedule and shifted the pace of downstream CRM activity accordingly.

Staff. CLIMAAXKòrsou was executed largely in-house by a small MDC technical team alongside their other institutional responsibilities. The distinctive value of in-house execution is what proximity to MDC's own data made possible: locally-aware bias correction, downscaling and calibration choices that generic default parameters would not have produced.

External support — used surgically, not structurally. Occasional contractor and external-tool assistance was used to unblock specific tasks (primarily data cleaning and format conversion); the sub-grant also covered acquisition of some curated third-party datasets. All external support was scoped to auxiliary tasks; methodology, calibration and interpretation stayed inside MDC.

Cost. The CLIMAAX FSTP sub-grant has been managed to plan across four expense categories: (i) external contractor support for data cleaning and format conversion; (ii) stakeholder workshops, bilateral engagements and multi-agency presentations; (iii) deliverable production across all project phases (D1, D2 v3.0 revision, D3); (iv) reshaping and development of the MDC-hosted Climate Impact Atlas (closing KPI K4, the still-open item). Long-term financing beyond the FSTP cycle is a separate matter (§ 3.2 Finances and § 5.2.5).

How would you value the impact of CRM on improved understanding of risk?

The CRM process meaningfully improved understanding of climate risk on Curaçao at three complementary layers: (i) *within MDC*, by forcing our own risk products to be tested against sectoral operational realities and sharpened where they were coarse; (ii) *within the coalition of sectoral counterparts*, by placing a common quantified reference against which divergent mental models and external non-authoritative claims could be reconciled; and (iii) *at the institutional-positioning level*, by crystallising MDC's role as the authoritative reference on climate risk for Curaçao in the eyes of local stakeholders. Risk assessment answers *what could happen*; CRM adds *who owns the response, on what timeline, with what constraints* — and answering that alongside sectoral counterparts forces every party to name their operating assumptions out loud against a shared evidence base.

Some counterparts may have experienced the CRM process as touching territory they consider their own domain of expertise. This tension is not a failure of the process; it is a defining feature — CRM by design synthesises sectoral knowledge into a cross-sectoral risk picture, and that synthesis inevitably surfaces points where a sectoral view and the integrated view diverge. Working through those points is exactly how real scenarios come to be identified. The alternative — siloed sectoral views that never meet — is precisely the fragmented state the CRM work is designed to leave behind. The friction is the productive core of the method, not overhead against it.

5 Conclusions Phase 3

The central conclusion of CLIMAAXKòrsou is that the study now provides Curaçao with a substantially better insight into the risk and impact of climate-change-driven hazards than was available before the project. Four independent hazard lines — coastal flooding, pluvial flooding, heat stress and drought — have been quantified at neighbourhood resolution using locally validated methods, openly published for reuse, and translated into a Climate Risk Management framework that connects the technical evidence to policy levers, institutional mandates and specific measures.

The results of this study are inputs into operational, intergenerational and decision-making processes — for MDC it allows us to integrate into our own operational workflwos and strengthen our warning and climate services — in addition to stakeholders accross Curaçao's ministries and agencies, and for the private and civil-society actors who ultimately own the assets and populations at risk.

This is the focus that the CRM analysis has crystallised: not to close the risk assessment as an academic product, but to hand it over to the institutions and processes that shape Curaçao's development trajectory over decades. That hand-over is already visibly under way — in November 2025 the Curaçao Climate Change Platform (CCCP) published the concept *Kaderbeleid Curaçao en klimaatverandering* as Curaçao's national climate policy framework, and across H1 2026 Dr. Albert Martis (Director MDC; WMO Permanent Representative for Curaçao and Sint Maarten; Member of the WMO Executive Council) took the framework forward in a coordinated series of three high-level briefings: to HE Mauritsz de Kort, Governor of Curaçao (21 January 2026, jointly with Beleidsdirecteur Miriam Jonker of VVRP); to the Staten Werkgroep Klimaatverandering and Statenvoorzitter Fergino Brownbill (week of 27 February 2026, as CCCP workgroup chair); and to directors of all involved ministries in the interministerial overleg (29 May 2026). CLIMAAXKòrsou technical evidence contributes directly to that framework.

