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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)

**PROPOSAL TO INVESTIGATE MARINE IMPACTS
ON LOWLAND AGRICULTURE AND COASTAL RESOURCES
(MILAC)**

Introduction

MILAC aims to contribute to Natural Disaster Reduction (NDR) in coastal lowlands where marine impacts from Tropical Cyclones cause severe damage to population, agriculture, freshwater, environment, and infrastructure in general. MILAC therefore calls for the participation of a number of organizations leading to increased synergy from having them work together.

A MILAC strategic document has been endorsed by WMO Executive Council EC-LIV and subsequently submitted to Congress Cg-XIV. As well, an excerpt on this issue is attached to this document stemming from the 2003 meeting of Presidents of WMO Technical Commissions. The present document provides a strategic, action-oriented approach comprising the following consecutive steps:

- identification of the socio-economic problems (connected with tropical cyclones);
- establishment of a comprehensive solution to mitigate problems within a NDR framework;
- development of new and revision of existing policies;
- provision of tools (i.e. observations and numerical models) for the solution;
- testing and implementation of tools;
- integration of tools and policies within an overarching (regional) system for natural disaster mitigation.

Summary

It is foreseen that this approach be undertaken at the regional level, with the intent that regional pilot projects be linked. This “chain of projects”, separated by regions, would become a vehicle for exchange of experience and knowledge on tools and data for the purpose of NDR. Regions will prioritise problems specific to their needs, so problems and solutions are expected to differ, but some elements being common.

Each region will undertake a problem identification that may include the following elements;

- Tropical cyclones climatology including extremes in the region;
- Regional demographics and infrastructure;
- Significance and sensitivity of agro- and aqua-culture;
- Significance and sensitivity of water supplies;
- Miscellaneous and mixed cause impacts;
- Identification of hazardous areas.

A typical result from such a study could be an increased understanding of the risk associated with storm surge hazard in a region. The risk assessment may point to the need to revise current approaches to managing use of hazard-prone lands, managing water resources, and planning of agriculture. Another typical conclusion may be to seek the establishment and preparedness of emergency evacuation mechanisms for populations at risk and agricultural livestock, equipment, and materials.

Actors

Although each regional MILAC project should have its autonomous management, there are supporting actors who will facilitate cross-regional exchange of approaches, concepts, tools, and resources. In fact one could figure two classes of actors; one being the internal regional experts, the other being those who can facilitate inter-regional transfers of knowledge and resources.

Within each region and each project one will typically find:

- Tropical Cyclone Programme (TCP) Regional Specialized Meteorological Centres (RSMCs) providing meteorological forcing data;
- GOOS Regional Associations, in particular those covering the tropics;
- WMO Regional Associations (6, with 4 in the tropics);
- Commission for Agricultural Meteorology (CagM) regional experts, Open Programme Area Groups (OPAG) No. 3 on Climate Change and Natural Disasters in Agriculture;
- Commission of Hydrology (Chy) experts;
- JCOMM regional experts;
- Other WMO Technical Commissions;
- NDR organizations and regional politicians.

Between each project/region, facilitation of transfer mechanisms would be driven by;

- WMO Secretariat and GOOS Project Office;
- JCOMM/GOOS Capacity Building and Services;
- I-GOOS & GOOS Regional Alliance Federation.
- CAgM and CHy.
- NDR global bodies.

Actions

A brief outline of actions is given, for each step followed by an illustrating example as perceived for a South China Sea (SCS) country (*in cursive*).

1. Establishment of regional inter-organizational fora with the task to define the problem to be approached

Such a forum would consist of:

- the proper regional NDR body;
- the most relevant GRA;
- the most relevant WMO RA(s);
- others as appropriate.

SCS example: *The actual NDR body would be a national committee for NDR, the GRA would be the upcoming SEAGOOS. The WMO RA would be RA V (Regional Association V: Southwest Pacific).*

2. With participation of TCP, JCOMM and others to “define the problem”

In one region it may be found most appropriate to prioritise population safety due to flooding, demographics and infrastructure. In another area it may be found more important to secure freshwater resources exposed to marine impacts from storm surges. Different objectives will lead to different strategies, however there remains a large potential for synergy.

