Socio-Economic Benefits (SEB) Assessment of Climate Services in the Agriculture and Disaster Risk Reduction Sectors – Cameroon

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Plan of Presentation

- Contexte and Rationale
- Overall objectives
- Strategic framework for analyzing SEB of CIS on Agriculture and DRR
- Assessment scope and Methodology of SEB
- Case Studies – Climate Services and SEB Evaluation

Contexte and Rationale

- Climate Information Services (CIS): (a) converts weather/climate data into useful, tailored information; (b) supports better decision-making in agriculture & disaster management and (c) provides benefits are **social, economic, and environmental** (Zillman, 1999; WMO, 2015).

- **Importance of CIS in Agriculture**: (a) choose planting times, crop types; (b) optimises livestock breeding activities; (c) reduce yield losses (Hansen et al., 2011) and (d) enhances food security and rural livelihoods.

- **Importance of CIS in DRR** : (a) provides early warnings for floods, droughts, extreme weather; (b) supports contingency planning and timely community response and (c) reduces human and economic losses (SPREP, 2016; Cheng et al., 2020).

Contexte and Rationale con't

Cameroon's Vulnerability

- ✓Geographically diverse: major climate zones of Africa.
- ✓Ranked **155th/171** in ND-GAIN (2022) for climate adaptation.
- ✓Rising temperatures & erratic rainfall increase risk.
- ✓Agriculture employs **70% of population** (WWF, 2022).

Climate Impacts and Projections

- ✓**0.86°C increase** in average temperature (1974–2020).
- ✓**2.9 mm/decade** decline in rainfall since 1960.
- ✓Recurring droughts in Far North threaten food systems & cause migration.
- ✓**GDP losses up to 10%** by 2050 without adaptation (IMF, 2024).

Contexte and Rationale con't

Logframe – Agriculture Sector

Goal: Enhanced yields, reduced losses, improved livelihoods.

Purpose: Climate info used in farm planning and crop choices.

Outputs: Localized bulletins, farmer training, SMS/radio dissemination.

Inputs: Funding, skilled staff, ICT tools, national/international support.

Logframe – Disaster Risk Reduction

Impact: Reduced fatalities & damage; improved community resilience.

Purpose: Climate data integrated into DRR plans & response.

Outputs: Early warnings, risk maps, trained responders.

Inputs: Weather data systems, skilled personnel, software & financing.

Contexte and Rationale con't

- Rationale for Strengthening CIS : (a) CIS improves resilience in agriculture and DRR; (b) enables data-driven planning, resource optimization, and risk reduction; (c) integrates scientific forecasts and local knowledge and (d) supports national adaptation strategy and Vision 2035.

- Key Takeaways: (a) CIS are critical for adaptation in climate-vulnerable sectors; (b) CIS enable informed decision-making and reduce risks; (c) strengthening CIS requires coordination, investment, and capacity building and (d) prioritize user-centered services, especially in local languages.

Overall objectives

Main Objective:

To undertake a **Socio-Economic Benefit (SEB) assessment** of Climate Information Services (CIS) in the **agriculture** and **disaster risk management (DRM)** sectors in **Cameroon**.

Focus:

Evaluate how CIS provided by the **Department of National Meteorology (DNM)**—and supported by **ClimSA**, **WMO**, and **ACMAD**—contribute to: (a) b**etter decision-making; (b) increased resilience and (c) enhanced productivity**

Specific objectives

Specific Objectives (1–2)

(1) Identify an **appropriate SEB assessment methodology**

- Context-specific and
- Replicable across sectors/institutions in Cameroon

(2) Analyse the **socio-economic benefits** of CIS for:

- **SODEPA**, **CDC**, **HEVECAM**
- Focus: **Productivity**, **Cost reduction**, **Risk mitigation**, **Operational efficiency**

Specific Objectives (3–4)

(3) Assess SEBs in **Disaster Risk Management (DRM)**

- Focus on vulnerable areas (e.g., **DCC**)
- Target: **Flooding**, **Extreme weather**

