



CUBA RISK REDUCTION MANAGEMENT CENTRES

BEST PRACTICES IN
RISK REDUCTION

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Risk Reduction Management Centre in Old Havana

We would like to acknowledge the **Provincial and Municipal Presidents, Civil Defence Heads and Staff, Risk Reduction Management Centres and Multi-disciplinary Group Members**, who have developed numerous and successful experiences in risk reduction, including those described in this publication, and the willingness to share them in diverse settings and contexts.

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Risk Reduction Management Centre equipment.

UNDP and risk management

The United Nations Development Programme (UNDP) is the UN's global development network, an organization advocating for change and connecting countries to knowledge, experience and resources to help people build a better life. We are on the ground in 166 countries, working with them on their own solutions to global and national development challenges. As they develop local capacity, they draw on the people of UNDP and our wide range of partners.

As one of the key practice areas, the UNDP is working to assist countries to prevent crisis and encourage recovery, making the integration of risk reduction into the human development framework an essential component. The Hyogo Framework for Action, approved in January 2005 as an outcome of the World Conference on Disaster Reduction, guides UNDP's collaboration in this area and is a decisive step forward in putting disaster risk reduction on the international agenda.

In the Caribbean region, UNDP supports such objectives through the Bureau for Crisis Prevention and Recovery (BCPR) and the Caribbean Risk Management Initiative (CRMI) project. In this way, UNDP provides a platform for coordinating and sharing knowledge, skills, reflections, and discussion in the field of climate change adaptation and disaster risk management, across language groups and cultures in the Caribbean. A firm commitment exists in order to identify and promote best practices in the region so that shared challenges can be addressed using a wide range of experiences and tools.

This document aims to systematize the best practices of the Cuban model of Risk Reduction Management Centres, which have been supported by UNDP Cuba through diverse initiatives. This model establishes the possibility of mitigating disaster impacts through an informed, coordinated, multi-disciplinary and decentralized approach which focuses on identifying hazards and acting preemptively to reduce risks. This approach has contributed to the excellent track record in Cuba of protecting human life and livelihoods through preparedness and institutional capacity building at a local level.

In his preface to the 2009 Global Assessment Report on Disaster Risk Reduction, UN Secretary General Ban – Ki Moon urges a radical shift in development practices, and a major new emphasis on resilience and disaster planning. He points to compelling evidence that suggests that investing in disaster risk reduction is a cost-effective means to protect development, reduce poverty and adapt to climate change. It is our hope that the documentation and sharing of this model of risk reduction serves the broader community in its efforts to reduce risk and ensure the well-being of respective populations.

Mrs. **Barbara Pesce-Monteiro**
RESIDENT REPRESENTATIVE, UNDP CUBA



Havana's Malecón, flooded as a result of Hurricane Wilma, 2005

Prologue

The purpose of this publication is to present the Cuban experience in the creation of the Risk Reduction Management Centres. There is no recipe to make this model work in other countries; we simply put forward this knowledge, given that it constitutes an important instrument for local governments in managing preventative actions and decision-making in the area of disaster risk reduction.

Since the triumph of the Revolution Cuba has adopted a series of economic, social and environmental measures to reduce societal vulnerability in face of the natural, technological and health hazards.

The Risk Reduction Management Centres aim to compile and organize the necessary information for risk studies, facilitate the control of vulnerability and create a culture of risk perception in the population and the authorities, among its multiple activities, as part of the effort to perfect the Civil Defence System of the country.

The Joint Staff of National Civil Defence (EMNDC) founded the Risk Reduction Management Centres in 2005, with the support and funding of UNDP and other agencies within the UN System. The Centres are equipped with essential resources, subordinate to local governments in municipalities with the greatest exposure to hazards, and are armed with the fundamental mission of achieving greater effectiveness in the planning and undertaking of civil defence measures for the protection of the population, economic resources and the environment.