SCS example: *There would be a meeting in one of the capitals of the region, conducted by the regional NDR body, SEAGOOS, TCP and JCOMM, attended by national GRA and JCOMM representatives and the forum defined above. Possible outcomes may be to prioritise activities of high importance, such as population evacuation, structural protective measures such as dredging and dikes, and protection of freshwater reservoirs and sewage treatment plants. Another possibility could be that solutions in one region would not be realistic in another. Priorities could include the development and implementation of policies on acceptable land use practices in hazard prone areas, or providing improved services to reduce losses to the agricultural community. This underlines the importance of the involvement of the regional/national NDR bodies in the planning process.*

3. Establishment of a solution strategy to mitigate the problems

If the problem is inaccurate early warnings or warnings that do not provide sufficient lead time to permit the evacuation of large populations, then the strategy would be to seek better 1 – 5 days forecasting tools and deliver mechanisms for forecast products in accordance with NDR requirements. If the problem is escalating losses for events of similar magnitude occurring over several years, then more comprehensive solutions that include forecasting with other non-structural and structural solutions could be considered. If the problem is the need for better management and planning of freshwater resources and agriculture, then the strategy will be to combine hindcasts with medium long-term forecasts.

SCS example: *Storm surge and wave models would be sought for the purpose of short-medium term forecasting. A monitoring network could be defined to support forecasting.*

4. Developments of tools to implement the strategy

Numerical models for storm surges and coastal waves are fed by atmospheric forcing input from numerical weather prediction models operated at all RMSCs. This means that ALL areas doing MILAC projects need to have access to atmospheric forcing data, and they may ALL need to have wave, storm surge, and hydrological models. These models can be run in hindcast or forecast mode depending on the problem that is to be solved. The need for enhanced modelling capabilities calls for:

- further improvement of model suites through inter-regional comparison of results;
- adding specific models for mitigation purposes associated with agricultural and water resource management practices;
- inverse modelling aiming at defining the optimal ocean observing network in support of improving model performance; and
- the development of cost/benefit assessments ‘before or after’ incidences.

While the basic tools (observations, data management, models to predict or hindcast) are important, they are still incomplete in relation to most purposes. The ‘error bars’ are likely to be large, and their characteristics (e.g., accuracy) need to be provided to and better understood by NDR bodies, who are taking actions and decisions based on these inputs.

SCS example: Models would be installed and tested, and an inter-regional group would start working on improvements. An ocean monitoring network could follow, consisting of either in-situ or remotely sensed observations.

5. Testing and implementation of tools

Observation/monitoring networks must be operated in a responsible manner with high regard to Quality Assurance. Numerical models must be tested and their accuracy established. Ensemble techniques are applied to give the best estimates of error bars.

SCS example: Experiments and early warning systems could be arranged. There should be agreements on regional shares of responsibilities.

6. Integration of tools in an overarching system for NDR

If a regional NDR official body is present, it must be negotiated with them how to introduce the MILAC tools output into their procedures in a situation of disaster. This relates to delivery mode, updating according to proximity of the TC etc.

SCS example: NDR organizations of the region should be aware of the activities at an early stage and be prepared to include the setup in their infrastructure.

7. Inter-linkage of MILAC regional projects

Overarching bodies such as the International Secretariat for Natural Disaster Reduction, the GRA Federation, JCOMM and TCP, will facilitate the exchange of plans, knowledge and experience gained through meetings, reports and web sites.

Actors and their roles

The following table indicates successive steps to be taken in MILAC projects, and indications of actors and roles. Not all perceived partners have confirmed their interest.

Table 1

MILAC	WMO TC's	WMO RA's	IOC/GOOS bodies	Others
General concept and Promotion	CAGM, CHy, JCOMM, the Tropical Cyclone Programme	I, II, III, IV, V	GOOS Africa, IOGOOS and SEAGOOS GOOS Caribbean	NDR contacts
MILAC steps:				
1. Regional for a		TBD	TBD	TBD
2. Problem definition	Compilation of advice inputs	Focal advisers	Focal advisers	TBD
3. Solution strategy	Recommended by TC's	Advising	Joint advice	
4. Tools and links developments. Including CB.	By TC expertise	Observing	Supporting expertise	
5. Pre-implementation/testing	By TC expertise	Observing/accepting	Supporting expertise	NDR observation
6. Mitigation system, sustained and integrated	Liaising with partners and operators	Partners	Partners	Local comm.-unities and NDR
7. Overarching linkage	TCP, JCOMM and future GRA network			WMO IOC/GOOS
MILAC support:				
1. Funding	Promotion via WMO Secretary (TBD.)	Seeking regional sources	Seeking regional sources	NDR sources
2. Awareness	Submission to Congress and joint TC/RA meetings?	Internal meetings	Internal meetings	With IOI and local communities.