Concrete outcomes of the CLIMAAXKòrsou work:

- **Local profile** (§ 2) — the priority climate risks for Curaçao, the resilience-capacity assessment (low for coastal and pluvial, low for heat, medium for drought), the policy context, and a mapped set of Key Actors and Systems that includes MDC, VVRP (and specifically its spatial-planning-policy directorate Beleid, which drafts the ZOP), CBS, Kranshi, CMC, SVB, GMN gezondheid, CBCS, Aqualectra, MEO, GMN, DCBD, CCCP, UNESCO, Kadaster, the Rif Mangrove Park operator and hospitality-sector actors.
- **Climate Risk Management framework** (§ 3) — measurable CRM objectives with indicators, supportive elements assessed across knowledge, tech, social-behavioural, engagement, finance and governance, and a prioritised list of CRM measures spanning nature-based (Rif Mangrove Park as on-island example), grey-infrastructure (engineered wave-breakers with Willemstad Zuid as on-island example, site-specific Spaanse Water water-management structure), regulatory (ZOP revision, building-code freeboard), operational (heat-health surveillance, extreme-rainfall early warning) and cross-cutting (Climate Impact Atlas, data-sharing formalisation) categories.
- **Anchoring in observed reality** (§ 2.4) — the 2024 events documented in § 2.4 (record annual temperature, Banda Abou flash-flood, Waaigat coastal inundation, ongoing SLR-

impact at Spaanse Water) provide independent confirmation that the risks quantified by CLIMAAXKòrsou are present-day, not distant-future.

The CRM measures in § 3.3 (Table 3-4) respond directly to the § 2.1 hazard analysis, and the § 2.4 present-day events confirm that the risk projections align with observed reality on the island — the interpretation of the results is therefore both anchored to the underlying risk assessment and validated against realised experience.

Phase 3 has added, on top of the earlier risk-analysis deliverables, the following outputs specifically produced in this phase: (i) a prioritised CRM measures list co-developed with sectoral stakeholders (Table 3-4); (ii) a proposed evidence fill of the Kaderbeleid Bijlage I matrix (Table 3-5) as concrete national-policy integration; (iii) a coordinated series of three H1 2026 high-level briefings (§ 4.2 Figures 4-2 and 4-3); and (iv) a public-facing Climate Impact Atlas prototype (§ 6.3 Figures 6-1, 6-2 and 6-3).

5.2 Key results from the CLIMAAXKòrsou research

Curaçao now has an openly published, locally validated multi-hazard risk assessment; an active multi-agency coalition operating within the Curaçao Climate Change Platform framework; and a Climate Impact Atlas that puts the results in the hands of decision makers and the public. The task ahead — carried forward beyond this deliverable — is the sustained integration of these outputs into the concrete choices that shape Curaçao's built environment, public health system, water infrastructure, tourism sector and coastal development for the coming generations.

Five key results stand out from the CRM analysis. Each names a structural finding the research surfaced together with the natural instrument or implication that follows from it; the ownership of any subsequent action sits with the sectoral counterparts identified in § 2.3 and Table 3-4, not with CLIMAAXKòrsou itself.

5.2.1 Inter-institutional data governance is the binding constraint on Curaçao climate risk work; a shared data commons is the enabling instrument

The small-island scale that makes Curaçao vulnerable to a compact set of climate hazards is the same scale that makes such a framework tractable — the number of institutions is finite and the coordination distance is short. What is missing is a formal agreement on ownership, access and use of data, plus the technical infrastructure to make sharing operational at low marginal cost. If that framework existed, every result produced by MDC in this project would automatically flow into partner-sector applications, and every insight held in partner-sector datasets would automatically become available for climate-risk analysis.

5.2.2 — Climate risk on Curaçao is inseparable from tourism-sector risk; the sector is a natural adaptation partner rather than a bystander

Curaçao is highly dependent on tourism, and the sector is spatially exposed: the majority of the island's beach-based tourism attractions, the cruise-terminal infrastructure that has anchored the post-ISLA economic pivot, and the **UNESCO Historic Area of Willemstad** (see § 2.1.1) are all concentrated on the southern (leeward) coast, which is also the highest-exposure zone for sea-level rise. The UNESCO inscription in particular carries a value that cannot be substituted through

insurance or reconstruction — loss of integrity would trigger reputational and revenue damage across the tourism sector well beyond the affected buildings themselves. Rising temperatures further threaten the destination-comfort value that draws visitors, with cascading effects on cruise-route selection and seasonal viability. Communicating the CLIMAAXKòrsou results to the Curaçao Tourism Board, hospitality trade organisations, cruise and dive operators, Curaçao Ports Authority, and the UNESCO liaison — and involving them as co-investors in adaptation measures — turns them from bystanders into stakeholders, and connects Curaçao to the UNESCO climate action programme for World Heritage properties.