In this material, the functions of the Risk Reduction Management Centres are explained, with a focus on the principle activities and how they have achieved good results in the prevention of hydro-meteorological risks in particular. However, this does not imply that all issues are resolved; to the contrary, as express in the title, we will continue to work in systematizing them.

This text is a modest presentation of a best practice, which we offer to authorities, organizations, leaders of civil defence and protection, and all those interested in the topic in diverse areas of the world. The objective is, depending on the particularities of each country, to work together for disaster risk reduction, believing that if all take part in this, a better world is possible.

General **Ramón Pardo Guerra**
HEAD OF JOINT STAFF OF NATIONAL CIVIL DEFENCE

Acronyms

AECID	Spanish International Cooperation Agency for Development *
ANAP	National Association of Small Farmers *
BCPR	Bureau for Crisis Prevention and Recovery
CDM	Municipal Defence Council *
CDR	Committees in Defence of the Revolution *
CDZ	Zone Defence Council *
CPAP	Country Programme Action Plan
CPD	Country Programme Document
CRMI	Caribbean Risk Management Initiative
DCDB	Digital Cartographic Data Bases
DIPECHO	Disaster Preparedness European Commission's Humanitarian Aid
DTM	Digital Terrain Models
EMNDC	Joint Staff of National Civil Defence *
EWPP	Early Warning Points
EWS	Early Warning Systems
FMC	Cuban Women's Federation *
GIS	Geographic Information System
IDERC	National Spatial Data Infrastructure of the Republic of Cuba *
MINCEX	Ministry of Foreign Trade and Investment *
MDG	Millennium Development Goals
RRMC	Risk Reduction Management Centre
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNISDR	United Nations International Strategy for Disaster Reduction
WFP	World Food Programme

* Acronyms based on Spanish

1. Risk Management in Cuba

1.1 DISASTER RISK REDUCTION MANAGEMENT IN CUBA

Cuba is exposed to different risks of natural and other origins. Due to its geographical location in the western Caribbean Sea, Cuba is affected annually by intense hydro-meteorological events, primarily hurricanes. The country's hurricane season lasts for 6 months, from June 1st to November 30th. 2005 was noteworthy as it was extended to January 6th 2006, and was the most active season known in history.

Between 1998 and 2008, Cuba was struck by more than 20 tropical storms, of which 14 became hurricanes and seven were of great intensity. During this time period, a total of 11 million people were evacuated. Damage to infrastructure was considerable, with more than one million houses affected and estimated economic losses of 18 billion dollars. Despite this destruction, only 35 lives were lost.



House in La Bajada village, Pinar del Rio province, affected by category 5 hurricane Ivan in September 2004.

IMPACT DUE TO TROPICAL STORMS (in millions of Cuban Pesos CUP. 24 CUP = 1 USD)			
Year/hurricanes	Total	Cost of preventive measures	Cost of replacing housing
2004	2.145,8	48,5	485,1
Charley (August)	1.222,7	9,1	432,6
Iván (September)	923,1	39,4	52,5
2005	3.036,0	117,2	1.074,8
Dennis (July)	2.124,8	18,7	1.026,1
Rita (September)	207,0	25,0	3,1
Wilma (October)	704,2	73,5	45,6
2006	95,1	15,2	24,6
Ernesto (September)	95,1	15,2	24,6
2007	1.155,4	12,8	364,4
Noel: Intense rains and tropical storm (October)	1.155,4	12,8	364,4
2008	9.759,3	137,7	4.983,8
Fay (August)	37,8	1,6	16,8
Gustav (September)	2.096,7	30,9	1.121,5
Ike (September)	7.325,3	95,9	3.764,7
Paloma (November)	299,5	9,3	80,8

Source: National Statistics Office.

The population most exposed to the destructive impact of these events are those living in isolated coastal and mountainous zones. In these areas, settlements may remain incommunicado for several days until the reestablishment of pre-existing conditions. Recovery activities are carried out in the housing, critical services and infrastructure sectors based on existing disaster reduction plans, or the decisions made by defence councils at different territorial levels.