(4) Provide **practical and actionable recommendations**

- Improve CIS **design**, **delivery**, and **uptake** in agriculture and DRM

Strategic framework for analysing SEB of CIS on Agriculture and DRR

Theory of Change (ToC):

a) Helps assess how CIS from the DNM contributes to: (a) i**mproved livelihoods; (b) reduced disaster losses and (c) enhanced resilience** in agriculture and DRR

b) Supports national planning (Vision 2035, NAP, SDGs)

c) Based on inputs → activities → outputs → outcomes → impact (WMO, 2019)

Enabling Conditions and Risks

- **Key Assumptions:**
  - Accurate & timely CIS
  - Effective dissemination infrastructure
  - Institutional collaboration
- **Risks:**
  - Low user literacy
  - Delayed forecast delivery
  - Weak inter-agency coordination

ToC for Agriculture Sector

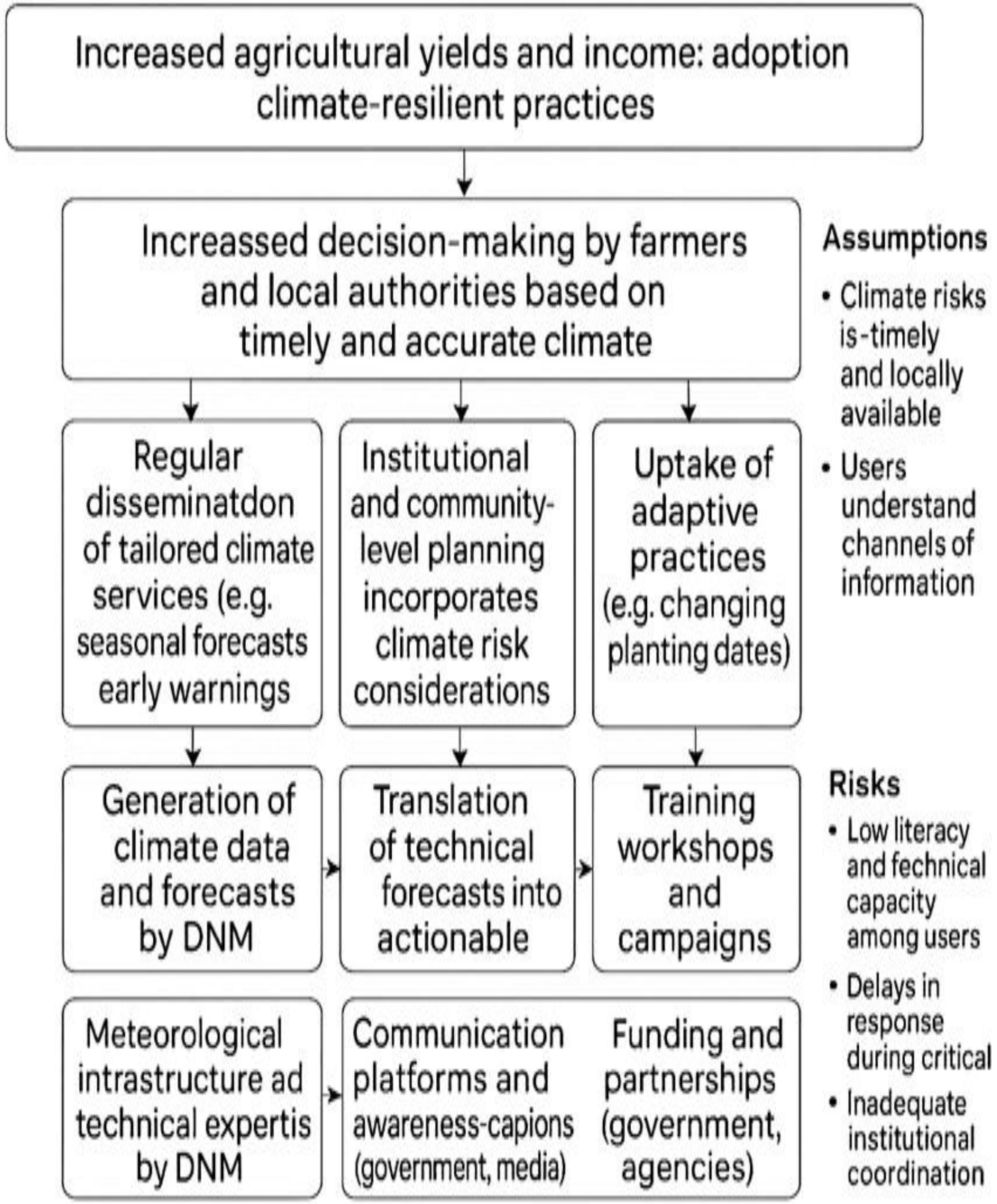
Inputs: Infrastructure, skilled personnel, ICT tools, institutional support