5.2.3 — A green-ratio requirement in the building code and land-clearing regulation is the single instrument capable of delivering cross-hazard co-benefits at design stage

At present, new construction and land-clearing on Curaçao are not required to preserve or replant a minimum green fraction. Introducing this as a Beleid instrument would deliver cross-cutting benefits: heat mitigation through urban tree canopy, pluvial-flood mitigation through infiltration, biodiversity preservation, and — directly relevant to the tourism argument — destination attractiveness under increasing heat. It is a single lever with multiple payoffs.

5.2.4 — The multi-hazard programme needs its outstanding data and modelling upgrades to move from strong first-cut to operational second-cycle

LiDAR DEM, geolocated CBS records, an operational NDVI-based vegetation drought monitoring layer, and heat-health surveillance data are the missing pieces that would take the CLIMAAXKòrsou risk products from strong-first-cut to operational-second-cycle. Each has a clear next step already scoped in this deliverable.

5.2.5 — Curaçao's CLIMAAXKòrsou outputs are directly transferable to Dutch Caribbean and wider Caribbean SIDS peers; the international pathway sits inside the UN system and reinforces the SNIJ / SIDS-equivalent recognition case

This result is already in operation, not aspirational: MDC is actively supporting Bonaire (BES) in 2026 with the transfer of its CLIMAAXKòrsou calibrated heat methodology and the heat-coalition experience — a partnership motivated by a concrete cross-island burden (heat-affected patients from Bonaire are currently airlifted to Curaçao for treatment). See § 4.1 for the regional usability picture and Table 3-4 for the corresponding CRM measure. The methodologies, open data, coalition patterns and CRM measures documented through CLIMAAXKòrsou are directly transferable to peer meteorological and climate agencies in the region.

At the international level, MDC brings this evidence into two complementary UN-system channels — direct IOC membership and NDC-NL workgroup-team membership under the UN Decade of Ocean Science for Sustainable Development (§ 4.1). CLIMAAXKòrsou also gives concrete Curaçao substance to the SNIJ / SIDS-equivalent recognition case for multilateral climate-finance access; the financing landscape, the SNIJ framing, the UN-system corroboration and the ITLOS legal reinforcement are set out in § 3.2 (Finances & resources), and the corresponding 2025 fiscal-reality (1.9 % priority-resource allocation to climate resilience) is set out in § 2.2.

Together these five results describe not a set of one-off adaptation actions but a sustained programme through which Curaçao's climate risk knowledge becomes progressively better

connected, better applied, and better maintained. Beyond the specific results, the project leaves MDC with a rerunnable technical workflow and a set of standing institutional relationships that can iterate — absorbing new data as it matures, drawing in additional stakeholders as CRM expands, and producing progressively better insight and better-curated products as the climate signal continues to unfold. The programme's shape is now in place; what remains is its sustained use — for the island itself, and for the region within which Curaçao intends to lead by example.

6 Progress evaluation

6.1 Project outputs

This section reports Phase 3 progress against the Individual Follow-up Plan (IFP). The three Phase 3 IFP commitments — stakeholder discussions to develop adaptation strategies, an elaborated list of prioritised adaptation strategies, and a risk-management plan for the priority hazards — are tracked below through the corresponding KPIs and Milestones.

Table 6-8 — Overview Key Performance Indicators

Key performance indicators	*Progress*
K3 — At least 1 stakeholder meeting in Phase 3	Distinct Phase 3 engagements: three coordinated H1 2026 briefings by MDC Director Dr. Martis (Governor of Curaçao 21 January 2026; Staten Werkgroep Klimaatverandering week of 27 February 2026; interministerial overleg 29 May 2026); CBCS Board / Climate Workgroup (4 February 2026), Commissie Integraal Watermanagement (5 February 2026), CBS data-sharing consultation (6 July 2026), NDC-NL online meeting (6 July 2026), multiple Beleid bilateral consultations across H1 2026, ongoing heat coalition with Kranshi, CMC and SVB, regional-capacity partnership with Bonaire (BES), and sustained CCCP Platform sessions.
K4 — At least 2 publications of new maps in the Klima Kòrsou Atlas	Pathway redirected from the originally-planned external, third-party-operated climate-atlas platform to MDC's own institutional website — preserving MDC's authoritative-figure role as owner of climate-hazard and impact data for Curaçao (justified in accepted D2 v3.0). A prototype Atlas presenting the four Phase 3 hazard risk maps (coastal flood, pluvial flood, heat stress, drought) has been prepared as a first-visible increment: a public-facing landing page with a dedicated per-hazard story page for each, MDC-branded, linking each hazard to the openly deposited methodology and data (five DOIs). The full MDC-hosted Climate Impact Atlas remains under active development and is the visible next spend on the sub-grant.

