



World Meteorological Organization

Working together in weather, climate and water

Strengthening Regional Cooperation to Support Forecasting with Multi-Hazard Approach in RA IV

Background

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Chief of Disaster Risk Reduction Programme

7 March 2011

Georgetown, Cayman Islands

Strengthening national and regional institutional capacities for delivery of Meteorological, Hydrological, Marine and Climate Services to support



1

Alignment of clear policies, legislation, planning, resources at national to local Levels (Multi-sectoral, Multi-agency)

Risk Assessment

Historical Hazard databases
Hazard statistics
Climate forecasting and forward looking hazard trend analysis

2

Exposed assets & vulnerability

Risk Reduction

Preparedness (saving lives):
early warning systems
emergency planning and response

3

Prevention (Reduction of economic losses):
Medium to long term sectoral planning (e.g. zoning, infrastructure, agriculture)

4

Risk Transfer

CATastrophe insurance & bonds
Weather-indexed insurance and derivatives

5

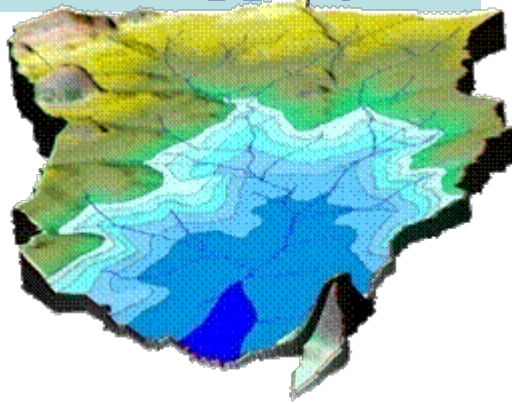
Information and Knowledge Sharing
Education and training across agencies

6



Understanding the Risks requires a variety of Meteorological, Hydrological, and Climate data and information!

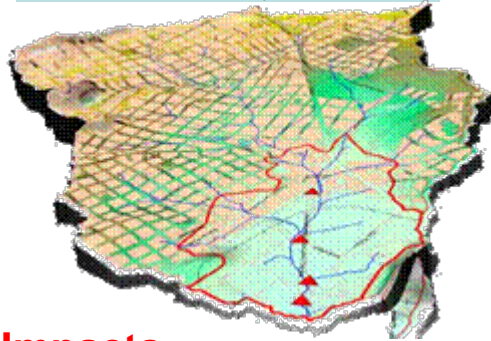
Hazard Analysis and Mapping



Heavy Precipitation and flood mapping

Need for historical and real time data
Statistical analysis tools
climate forecasts and trend analysis

Exposure and Vulnerability



- Impacts:**
- ✓ population density
 - ✓ agricultural land
 - ✓ urban grid
 - ✓ Infrastructure
 - ✓ Businesses

Need for Socio-economic impacts data and analysis tools

Potential Loss Estimates

Number of lives at risk

\$ at risk

- ✓ Destruction of buildings and infrastructure
- ✓ Reduction in crop yields
- ✓ Business interruption

Need for risk assessment tools combining hazard, asset and exposure information

This information is critical for decision-making and development of strategies to reduce the risks



Early Warning Systems Require Coordination Across Many Levels and Agencies

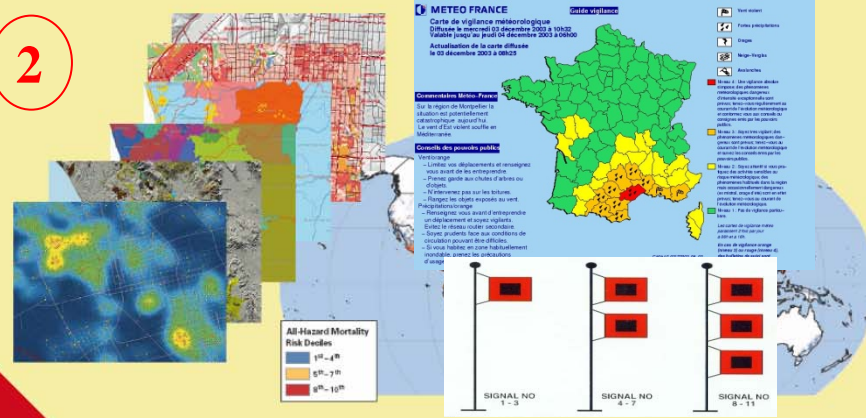
National to local disaster risk reduction plans, legislation and coordination mechanisms