Activities: Forecast generation, advisories, farmer training

Outputs: SMS/radio bulletins, localized forecasts, awareness campaigns

Outcomes: Adaptive behaviours—e.g., better planting decisions, risk planning

Impact: Higher yields, reduced losses, income stability, food security



ToC for DRR Sector

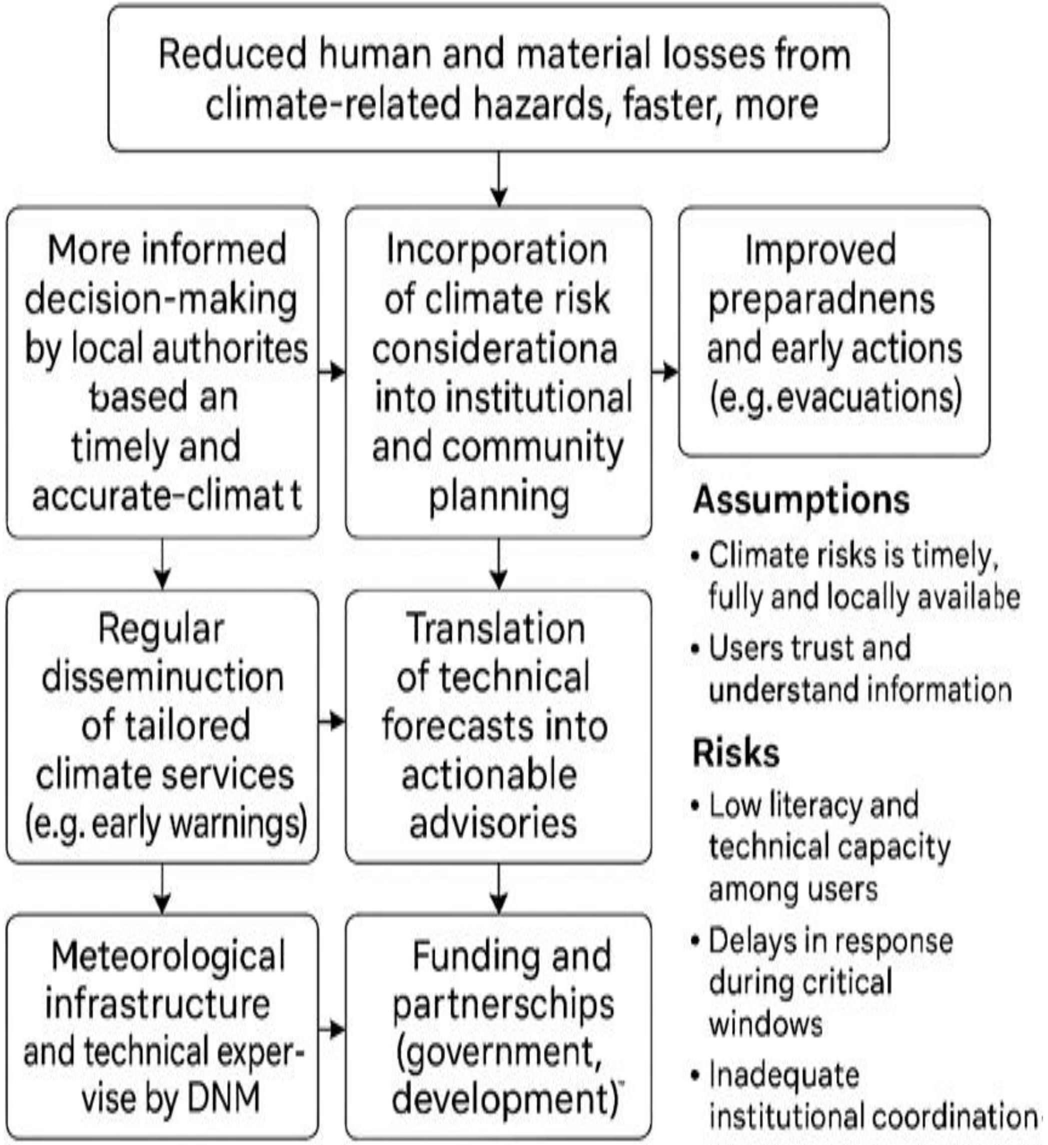
Inputs: Weather stations, modelling tools, DRR funding