Key performance indicators	*Progress*
K5 — At least 15 stakeholders involved in the project activities	Over 35 organisations engaged across all sectors via the recurring CCCP Platform sessions, with additional Phase 3 coalition expansion. Sectors covered include national government (VVRP + Beleid, GMN, MEO, DRR, CINEX, MDC), data and analytical partners (CBS, Kranshi, CMC, SVB, DCBD), financial sector (CBCS, Vidanova Bank, Ennia), sectoral and market actors (Aqualectra, Curaçao Tourism Board, Curaçao Ports Authority, Rif Mangrove Park), NGOs / civil society (Amigu di Tera, EcoVision, Fundashon Nos Grandinan, CARMABI, DCNA, Uniek Curaçao), and international partners (UNESCO, IOC, NDC-NL, Bonaire BES).

Table 6-9 — Overview milestones

Milestones	*Progress*
M5 — Presentation of the results to policy and decision makers in Curaçao	Delivered through three coordinated H1 2026 briefings by MDC Director Dr. Albert Martis: to HE the Governor of Curaçao (21 January 2026, joint with VVRP Beleidsdirecteur Miriam Jonker; Governor's public post 22 January 2026); to the Staten Werkgroep Klimaatverandering and Statenvoorzitter Fergino Brownbill (week of 27 February 2026, as CCCP workgroup chair; Amigoe article 27 February 2026); and to directors of all involved ministries in interministerial overleg (29 May 2026). Additional Phase 3 engagements included CBCS Board / Climate Workgroup, Commissie Integraal Watermanagement, CBS data-sharing consultation, NDC-NL online meeting, heat coalition (Kranshi, CMC, SVB) and regional-capacity partnership with Bonaire (BES).
M7 — List of prioritized adaptation strategies	Delivered as the prioritized CRM measures documented in the D3 deliverable, Chapter 3 (Climate Risk Management): measures for coastal flood (6), pluvial flood (3), heat stress (6), drought (3), plus 6 cross-cutting enablers. Each measure carries an assessed effectiveness, timeline horizon, named responsible organisation, expected co-benefits and known adaptation limits.

6.2 K4 prototype evidence

The K4 deviation and its resolution are documented in the Table 6-1 K4 cell. The prototype Atlas evidence is shown in Figure 6-1 (landing page) and Figure 6-2 (per-hazard story page — heat stress example). The prototype is public-facing, MDC-branded, and links each hazard to the openly deposited methodology and data (five DOIs, § 8).