Hazard Data and Forecasts

1

2



Risk Information



Communication and Dissemination Mechanisms

3

4

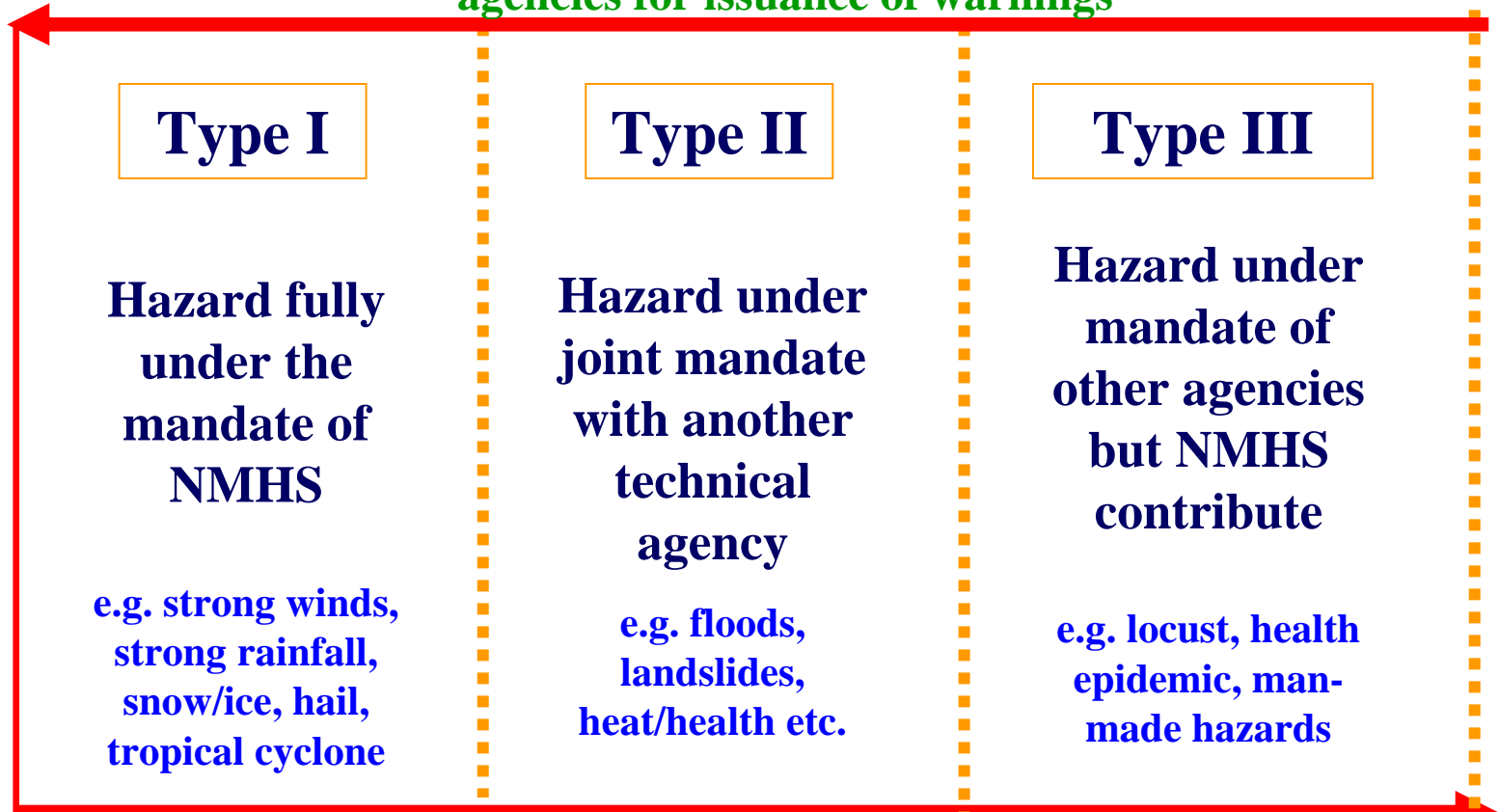


Preparedness and Early Response



Coordination and Cooperation with National Hydro-Met Services

Increasing Level of coordination with civil protection and risk management agencies for issuance of warnings



Increasing Level of coordination with technical agencies for early detection, monitoring and development of warnings



Building national and regional capacities with service delivery focus

Leveraging regional and international cooperation

Reduction of **Risks**: Life, economics

National ~~Multi-sector~~ Multi-agency coordination and planning at national to local levels

DRM and civil protection, agriculture, health, water resource management, infrastructure and planning, insurance and financial markets, etc