1.2 THE VISION OF DISASTER RISK REDUCTION IN CUBA

Natural disaster risk reduction in Cuba is supported by a legal framework that includes laws, decree-laws, statutes, and ministerial resolutions. This solid institutional base guarantees the implementation and control of the disaster risk reduction strategy.

After the 1959 Revolution, the government adopted its first measures to support risk reduction. In 1962, the People's Defence structure appeared; in July 1966, through Law 1194, it was transformed into the Civil Defence System. On December 21st 1994, Chapter XIV of Law 75 defined the system of civil defence measures as a state-run system whose main function is to safeguard the Cuban population and their social and economic achievements in face of any type of natural or other risks. This law established that the presidents of the provincial and municipal assemblies, who function as governors and mayors, are responsible for heading civil defence in their respective territories. They are responsible for implementing the principle measures that ensure that protection of the population and economy. These measures must be coordinated and executed by state bodies, economic entities and social institutions with the full participation of the entire population.

The Civil Defence System has continually improved as a result of new experiences and laws, such as Decree-Law 170 of May 1997 which established a legal framework specifically to civil defence and broadened all aspects related to disaster risk reduction in the Republic of Cuba. To date, the Civil Defence System has accumulated more than 45 years of experience and has tested its efficiency and effectiveness against multiple disaster situations over the years.

Disaster risk reduction is a priority for the Cuban government, as can be seen in its vast legal framework and structural and educational actions that positively impact social, economic and safety indicators of the population. One of the actions undertaken by the Civil Defence System in 1963 was the conception and later development of a system of hydraulic works aimed at preventing frequent flooding associated with tropical storms, hurricanes and other extreme meteorological events and therefore protecting persons, good and resources in the risk areas. This system known as "voluntary hydraulics" provides information regarding rain patterns and other data related to hydraulic works. Due to its adequate functioning during extreme situations, the system allows for the management of risk factors associated with flooding.



Headquarters of the Joint Staff of National Civil Defence in Havana.

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It is necessary to develop a system of civil defence measures that anticipates and minimizes the occurrence of natural disasters and other types of catastrophes that can cause the country considerable human and material losses, as well as other social, economic and environmental upheavals, all of which negatively affect development. For risk reduction, coordinated action of national efforts and resources is needed, as well as international assistance and cooperation.

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1.3 ORIGIN AND ANTECEDENTS OF RISK REDUCTION MANAGEMENT CENTRES

In December 2004, the Disaster Reduction Unit of the Bureau for Crisis Prevention and Recovery (BCPR), under the United Nations Development Programme (UNDP), published a series of case studies for distribution at the Second World Conference on Disaster Reduction, held in January 2005 in Kobe, Japan. Among them was *Risk Reduction in Havana's Coastal Settlements: A case study from Cuba*.

This study reported on a project developed by the Joint Staff of National Civil Defence (EMNDC), with financial assistance from the non-governmental organization Movement for Peace, Disarmament and Liberty (MPDL), within the framework of the Fourth Disaster Preparedness European Commission Humanitarian Aid (DIPECHO) Action Plan. Positive results of the project included the following:

- Conducted a coastal flooding risk assessment in five municipalities located along Havana's northern shore. This process was headed by the mayors of the local governments in their capacity as heads of Civil Defence and incorporated a participatory approach which facilitated coordination among different sectors and institutions involved in the study. As a result of the study, EMNDC designed and established the first methodology for risk assessment.
- Improved municipal government access to information from Civil Defence and meteorological services due to access to the Internet, Intranet and other communication channels; in addition this improved community access to early warnings issued by these institutions.
- Developed a geographic information system (GIS) to facilitate risk analysis, decision-making, development planning and response to disaster hazard situations. This was the first experience in the country in using GIS for risk-related purposes.
- Created permanent municipal command posts in Risk Reduction Management Centres, in order to incorporate risk analysis into development planning and investment projects, monitor meteorological information and activate early warning points (EWP).
- Created and equipped community-level rescue and lifesaving brigades as first responders in the event of disasters.