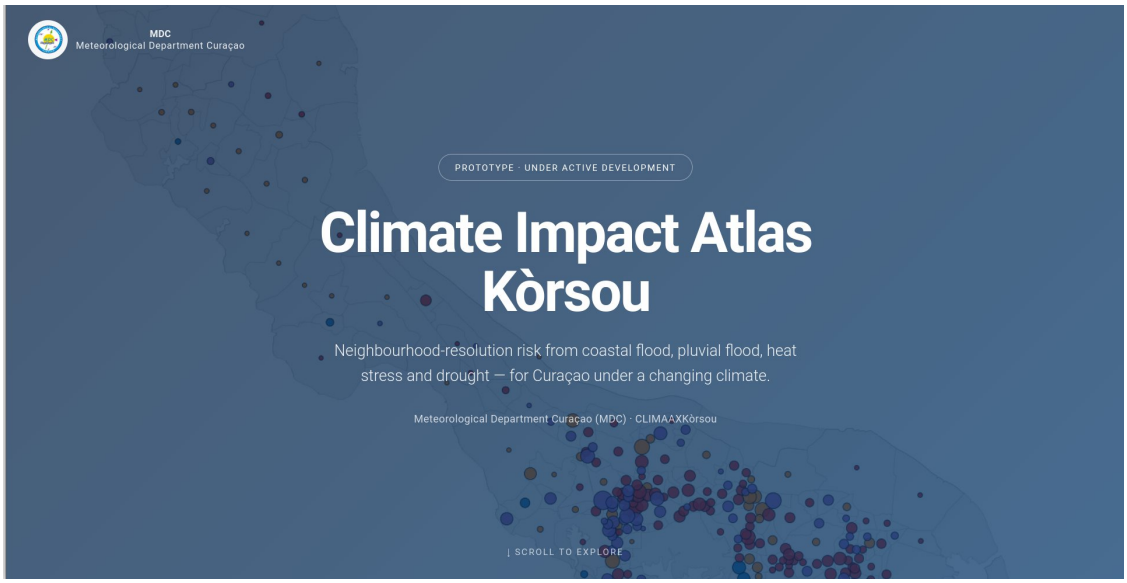


Figure 6-10 — Climate Imp[act Atlas Korsou (prototype) — landing page.

Landing page preview of the MDC hosted Climate Impact Atlas. Four priority hazards presented at a single glance undeer a common visual language; per hazard story pages accessible via the Explroe buttons.



Figure 6-11 — Climate Impact Atlas Korsou (prototype) — per hazard story page.

Example per hazard story page (heat stress shown). Colored hazard hero with headline statistic, follwoed by narrative sections covering the risk today and udner future scenarios, hotspot georaphy and the CRM measures under discussion with the responsible sectoral counterparts.