Products and Service Delivery

Capacity Building

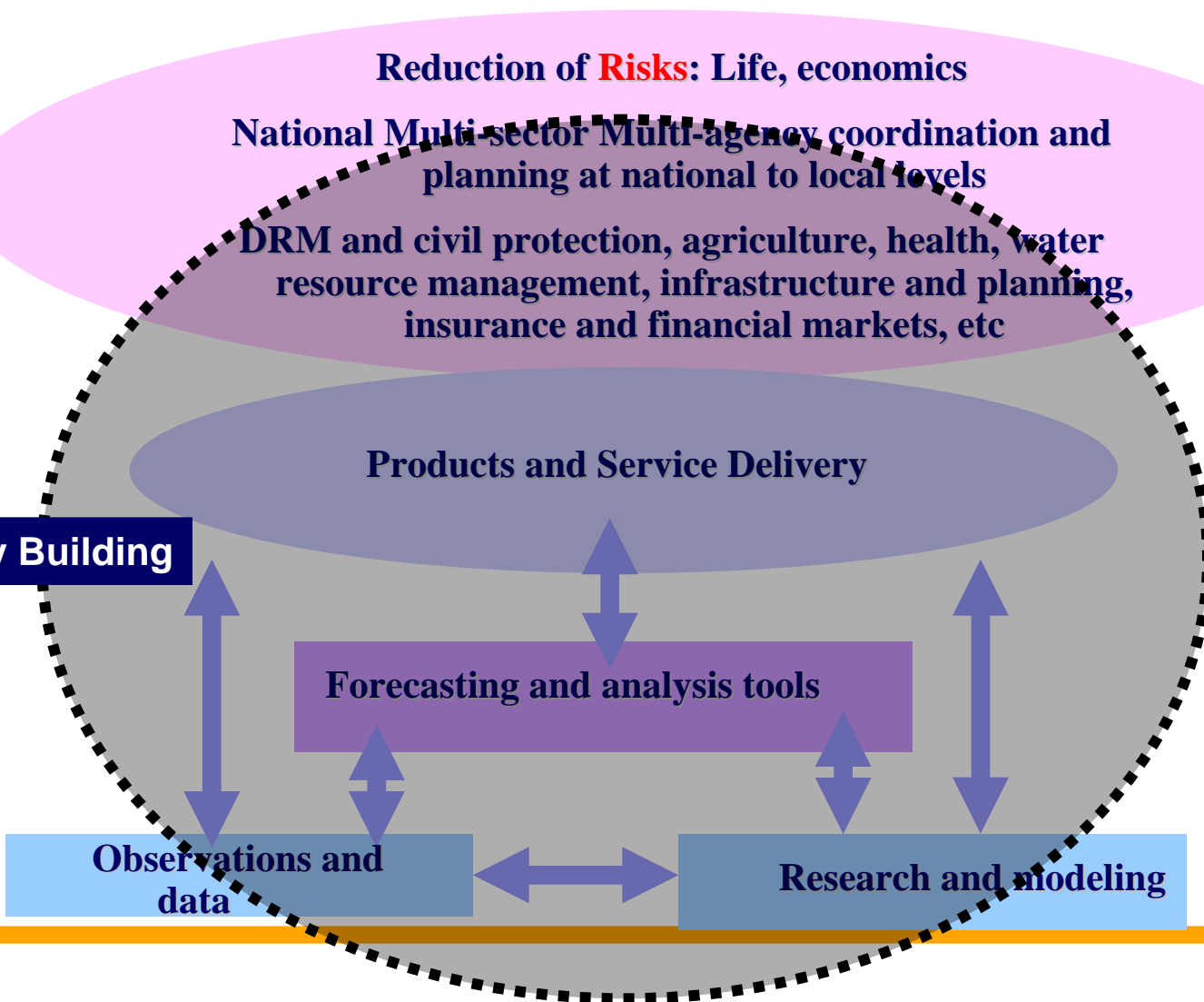
Forecasting and analysis tools

Observations and data

Research and modeling

Regional aspects

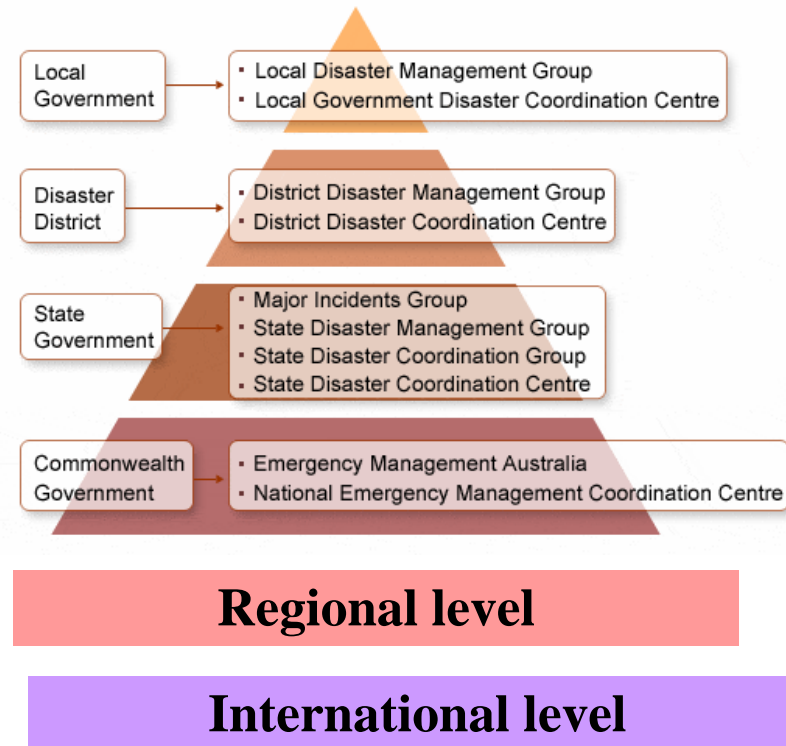
International aspects





DRR Capacity Development Implementation approach

- Risk-based
- Multi-sector institutional mapping and consultations (national, regional)
- Identify, segment and understand user needs and priorities
- Review and assess capacities and gaps
- Define and implement Phased projects with in long-term Capacity development approach
- Integrated projects (WMO Programmes, commissions)
- leveraging partnerships and bi- and multi-lateral cooperation
- Sustainability





Initiatives and pilot projects in RA IV

Central America

The Caribbean



Early Warning Systems with Multi-Hazard Approach Pilot Project – Central America

- Pilot Countries:
 - Costa Rica (World Bank Funded)
 - El Salvador (NOAA – USAID funded)
 - Mexico (Government and NOAA – USAID funded)
 - National multi-agency cooperation (Met/Hydro/DRM)
 - Multi-level (Regional, National, Local)
 - Focus: Flash Flood-Riverine Flood Warning Systems
 - Partners: WMO, NOAA-NWS, UNDP, World Bank
-



The Caribbean





Goal

**Strengthening Meteorological, Hydrological
and climate services at national and regional
levels to support risk assessment and multi-
Hazard Early Warning Systems**

**Focus sectors: DRM, Agriculture and Food Security,
Water Resource Management, Planning and
Development Sectors**



Where ?

Strengthened coordination and cooperation across British, French, Dutch and Spanish Speaking countries and territories



Antigua and Barbuda, Aruba, the Bahamas, Barbados, Bermudas, the British Caribbean Territories, the Caribbean Netherlands, Cuba, Curacao, Dominica, the Dominican Republic, the French West Indies, Grenada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint-Marteen, Saint Vincent and the Grenadines, and Trinidad and Tobago also including Beliz and Surinam



Who?

Key Stakeholders in the region have been engaged

✓ **National:**

- Beneficiaries:
 - National Meteorological and Hydrological Services (NMHS) and Disaster Risk Management (DRM) Agencies and other key ministries of the beneficiary countries.
 - Other ministries, specifically, finance and planning, agriculture, water resource management and coastal zone management
- Contributing Countries: USA, Finland, France, Canada, Spain, others (TBD)

✓ **Regional:**

- Regional centers and agencies of CARICOM: CDEMA, CMO and its CIMH;
- WMO RA IV and its DRR and Hydrology Task Teams, WMO RA IV Hurricane Committee, the WMO RSMC – Miami Hurricane Center
- Regional agencies and platforms: ACS, OAS, Caribbean Development Bank (CDB)

✓ **International and donors:**

- UN and International Agencies: WMO, UNDP, UNESCO-IOC, etc.
- Bi-lat donors and development banks: IADB, World Bank, USAID/OFDA, Canada (CIDA), Finland (MFA), Spain (ACE), Japan (JICA), others (TBD) etc.



How?

Long-term Capacity Development (8 years) with phased project management (2-yr cycle)

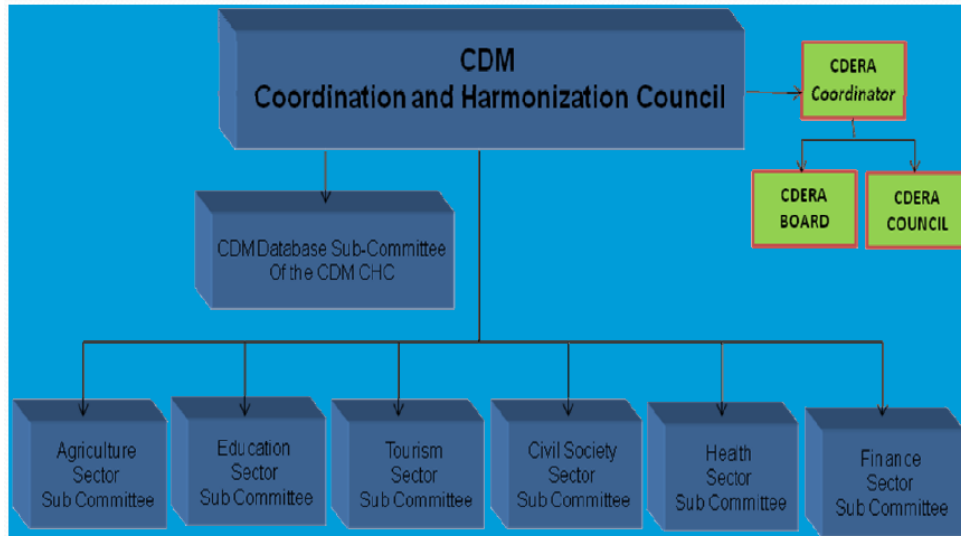
- **2010-2011**: Development of programmatic and technical aspects
Long-term capacity development and phase-I project priorities
- **2011**:
 - Phase-I (multi-component) project implementation plan and project governance
 - Institutional mapping and partnerships for implementation(national and regional)
 - Resource mobilisation strategy and coordination with the donors
 - Regional mechanisms for multi-stakeholder coordination, sharing progress, experiences, monitoring and evaluation
- **2012**: Phase-I Project (multi-component) to be Launched