Target areas/regions

The table below shows perceived areas of interest to MILAC projects, with indications of actors and status of initiatives already taken. WMO RAs are existing intergovernmental bodies. GOOS RA's have either recently been given formal status, or are under development leading to a formal status. A possible GOOS RA Network Development may help to consolidate the chain of GOOS RA's.

Table 2

Area	Project name or acronym	GRA's and RA's, RSMC's involved	Perceived focal body or nation	Perceived priority problem	Status of development
South China Sea	TBD	SEAGOOS RA V RSMC X	Thailand	Waves/surge Forecast in TC	SeaCamp programme Ongoing training
Indian Ocean	TBD	IOGOOS, RA II RSMC X	India	Erosion and flooding fc Biodiversity	Pending
Western IO	WIOMAP	RA I RSMC X	Kenya	Ocean fc	Full proposal In submission
West African	TBD	GOOS Africa RA I RSMC X	Nigeria	Storm surge fc	Draft proposal via JCOMM CB
Caribbean	TBD	GOOS Carr RA III and IV RSMC X	???	Storm surge fc with TC's	???
Others i. e. NE Pacific		RSMC ?			

Funding strategy

Some initial actions should be derived from synergy. When items and their costs are outlined within a comprehensive plan, items must be covered primarily by external sources and should not be dependent on the regular budgets of IOC and WMO.

Coordination Mechanism

A facilitating mechanism could be the newly established Resourcing Team under JCOMM CB.

List of acronyms (in order of appearance)

EC-LIV: WMO Executive Council 53 (year 2002)-

Cg – XIV: WMO 14th Congress (2003).

TCP : Tropical Cyclone Programme.

TCP RSMC: Regional Center for monitoring and forecasting of Tropical Cyclones.

CAGM : WMO Commission for Agricultural Meteorology.

OPAG: Open Programme Area Group.

CHy: WMO Commission of Hydrology.

SEAGOOS: South East Asia GOOS.

RA: WMO Regional Associations (6 in total).

GRA: GOOS Regional Alliances (In similarity to WMO RA's)

IOGOOS: Indian Ocean GOOS.

Attachment

Excerpt from the Joint meeting of President of WMO Technical Commissions, February 2003.

4.5 The meeting discussed the proposal for a cross-commission project "Marine Influences and Impacts on Lowland Agricultural and Coastal Resources" presented by Mr J. Guddal, co-president of JCOMM. It noted that CAgM and CHy as well as some Regional Associations and Regional GOOS Alliances have already been involved in preparation of this proposal. **Mr Guddal also, in the same context, emphasized the potential, implicit roles of the Tropical Cyclone Programme B** The meeting recalled that in accordance with the decision made at 2002 PTC meeting the draft project proposal "Natural Disaster Reduction in Coastal Lowlands" had been submitted to EC-LIV and approved by the Council as a draft project proposal (Annex II to paragraph 2.3.12, EC-LIV). It agreed that the new initiative should be considered as further development of approved project proposals, in particular with respect of impact on lowland resources and should be treated as a demonstration project.

4.6 The meeting recognized that all commissions could be involved in these activities. In the discussion the president of CHy pointed out that the contribution of CHy to the new project could be through already existing projects on flood management. He mentioned also that at regional level some projects concerning flash flood forecasting were being implemented in Central America and Mozambique. The President of CAS suggested as the main possible contribution of CAS to the project the development of forecast systems for severe weather events. The President of CCl referred to the role that the Regional Climate Centres could play in providing products for use in regional forecast applications. The Vice-president of CIMO stressed the need to ensure reliable telecommunications links and appropriate observation systems in order to assure the availability of essential information. The President of CAeM mentioned that a possible contribution of CAeM could consist of AMDAR and other aircraft data used in better identifying and forecasting severe weather phenomena, and in this specific case tropical cyclones. The Acting president of CBS referred to the work that the Commission had done through PWS to establish a web site titled Severe Weather Information Centre at severe.worldweather.org.

4.7 The meeting recommended to integrate the new initiative with the project proposals approved by the EC-LIV and prepare in collaboration with the co-president of JCOMM a document based on proposed project to bring this issue to the Fourteenth Congress.