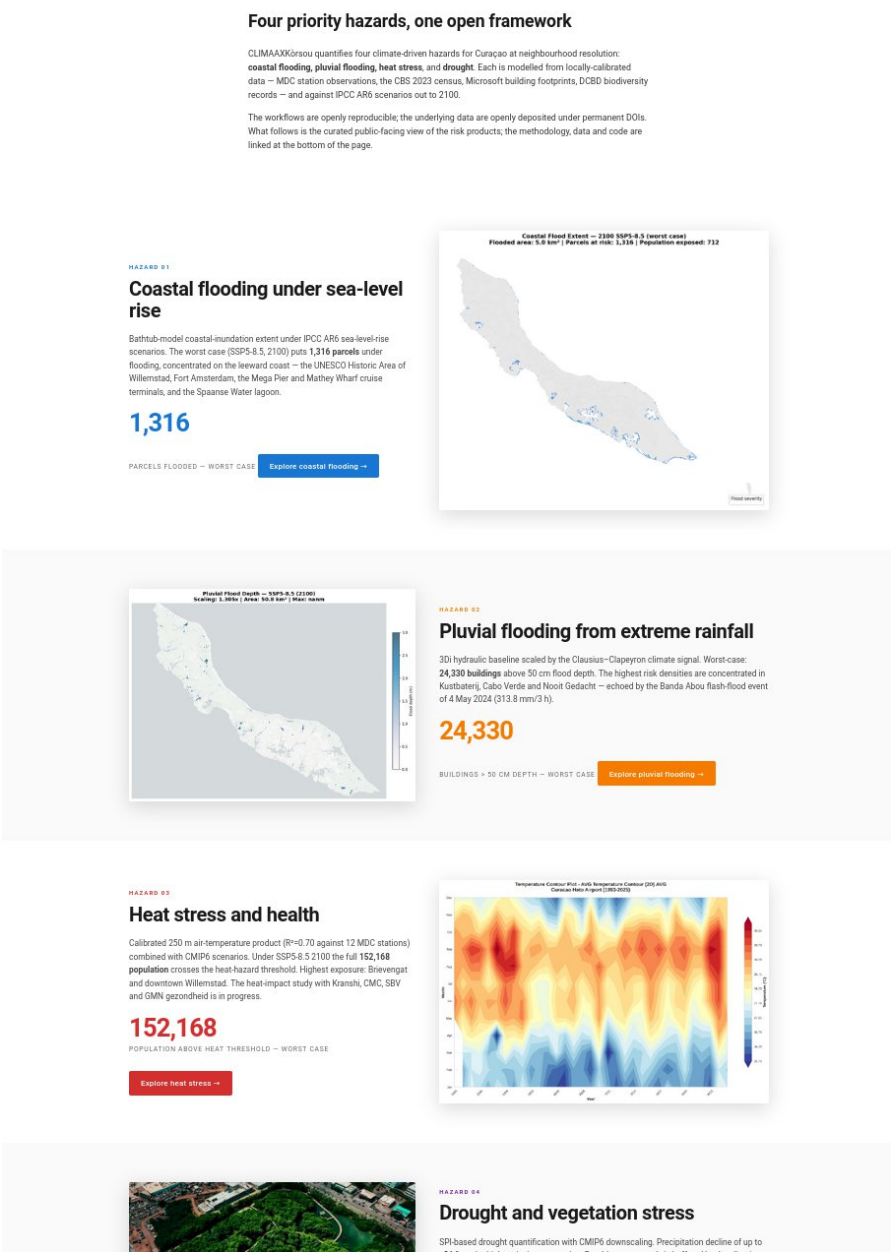


Figure 6-12 — Climate Impact Atlas Korsou (prototype) — landing page scroll view.

Mid-scroll view of the landing page showing the alternating per hazard sections (headline statistic, short narrative, hazard representative map) that give a reader a single canvas overview of all four hazards before drilling into any per hazard story page.

7 Supporting documentation

CLIMAAXKòrsou outputs are organised below in the four M22 categories. All spatial datasets and deliverable documents are published on the CLIMAAX GeoNode portal (https://climaax.kajoservices.com/) as the canonical open-repository entry point; Zenodo DOIs are issued centrally by the CLIMAAX team from the GeoNode metadata records under the summer 2026 CLIMAAX process update. Where a supporting document is held internally by MDC (Kaderbeleid concept, stakeholder engagement decks), that is stated explicitly.

Main report

- CLIMAAXKòrsou deliverable M22

Annex documents (attached / cross-referenced)

The following supporting documents are cross-referenced from the body chapters. They inform the D3 narrative but are not CLIMAAXKòrsou-attributed outputs, and are held in MDC's internal document archive:

- **Kaderbeleid Curaçao en klimaatverandering** (concept, November 2025) — CCCP national climate policy framework; cross-referenced in § 8. Copy retained by MDC as a supporting document to this deliverable.
- **Curaçao Climate Platform — Uniting for a resilient future** — presentation deck used by Dr. Albert Martis in the coordinated series of H1 2026 high-level briefings (Governor 21 Jan; Staten Werkgroep 27 Feb; Ministry Directors 29 May); cross-referenced in § 8. Copy retained by MDC as a supporting document to this deliverable.
- **Impacts of the four priority hazards on government ministries** — cross-ministerial mind map used in the Kaderbeleid presentation, reproduced as Figure 3-1 in § 3.4.

Visual outputs

- **Climate Impact Atlas — MDC-hosted prototype**: landing page and one story page per priority hazard (coastal flooding, pluvial flooding, heatwaves, drought), developed on the MDC website as the public-facing distribution surface for CLIMAAXKòrsou risk products. Illustrated in § 6.3 as Figures 6-1, 6-2, and 6-3. Production launch on the MDC website is scheduled for Q3 2026 following the coordinated CCCP dissemination cycle; the prototype content is complete and functional.
- **Figure 3-2 — CLIMAAXKòrsou D3 multi-hazard synthesis map**: per-neighbourhood dominant climate hazard under the SSP5-8.5 2100 end-of-century scenario, derived from the multi-hazard risk product listed in Table 7-1 row 20.
- **Per-hazard risk-picture figures throughout § 2.1** (Figures 2-1 through 2-6) — screenshots and export-quality maps derived from the underlying CLIMAAX GeoNode datasets listed in Table 7-1.
- **Stakeholder engagement decks** used in Phase 3 briefings (CBCS Board / Climate Workgroup 2026; CBS bilateral 2026-07-06). Held in MDC's internal engagement archive; not intended for external distribution as standalone documents.

- **CRM measures overview graphic** (in preparation for the Q3 2026 CCCP dissemination cycle) — a condensed one-page visualisation of the CRM measures in Tables 3-4 as a stakeholder-facing companion to the deliverable.