Linking to priorities of regional DRR strategy and platforms

- CARICOM
 - CDEMA – Comprehensive Disaster Management (CDM)

The CDM Governance Structure



Country type	Country name	REGIONAL ARRANGEMENT									
		ACS	OAS	CARICOM	CARIFORUM	OECs	CDEMA	ALBA	CMO-CMH	CDB	EU
ACP	ANTIGUA & BARBUDA	M	M	M	M	M	M	M	M	M	
ACP	BAHAMAS	M	M	M	M	M	M		M	M	
ACP	BARBADOS	M	M	M	M	M	M		M	M	
ACP	BELIZE	M	M	M	M		M		M	M	
ACP	CUBA	M			M			M			
ACP	DOMINICA	M	M	M	M	M	M	M	M	M	
ACP	DOMINICAN REPUBLIC	M	M		M						
ACP	GRENADA	M	M	M	M	M	M		M	M	
ACP	GUYANA	M	M	M	M	M			M	M	
ACP	HAITI	M	M	M	M	M	M		M	M	
ACP	JAMAICA	M	M	M	M	M	M		M	M	
ACP	ST KITTS AND NEVIS	M	M	M	M	M	M		M	M	
ACP	ST LUCIA	M	M	M	M	M	M		M	M	
ACP	ST VINCENT AND THE GRENADINES	M	M	M	M	M	M	M	M	M	
ACP	SURINAME	M	M	M	M	M	M		M	M	
ACP	TRINIDAD & TOBAGO	M	M	M	M				M	M	
FR OR	GUADELOUPE	AM(FR)									M
FR OR	MARTINIQUE	AM(FR)									M
FR OR	ST BARTHELEMY	AM(FR)									M
FR OR	ST MARTIN	AM(FR)									M
NL OCT	ARUBA	AM									
NL OCT*	BONAIRE	AM(NA)									
NL OCT	CURACAO	AM(NA)									
NL OCT*	SABA	AM(NA)									
NL OCT*	ST EUSTASIUS	AM(NA)									
NL OCT	ST MAARTEN	AM(NA)									
BCT	ANGUILLA			AM		AM	M		M	M	
BCT	BERMUDA			AM							
BCT	BVI			AM		AM	M		M	M	
BCT	CAYMAN ISLANDS								M	M	
BCT	MONTSERRAT			AM		M	M		M	M	
BCT	TURKS AND CAICOS ISLANDS	AM		AM			M		M	M	

Regional arrangements in the Caribbean



Roadmap for the project design to strengthen Caribbean Risk Assessment and MHEWS capacities

Consultations, Major Milestones and Timeline



donors



Outcomes to Date:

Reference document produced for programme and project development ...

- **National Roster:** Directors and experts from Met and Hydro services, DRM, Planning, Agriculture and food security and water resource management sector
 - Hydro network needs to be mapped in more details)
 - Agriculture, water resource management sectors need to be mapped further
- **Regional Roster:** Regional agencies supporting DRM
- **Mapping of assessments and projects:** in the region and opportunities for leveraging
- **Relationship** of Met/hydro/DRM agencies countries/territories mapped
- **Identification of capacities, remaining gaps and needs** not addressed through existing projects
- **Priorities for long-term** capacity development (national and regional)
- **Priorities for phase-I** project (multi-component)