Activities: Early warning systems (EWS), risk mapping, DRR training

Outputs: Alerts issued, hazard maps, trained local responders

Outcomes: Improved emergency preparedness and faster response

Impact: Reduced fatalities, avoided damage, community resilience



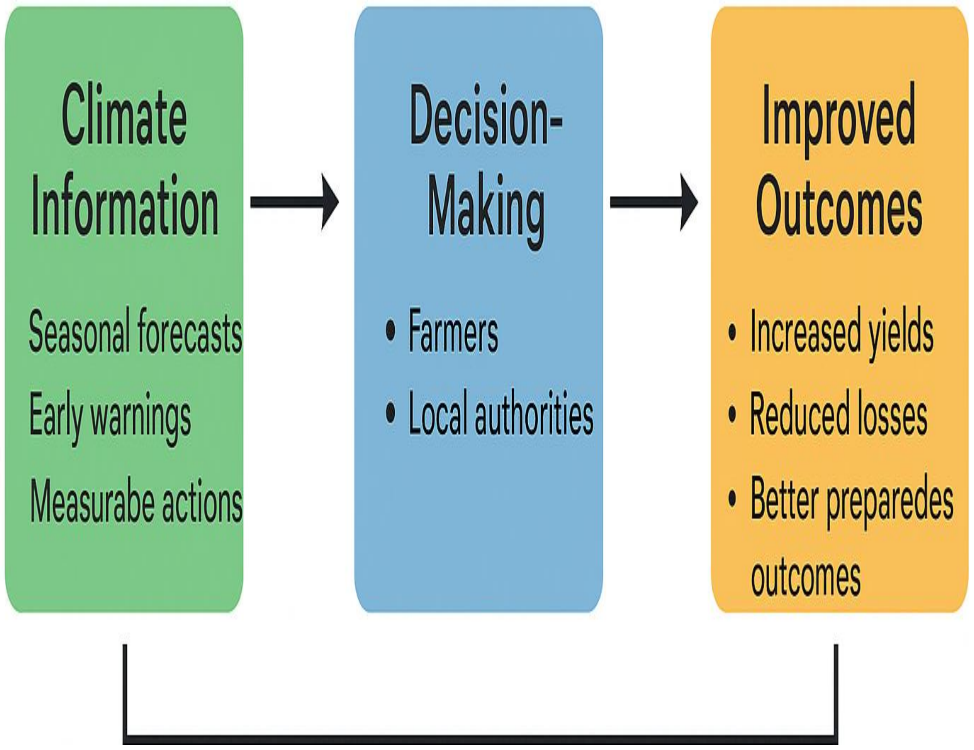
Conclusion & Application of using ToC

ToC offers a transparent, evidence-based framework for evaluating SEB.

Supports Cost-Benefit Analysis, avoided loss estimation, and impact tracking.

Strengthens investment cases for CIS in agriculture and DRR.

Aligns with WMO and ACMAD guidelines for multi-sectoral resilience.