Communication outputs

- **MDC website hosting the Climate Impact Atlas** — the primary public communication channel for CLIMAAXKòrsou risk products (production launch Q3 2026). Consistent with the dual-message framing described in § 4.2, the site carries both the risk pictures themselves and MDC's mandated role as the authoritative reference for hazard, natural-disaster and impact data going forward.
- **CCCP Platform coordination notes** — recorded contributions from the CRM analysis into CCCP working sessions (see § 4.2 and § 6 for engagement log). Held internally by MDC and CCCP.
- **Public-facing press release** (in preparation, coordinated with MDC communications and CCCP) — for the Climate Impact Atlas production launch on the MDC website.
- **Social-media announcements** from MDC accompanying the Atlas launch and periodic risk-picture releases thereafter, coordinated with CCCP's own dissemination cadence.

Datasets and documents on the CLIMAAX GeoNode Portal

The processed and derived spatial datasets produced by CLIMAAXKòrsou — plus the three CLIMAAXKòrsou deliverable documents (D1, D2 v3.0, D3) and the D1 workshop poster — are published on the CLIMAAX GeoNode portal (https://climaax.kajoservices.com/) with per-item ISO 19115:2005 XML metadata records (`gmd:MD_Metadata` schema — covering title, abstract, keywords, three responsible-party contacts, geographic and temporal extents, reference system, and CC-BY-4.0 licensing) and per-item Styled Layer Descriptor (SLD) style files. All rasters are normalised to EPSG:4326 (WGS84) with explicit nodata sentinel handling; vector products are packaged as GeoPackage.

Datasets are organised on the portal under a per-hazard folder structure aligned with the CLIMAAX controlled workflow vocabulary: coastal_flood, heavy_rain, heatwaves, droughts, and (for the D3 multi-hazard synthesis) multiple; each is further split by CRA category into hazard and risk. This structure mirrors the hazard-and-risk taxonomy applied throughout § 2 (Local Profile) and § 3 (Climate Risk Management).

For methodological detail per hazard workflow, refer to § 2.1 (hazard descriptions) and § 3.3 (CRM measures). The D3 multi-hazard synthesis product (`curacao_multiple_risk_neighbourhood_dominant_hazard_vector`, Table 7-1 row 20) is the specific spatial contribution of Phase 3: for each neighbourhood it identifies the dominant climate hazard under the SSP5-8.5 2100 end-of-century scenario.

Table 7-10 — CLIMAAXKòrsou datasets published on the CLIMAAX GeoNode portal

#	Phase	Workflow	Category	GeoNode URL
1	D1	Coastal floods	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1672
2	D1	Coastal floods	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1673
3	D1	Coastal floods	Risk	https://climaax.kajoservices.com/catalogue/#/dataset/1674
4	D1	Coastal floods	Risk	https://climaax.kajoservices.com/catalogue/#/dataset/1698
5	D1	Heavy rainfall	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1676
6	D1	Heavy rainfall	Risk	https://climaax.kajoservices.com/catalogue/#/dataset/1677
7	D2	Coastal floods	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1701
8	D2	Coastal floods	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1702
9	D2	Coastal floods	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1703
10	D2	Coastal floods	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1704
11	D2	Coastal floods	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1705
12	D2	Coastal floods	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1706
13	D2	Coastal floods	Risk	https://climaax.kajoservices.com/catalogue/#/dataset/1707
14	D2	Heavy rainfall	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1688
15	D2	Heavy rainfall	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1689
16	D2	Heavy rainfall	Risk	https://climaax.kajoservices.com/catalogue/#/dataset/1713
17	D2	Heatwaves	Hazard	https://climaax.kajoservices.com/catalogue/#/dataset/1714
18	D2	Heatwaves	Risk	https://climaax.kajoservices.com/catalogue/#/dataset/1715
19	D2	Droughts	Risk	https://climaax.kajoservices.com/catalogue/#/dataset/1716
20	D3	Multi	Risk	https://climaax.kajoservices.com/catalogue/#/dataset/1718

Table 7-11— CLIMAAXKòrsou deliverable documents

#	Phase	Title	GeoNode URL
1	D1	CLIMAAXKòrsou D1 Deliverable — Phase 1 (June 2025)	https://climaax.kajoservices.com/documents/1724
2	D1	CLIMAAXKòrsou D1 — Barcelona workshop poster	https://climaax.kajoservices.com/documents/1725
3	D2	CLIMAAXKòrsou D2 Deliverable — Phase 2 v3.0 (April 2026)	https://climaax.kajoservices.com/documents/1723
4	D3	CLIMAAXKòrsou D3 Deliverable — Phase 3 (July 2026)	*[to be added upon publication]*

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    - Heat Stress — CLIMAAXKòrsou (DOI 19273018)
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