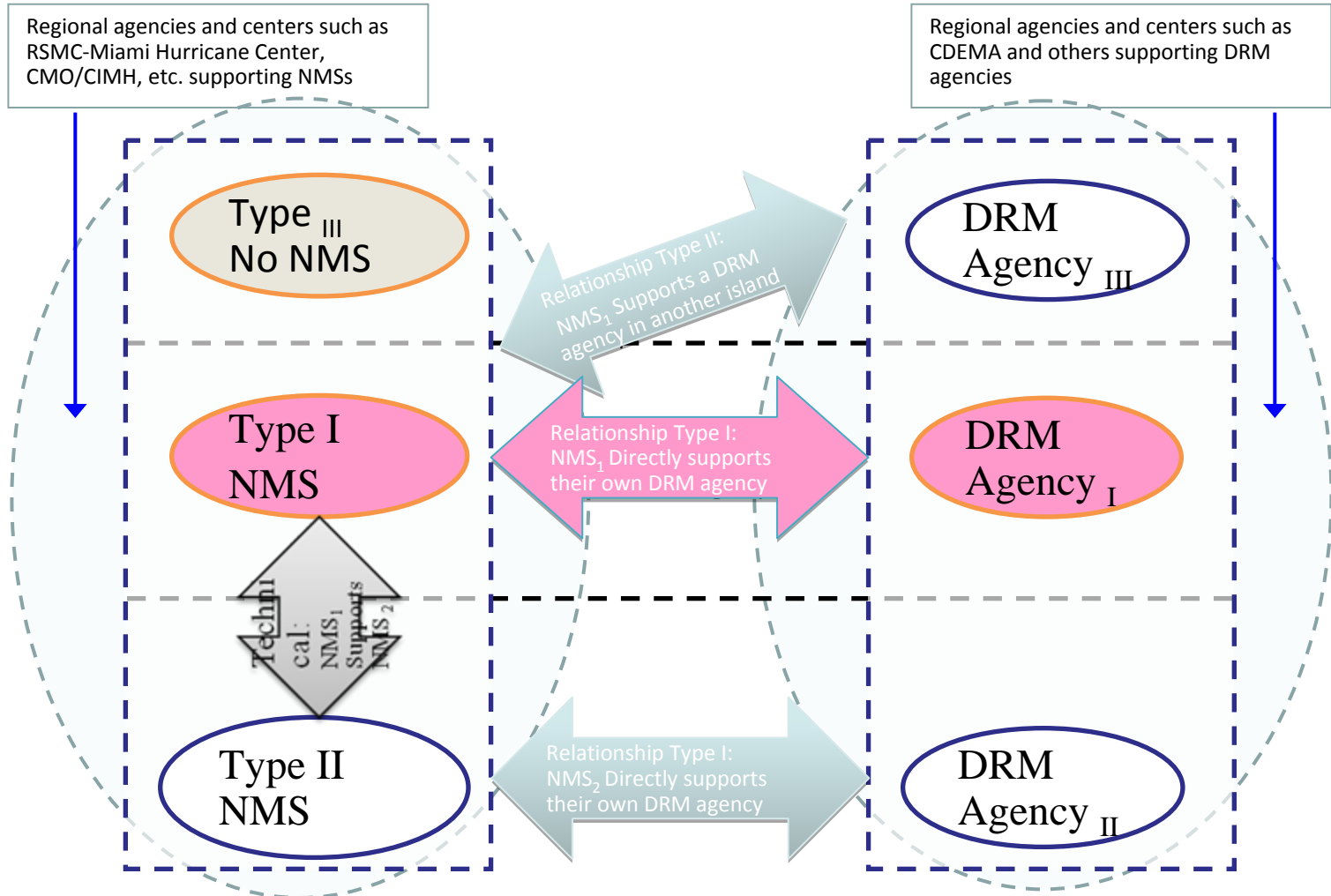
Priority Hazards

- Overall priority hazards for both subregions:
Tropical Cyclones, Storm Surge, High Waves, Flash and Riverine Flooding, Heavy Precipitation, Drought, Land/Mud Slides and Volcanic Eruption
 - Specific hazard priorities vary by country/territory based on geography, orography, seasonal patterns, etc.
-



Complex relationships between Disaster Management Agencies and Meteorological Services

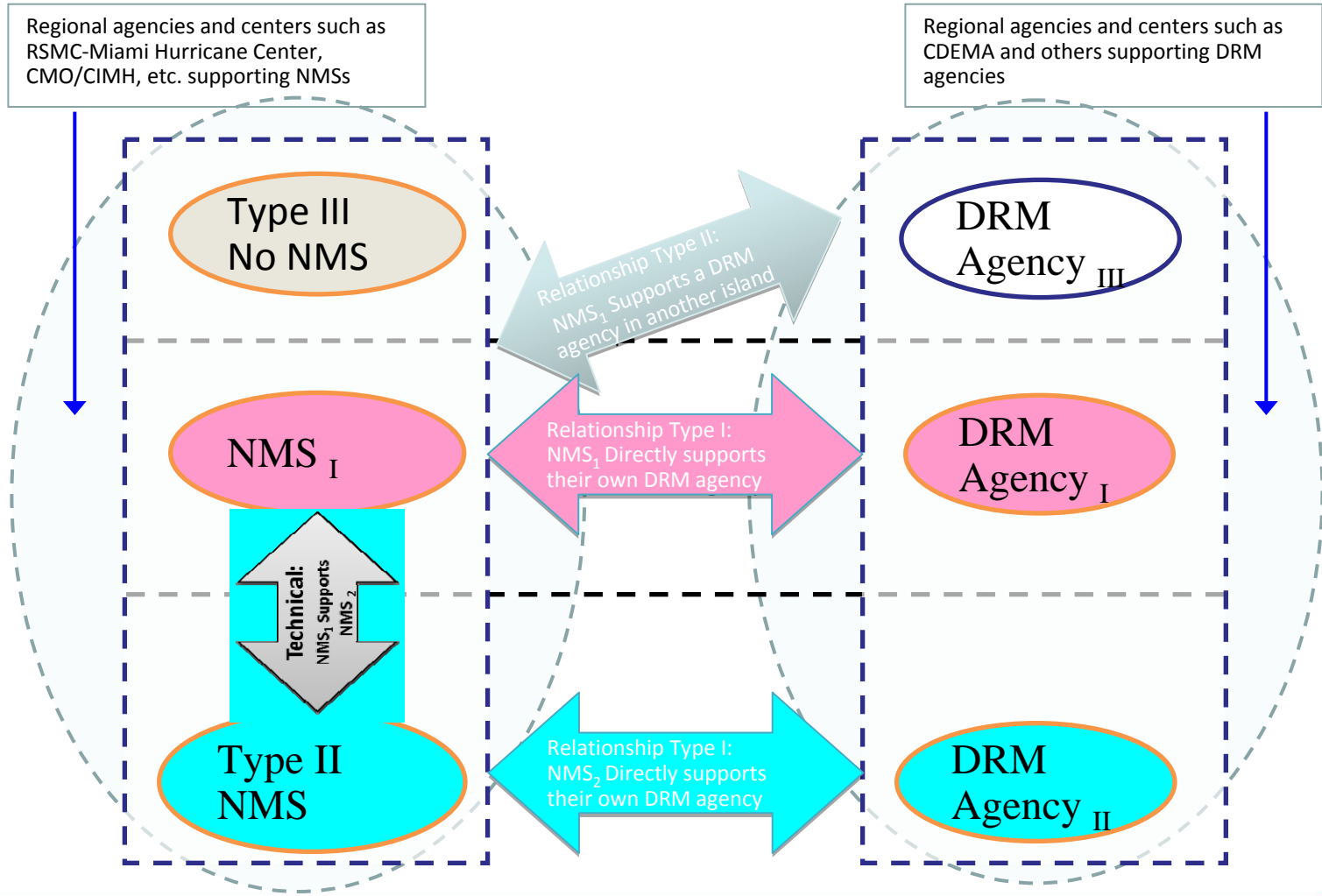
- Type I**
- Antigua & B.
 - Bahamas
 - Barbados
 - Belize
 - Cayman
 - Cuba
 - Curaçao
 - Dominican Rep.
 - Guadeloupe
 - Guyana
 - Haiti
 - Jamaica
 - Martinique
 - St Lucia
 - Suriname
 - Trinidad & T.