Assessment scope and Methodology of SEB

Focus sectors: Agriculture and DRR

- **Methodology combines**:
  - **Theory of Change (ToC)**
  - **Cost-Benefit Analysis (CBA)**
  - **Stakeholder Surveys**
- Anchored in **WMO SEB Handbook** and **ACMAD/WMO guidelines**

Cost-Benefit Analysis (CBA) in SEB Assessments

Agriculture: Evaluates yield gains, income increases, input efficiency

Example: BCR = 6.7 (100M FCFA gain vs. 15M FCFA cost)

DRR: Measures avoided losses, lives saved, reduced response costs

Example: BCR = 8.0 (20M FCFA avoided loss vs. 2.5M FCFA cost)

Assessment scope and Methodology of SEB

Impact Assessment Using CBA

a) **CIS enables**: (a) Higher yields, reduced crop losses (Agriculture) and (b) Mortality reduction, property protection (DRR)

b) **Tools**: Net Present Value (NPV), Benefit-Cost Ratio (BCR)

c) Captures both **tangible and intangible benefits**

Stakeholder Engagement in SEB Analysis

Inclusive approach aligned with Theory of Change

Agriculture stakeholders: MINADER, IRAD, DNM, farmers, FAO

DRR stakeholders: MINAT, DNM, ONACC, civil protection, UN agencies

Roles: Service co-design, dissemination, training, feedback, monitoring

Empirical Operationalization of ToC–CBA for SEB

Step 1 & 2 – Operationalize ToC and Define Causal Chains

Transform ToC into measurable indicators:

- **Inputs:** Weather stations, staff trained, ICT tools
- **Outputs:** Forecasts issued, number of users reached
- **Outcomes:** Yield increases, loss reductions

Test Causal Links:

- **Input → Output:** Input-output regression
- **Output → Impact:** Logistic regression, Structural Equation Models

Empirical Operationalization of ToC–CBA for SEB

Step 3 & 4 – Measurement Framework & CBA Integration

Measurement Alignment:

- % of farmers adopting CIS → Surveys
- Income growth → INS, farm records
- Avoided DRR losses → Time-series analysis

CBA Formula:

Net SEB = ∑(Benefits) - ∑(Costs)

- **Benefits:** Higher yields, lives saved, cost reductions
- **Costs:** Infrastructure, training, personnel, ICT

Limitations of using ToC and CBA for SEB Assessment

- Attribution challenges: Hard to isolate CIS impact from other influences
- Monetization issues: Intangible benefits (e.g., confidence, coordination) undervalued
- Model uncertainty: Reliance on assumptions and estimates
- Data limitations: Especially in rural and high-risk zones
- Equity gaps: CBA may overlook gender and vulnerability disparities
- Resource-intensive: Requires technical, financial, and coordination capacity
- Cameroon context: Limited long-term data; early-stage CIS partnerships (e.g., CDC, SODEPA, DCC)

CDC Case Study – Climate Services and SEB Evaluation

CDC: State-owned agro-industrial company (est. 1947)

Key Crops: Palm oil, rubber, bananas

Climate Sensitivities: Rainfall, humidity, pests

CIS Delivery: 2–3 day forecasts via WhatsApp (from DNM)

Geographical Reach: South-West & Littoral regions

Collaboration: New partnership with DNM

Highlighted Benefits:

a) Improved productivity from tailored forecasts
b) Increased operational efficiency
c) Enhanced resilience to weather-related risks

CDC Case Study – Climate Services and SEB Evaluation

Climate Services Impact Grid – Summary		
Impact Area	Positive Impact (Benefits)	Priority
Plantation Operations	Improved planning, crop protection, labor optimization	Very High
Pest & Disease Management	Early treatment, reduced losses	High
Worker Health & Safety	Reduced disruptions, improved shift timing	Medium
Infrastructure & Logistics	Safeguarded assets, optimized transport	Medium
Water & Resource Management	Better irrigation planning, efficiency gains	High
Long-term Planning	Climate-resilient investments, land-use planning	High

CDC Case Study – Climate Services and SEB Evaluation

Observed Benefits:

- **Yield increases** noted (pending quantification)
- **Fewer work interruptions**
- **Better pest scheduling & treatment**
- **Optimized fertilizer and irrigation**
- **Increased forecast trust**

Challenges:

- Language barriers (French vs. English)
- Forecast timing and format issues
- Infrastructure limitations

CDC –Recommendations

Recommendations to Enhance Benefits:

- Tailored forecasts for each crop type
- Expand training for interpreting and applying forecasts
- Establish a dedicated Climate Services Coordination Unit
- Improve infrastructure (weather stations, data systems)
- Integrate CIS into logistics and workforce planning

SODEPA Case Study

Established: 1974 under MINEPIA

Mission: Improve livestock productivity and food security

Operations: Ranches (Faro, Ndokayo, Dumbo, Jakiri), slaughterhouses (Yaoundé, Douala, Ngaoundéré)

Environmental Focus: Rotational grazing, biogas, climate-smart practices

Integrated Overview Table

Activities & Products

- Livestock breeding (cattle, goats, poultry)
- Meat, milk, eggs
- Farmer support & training

Climate Impacts

- Methane emissions → mitigated by biogas
- Deforestation risks → addressed by land management
- Heat stress, water scarcity

SODEPA Case Study

Climate Services Impact Grid – Summary				
Area	Climate Info	Positive Impact	Limitations	Priority
Pasture	Rainfall forecast	Strategic hay storage	Data not ranch-specific	Very High
Water	Drought alerts	Better supply planning	Generic regional info	High
Animal Health	Pest/disease forecast	Reduced mortality	Weak vet-climate link	High
Mobility	Rain/flood alerts	Transhumance planning	Limited updates	Medium
Welfare	Heat index	Reduced heat stress	Not yet operationalized	High

SODEPA Case Study

Tangible Benefits:

- Reduced fodder shortages
- Improved cattle survival
- Enhanced feed and health planning

Needs:

- Tailored forecasts
- Infrastructure & training
- Local language tools
- Joint SODEPA-DNM action plan

SODEPA – Key Recommendations

Strategic Actions:

- Co-develop a multi-year Joint Action Plan with DNM;
- Establish a Shared Data Platform for livestock-specific climate info;
- Prepare Technical Dossiers to access climate adaptation funding

- **Priority Tools & Services:**
- Customized weather bulletins for livestock production cycles;
- Localized early warning systems (droughts, disease, heat stress);
- Meteorological monitoring systems for ranch zones;
- Integration of climate data into operational & strategic planning

HEVECAM SA Case Study

Established: 1975 (privatized in 1996)

Location: South Region, Kribi area (Niété, Bissiang, Elogbatindi)

Products: Natural rubber, creamed latex

Contribution: 2% of Cameroon's export revenue

Environmental/Social Commitments: FSC certification, reforestation, social infrastructure

Challenge Highlight: Linked to deforestation and indigenous community displacement

HEVECAM SA Case Study

Access and Application of Climate Services

- **Sources:** DNM (seasonal, decadal, short-term bulletins)
- **Integration:** Planning, tapping, fertilization, worker deployment
- **Frequency of Use:** Daily to seasonal
- **Observed Outcomes:**
  - 2–5% annual loss reduction
  - Up to 20% monthly input and labor loss avoidance
  - Improved task rescheduling and risk mitigation
- **Limitations:**
  - No formal SOPs
  - Forecasts not localized enough

Barriers and Community Outreach

- **Challenges:**
  - Manual data collection
  - Delayed and generic forecasts
  - Lack of formal staff training
- **Suggested Solutions:**
  - Internal climate coordination unit
  - Feedback and co-development platform with DNM
  - Improved infrastructure and automation
- **Community Impact:**
  - Workers and families sensitized
  - Plan to extend forecast access to Bagyeli communities