Complex relationships between Disaster Management Agencies and Meteorological Services

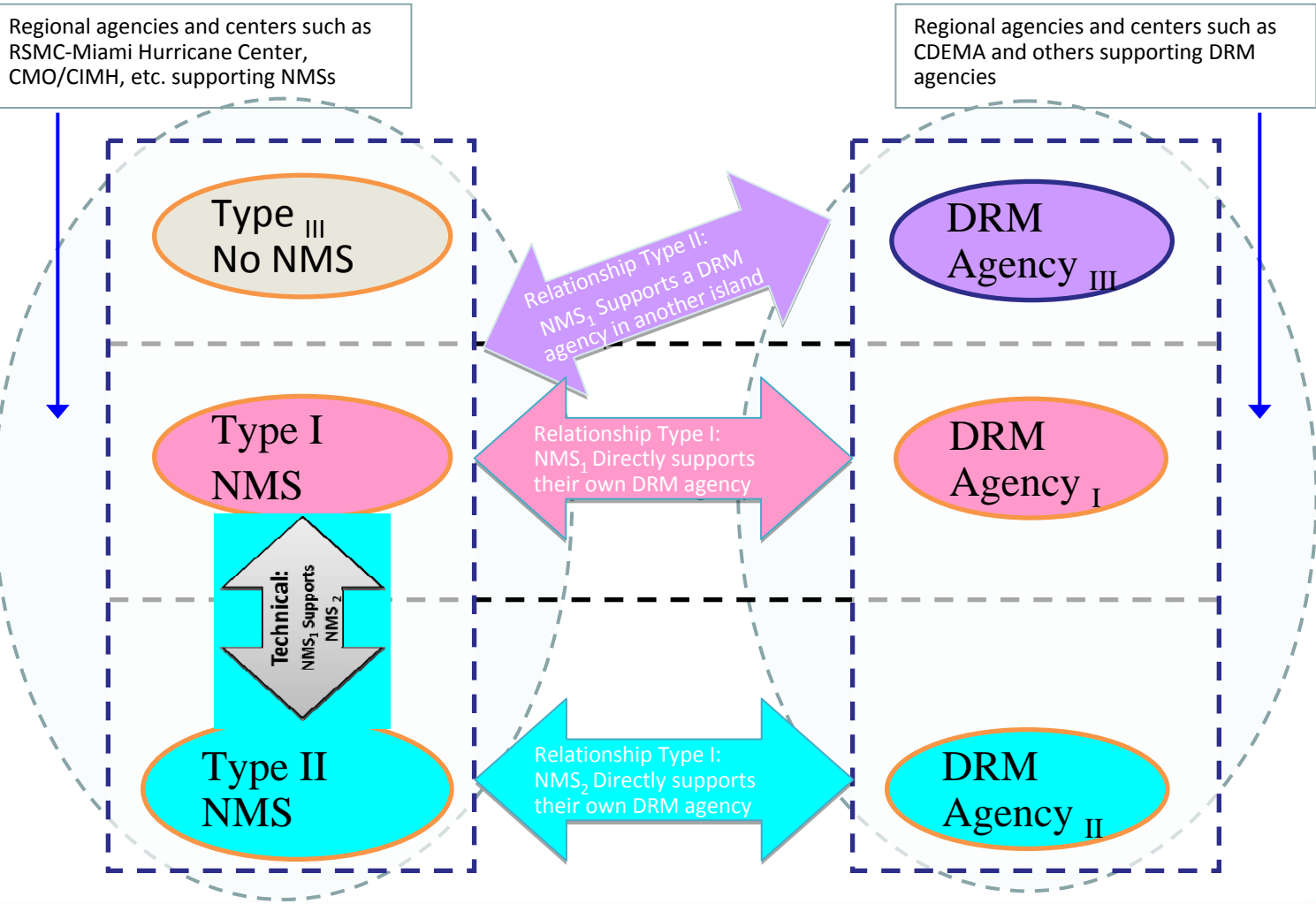
Type II
Barbados
Dominica
St Vincent & G.
Curaçao
Aruba
St Marteen
Trinidad & T.
Grenada





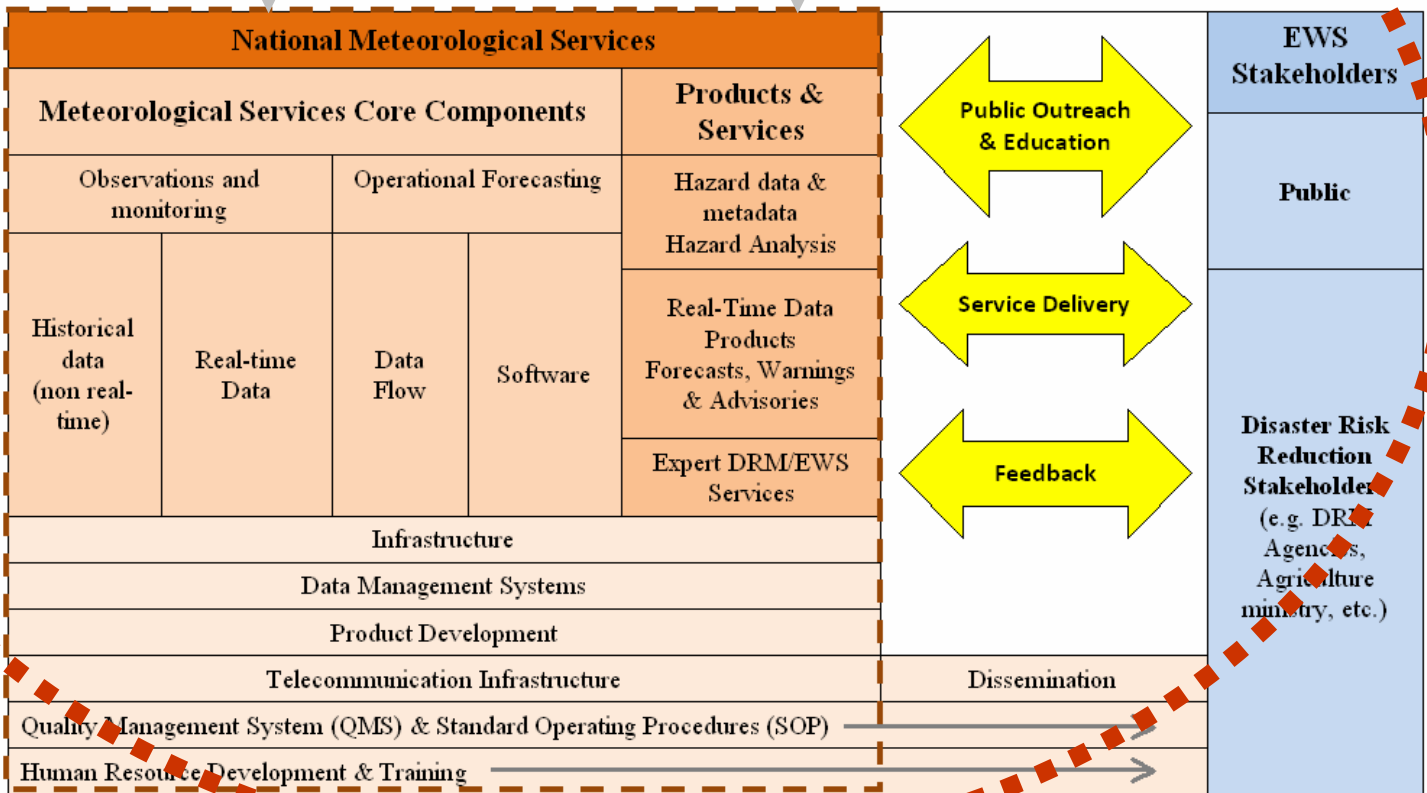
Complex relationships between Disaster Management Agencies and Meteorological Services

- Type III**
Antigua & B.
Anguilla
BVI
Montserrat
St Kitts & N.
Bahamas
Turks and C.
Curaçao
Saba/St Eustatius
Bonaire
Guadeloupe
St Martin/St
Barth





Other Technical Services Cooperating with NMSs and DRM Stakeholders
 (e.g. Hydrological Service, Ocean Services)



DRM

Agriculture and food security

Water resource management

Planning



Need for integrated approach building on existing projects and activities

- Mapped and reviewed existing assessments, projects and programmes
- Visits, consultations throughout the region
- Technical Cooperation Workshop in Barbados to complement information

Major gaps fall at the interfaces

Need for integrated approach to project

Sustainability of capacities

Island lead for DRR Agency	Island status	Does island have a National Disaster Preparedness Plan (NDPP)?	Type of DRR instrument	Policy and legal framework supporting EWS	Operational arrangements between meteorological services and DRR	Cooperation with other agencies (e.g. hydrological services)	Product and Service delivery to support EWS and risk reduction				Core capacities of the Meteorological Services to support EWS				Overarching capacities		Public outreach and educational programmes on EWS	Work and Learning Systems
							Forecasting	Data products (raw and value-added)	Liaison and advisory services	Distribution mechanisms	Monitoring and dissemination	Operational forecasting	Data management and exchange	Product development	IT & telecommunications	QMS		
Category 1: Countries with complete Meteorological Services																		
Antigua & Barbuda	Insd	YES	I	CEM EU WMO2818	RM02000 RM02010 F0217	CEAMP I R020000 R020000	RM02000 RM02010 F0217	CEAMP I R020000 R020000	RM02000 RM02010 F0217	WMO2896 F0217 R020000	R020000 R020000 R020000	YES	WMO2896 F0217 R020000	YES	YES	J020000 J020000 J020000	R020000 R020000 R020000	RM02010 RM02010 RM02010
Bahamas	Insd	YES	I	E.U.2818 WMO2818	RM02004 RM02015	R020000 CEAMP I R020000	RM02004 RM02015	R020000 CEAMP I R020000	RM02004 RM02015	WMO2896 F0217 R020000	R020000 R020000 R020000		WMO2896 F0217 R020000			J020000 J020000 J020000	R020000 R020000 R020000	RM02010 RM02010 RM02010
Barbados	Insd	YES	I	CEM EU.2818 WMO2818	RM02004 RM02015 F0217	R020000 CEAMP I R020000	RM02004 RM02015 F0217	R020000 CEAMP I R020000	RM02004 RM02015 F0217	WMO2896 F0217 R020000	R020000 R020000 R020000	YES	WMO2896 F0217 R020000	YES	YES	J020000 J020000 J020000	R020000 R020000 R020000	F020000 F020000 F020000
Belize	Insd	YES	I	E.U.2818 WMO2818	RM02015 F0217	R020000 CEAMP II R020000	RM02015 F0217	R020000 CEAMP II R020000	RM02015 F0217	WMO2896 F0217 R020000	R020000 R020000 R020000		WMO2896 F0217 R020000			J020000 J020000 J020000	R020000 R020000 R020000	WMO2818 WMO2818 WMO2818
Cuba	Insd	YES	I	E.U.2818 WMO_Ins WMO_2818	WMO_Ins F0217 WMO_2818	WMO_Ins F0217 WMO_2818	WMO_Ins F0217 WMO_2818	WMO_Ins F0217 WMO_2818	WMO_Ins F0217 WMO_2818	WMO_Ins F0217 WMO_2818	R020000 R020000 R020000		WMO_Ins F0217 WMO_2818			J020000 J020000 J020000	R020000 R020000 R020000	WMO_Ins WMO_2818 WMO_2818
Dominican Rep	Insd	YES	I	E.U.2818 WMO2818	RM02000 WMO2818	CEAMP I R020000	RM02000 WMO2818	CEAMP I R020000	RM02000 WMO2818	WMO2896 F0217 R020000	R020000 R020000 R020000	YES	WMO2896 F0217 R020000	YES	YES	J020000 J020000 J020000	R020000 R020000 R020000	WMO2818 WMO2818 WMO2818
Guyana	Insd	YES	I	E.U.2818 WMO2818	RM02010 WMO2818	CEAMP I R020000	RM02010 WMO2818	CEAMP I R020000	RM02010 WMO2818	WMO2896 F0217 R020000	R020000 R020000 R020000		WMO2896 F0217 R020000			J020000 J020000 J020000	R020000 R020000 R020000	WMO2818 WMO2818 WMO2818
Haiti	Insd	YES	I	E.U.2818 WMO2818	RM02000 WMO2818	CEAMP I R020000	RM02000 WMO2818	CEAMP I R020000	RM02000 WMO2818	WMO2896 F0217 R020000	R020000 R020000 R020000		WMO2896 F0217 R020000			J020000 J020000 J020000	R020000 R020000 R020000	WMO2818 WMO2818 WMO2818
Jamaica	Insd	YES	I	CEM EU.2818 WMO2818	WMO2004 WMO2818 F0217	CEAMP I R020000	WMO2004 WMO2818 F0217	CEAMP I R020000	WMO2004 WMO2818 F0217	WMO2896 F0217 R020000	R020000 R020000 R020000		WMO2896 F0217 R020000			J020000 J020000 J020000	R020000 R020000 R020000	WMO2818 WMO2818 WMO2818
St. Lucia	Insd	YES	I	CEM EU.2818 WMO2818	RM02000 RM02010 F0217	CEAMP I R020000	RM02000 RM02010 F0217	CEAMP I R020000	RM02000 RM02010 F0217	WMO2896 F0217 R020000	R020000 R020000 R020000	YES	WMO2896 F0217 R020000	YES	YES	J020000 J020000 J020000	R020000 R020000 R020000	WMO2818 WMO2818 WMO2818