HEVECAM SA Case Study

Climate Services Impact Grid – Summary				
Impact Area	Climate Service Provided	Positive Impact	Limitations/Barriers	Priority Level
Plantation Management	Seasonal & decadal forecasts	Optimized planning for planting & tapping	Forecasts not localized	High
Rubber Yield & Quality	Real-time weather data	Improved latex collection & disease control	No real-time alerts, no economic tracking	Very High
Soil and Water Management	Rainfall & soil moisture forecasts	Guides irrigation & erosion management	Lack of technical training	High
Pest and Disease Control	Pest outbreak alerts	Early fungicide/biocontrol use	Weak climate-pest modeling	Medium
Occupational Safety	Heatwave & storm forecasts	Worker protection & safe task scheduling	Low alert dissemination	Medium
Logistics and Transport	Rainfall/storm road forecasts	Better logistics & delivery timing	Poor infrastructure	Medium
Long-term Investment Planning	Climate projections & trends	Informs climate-smart investment	Data underused, delays	High
Environmental Sustainability	Climate data for forest protection	Reduces deforestation risks	Weak monitoring systems	High

HEVECAM-Recommendations

Strengthening Climate Services for HEVECAM

Actions Needed:

- Customize forecasts for plantation zones
- Increase update frequency and simplify presentation
- Formalize staff training and data protocols
- Institutionalize climate data in operational manuals

Expected Benefits:

- Better task scheduling
- Reduced absenteeism
- Improved yield quality
- Enhanced corporate resilience

DCC Case Study

Established: 1987 (Decree No. 87/1366)

Core Mandates: (1) Urban Planning; (2) Infrastructure Development; (3) Public Services; (4) Environmental Management and (5) Economic Development

Climate Challenges:
•Flooding
•Rising temperatures
•Sea-level rise

•**Key Programs**:
•UPIMC (UN-Habitat)
•Green Space Management
•CLUVA Flood Risk Program

DCC Case Study

Climate Services Impact Grid – Summary				
Hazard/Risk	**CIS Provided**	**Positive Impact**	**Limitations**	**Priority**
Floods & Storms	Real-time alerts via WhatsApp, bulletins	Early evacuation, casualty reduction	Lack of early warning systems	Very High
Heavy Rainfall	Seasonal forecasts	Guides drainage & infrastructure planning	Non-compliance with city planning	High
Heatwaves	Temperature projections	Reduces heat-related illness	Limited logistics	High
Public Health	Forecasts for cholera/malaria	Enables early action	Coordination gaps	High
Infrastructure	Forecast for extreme weather	Aligns works with safe weather windows	No SOPs; lack of training	High
Transport	Real-time flood alerts	Anticipates road access disruptions	Weak data systems	Medium
Community Resilience	Risk awareness via bulletins	Loss reduction; civic awareness	Language/literacy barriers	High

DCC Case Study

Impact Themes and Stories

Operational Integration:

- Infrastructure planning aligns with forecast data
- Excavation bans aligned with rainfall peaks

Community Benefits:

- Info broadcast via local radios & platforms
- Students increasingly consult forecasts

Workforce Efficiency:

- Weather-calibrated task planning reduces material waste

Governance and Gaps:

- No current SOPs but ongoing development
- Lacks trained personnel & budget for CIS expansion

DCC – Key Recommendations

- Establish SOPs for climate service integration in DCC
- Create a Climate Coordination Unit within the Council
- Increase bulletin frequency and tailor forecasts for DRR actions
- Institutionalize CIS into urban planning and infrastructure decisions
- Strengthen coordination with DNM and local communities

Key Takeaways – SEB of Climate Services in CMR

❑**CIS Enhance Productivity and Risk Management**

a) Improved planning and early warning at SODEPA, CDC, HEVECAM, and DCC.

b) Supports anticipatory over reactive decisions.

❑**Non-Monetary Benefits Strengthen Institutions**

a) Better planning, staff confidence, and coordination.

b) Fostered collaboration between DNM and users.

❑**Theory of Change + CBA Methodology is Effective**

a) Merges qualitative and quantitative outcomes.

b) Adaptable even in data-constrained settings.

❑**Scaling Requires Institutionalization and Co-Development**

a) CIS integration in planning, budgeting, training.

b) Recommendations cover data, capacity, feedback.

THANK YOU FOR YOUR ATTENTION

MERCI