Areas requiring long-term development as identified from extensive consultations

- 1) **Establishment of policies, legislation and institutional arrangements** with clarification of role of national meteorological and hydrological services within different arrangements - Partnerships
 - 2) **Provision of Meteorological, Hydrological and Marine and Coastal hazard databases** (statistical and real-time), metadata and hazard analysis to support **risk assessment**
 - 3) **Service Delivery approach** within the NMHS to support DRM and economic sectors
 - QMS and SOPs developed between NMHS and other DRM and sectoral stakeholders (institutionalizations)
 - Application of WMO service delivery framework
 - 4) **Strengthened operational meteorological, hydrological, marine/coastal and climate forecast products** and training to support target sectors (**national and regional** components)
 - 5) **Coordinated Multi-Hazards early warning systems** in the region
-



Phase-I Project Components(1/2)

- **Component 1:** Policy, legislative and clarification of role and mandates of the NMHS in support of DRM
- **Component 2:** Strengthening of Forecasting Capacities for other priority hazards (nowcasting to longer-term)
 - Strengthening of regional operational products and services
 - Training
- **Component 3:** Warning dissemination, communication, and development of CAP
- **Component 4:** Initiation of QMS and SOPs of NMS and DRM agencies – with a service delivery approach
- **Component 5:** Pilot on (data rescue, data management) observational interoperability, data exchange and hazard analysis within the PPCR Regional Programme



Phase I Proposal Development and Planning Process (2/2)

- **Component 1:** Discussions on April 13-14 With CDEMA, OAS and UNDP for development of this component
- **Component 2:** Technical Meeting on Strengthening Regional Cooperation to Support Forecasting with Multi-Hazard Approach (7 March, Cayman Island)
 - Work plan for phased capacity development and engagement of the regional operational centers
- **Component 3:** Planning meeting for improving Warning dissemination, communication proposal with PWS and WIS (April 1, 2011, Miami, USA)
 - Improved Website of Meteorological Services
 - Training programme for Meteorological Services/ Media / DRM agencies
 - Development of Common Alert Protocols
- **Component 4:** Training workshop on QMS and SOPs with Directors of DRM, Met and Hydro scheduled for Fall 2011 with national follow ups (with Finland, others???)
- **Component 5:** Discussion with IADB/World Bank/CMO/CIMH (etc) on development of a regional PPCR projects (Week of April 18)



Leveraging existing projects and Resource Mobilization Opportunities

- Leveraging existing bi- and Multi-lateral cooperations in the region (Finland/CMO/CIMH/Caribbean, USA, UNDP/CIMH/CDEMA/Italian Cooperation, CIMH/CDB etc.)
 - EC-ACP, Regional Track of Pilot Project for Climate Resilience (IABD, World Bank)
 - Discussions underway with CDB, CIDA, USAID/OFDA
 - Others being identified
-



Component 2: Strengthening Forecasting capacities with Multi-Hazard Approach

	Meteorology (Section I)	Hydrology (Section II)	Marine (Section III)
Number of responses to each survey section	14	7	10

- 25 countries / territories received the obs/forecasting questionnaire (For those who have not responded, we look forward to receiving your completed survey!)
- This crosscutting activity engages a number of WMO technical Programmes and demonstration projects, TCP, GDPFS, HWR, MMOP, SWFDP
- Looking at the inter-linkages across meteorological, hydrological, marine and ocean related forecasting tools and products and the



Expected Outcome of this meeting: To contribute to the development of a clear “phased” work plan for strengthening of forecasting capacities for other priority hazards (regional and national components) and contribute to the development of Phase-I project proposal for Caribbean



Expected Outcomes of this meeting and DRR deliberations at HC 33

- Development of a “phased” work plan for strengthening of forecasting capacities for other priority hazards (regional and national components)
 - First Multi-Hazard Forecasting demonstration project (building on TC and SWFDP models)
 - Mapping of the hydrological network in the Caribbean and Central America
 - Annual forum for multi-hazard forecasting capacity development discussions
-



Mapping WMO DRR Cooperation Capacity Development Initiatives since 2007

**Type I: Multi-Agency Cooperation
Projects with World Bank, ISDR, UNDP
and WMO**

Central
America and
Caribbean
(2010-)

South East
Europe (2007-
present)

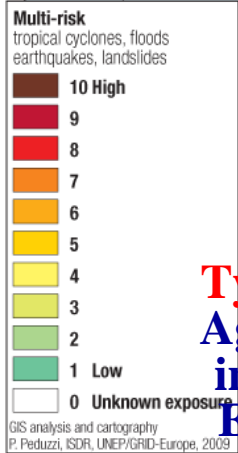
Pakistan

Haiti

South East
Asia (early
2010 -
ongoing)

**Type II: March 2010 - Multi-
Agency Cooperation Projects
in end-to-end Multi-Hazard
EWS (UNDP, ISDR, World
Bank, UNESCO-IOC,
CDEMA, CEPREDENAC,
IFRC)**

**Type III: Post-Disaster
Assistance (in coordination with
UN and World bank and multi-
lateral cooperation with Members**





Thank You

A Multi-Programme cooperation of WMO:

- **Peter Chen – GDPFS / SWFDP**
- **Gabriel Arduino - Hydrology and Water Resources**
- **Edgard Cabrera – Marine Meteorology and Ocean Affairs**
- **Oscar Arango – Regional Programme (RA IV)**
- **Maryam Golnaraghi - DRR Programme**

Webpage of the Workshop:

http://www.wmo.int/pages/prog/drr/events/CaymanIslands/index_en.html