The project allowed for the establishment of a new methodological and technical model for encouraging and strengthening local capacities. This led to the creation of municipal-level Risk Reduction Management Centres and the establishment of early warning points in vulnerable communities. In June 2005, Civil Defence and the Ministry of Foreign Trade and Investment (MINCEX), created the first Risk Reduction Management Centre (RRMC) with financial support from the Caribbean Risk Management Initiative (CRMI) project, BCPR and UNDP. The first centre was located in Guamá Municipality in Santiago de Cuba Province due to the fact that it was one of the most vulnerable communities in the country.

The efforts of Cuba in the area of disaster risk reduction are of interest to many countries in the region. Exchange and cooperation actions have taken place under the auspices of the United Nations System, international and regional governmental agencies, and non-governmental organizations.



A Risk Reduction Management Centre presented during the VII International Congress on Disasters in 2006.

1.4 COUNTRY PROGRAMME DOCUMENT AND RISK REDUCTION MANAGEMENT CENTRES

The United Nations Development Programme in Cuba recognizes the capacity of the country to respond to natural hazards, and has provided its support to prevention and recovery. The UNDP also endorses the strategy of strengthening local capacities for the integral management of disaster risk reduction, prioritizes vulnerable municipalities of the country for collaboration and integrates a gender focus into the strategy.

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The 2008 – 2010 United Nations Development Assistance framework in Cuba has a focus in five areas of cooperation: local human development, natural disasters and risks, environment and energy, and health and food security. Within this Framework, there are provisions made for continuing to assist in the creation of Risk Reduction Management Centres (RRMC) and early warning systems (EWS)

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The areas of cooperation, defined in the Country Programme Document (CPD) 2008-2012 and outlined in the corresponding Country Programme Action Plan (CPAP), respond to the objectives of United Nations Development Assistance Framework in accordance with the national priorities identified with the Cuban Government. The CPD and CPAP are a result of a consultative process with principle national counterparts. These areas of cooperation are also aligned with the UNDP Global Strategic Plan 2008-2011. The results aimed for in the CPD and CPAP will contribute to achieving the Millennium Development Goals and other commitments ratified by the country in UN summits and conferences.

The CPD and CPAP articulate the priority given to disaster risk management and the mainstreaming of gender in the development of local capacity, particularly in vulnerable municipalities and regions. They outline the importance of systematization, transmission of knowledge based on experiences developed by Cuba, and actions for strengthening south-south cooperation in the region.

The outcomes anticipated in the CPD and the CPAP will be achieved through actions to strengthen RRMCs and local EWS, conduct comprehensive studies, train staff, and engage in regional exchange workshops. The United Nations System, cooperation agencies and non-governmental organizations will undertake these efforts. The presence of these institutions validates the country strategy to reduce disaster risk by the means of strengthening capacity for comprehensive risk reduction management, with an emphasis on the local and vulnerable regions.

The Cuban National Civil Defence, MINCEX, UNDP-Cuba, and the CRMI have prepared this systematization of Risk Reduction Management Centres in order to document the accumulated experience of this model and disseminate it across the region. The RRMC initiative has the ongoing technical and financial support from the Cuban government, and assistance from diverse international cooperation agencies in Cuba, such as the UNDP, World Food Programme (WFP), the Spanish International Cooperation Agency for Development (AECID), and the non-governmental organization, OXFAM Solidarity, among others.

We anticipate that the best practices achieved by RRMCs and the lessons learned can contribute elements for the consideration of the international, and in particular, the regional community. We hope this reflection allows for the development of similar centres or other initiatives that contribute to disaster risk reduction in vulnerable communities.

2. Structure and functions of Risk Reduction Management Centres

2.1 LOCAL GOVERNMENTS AND DISASTER RISK REDUCTION

The Republic of Cuba, politically and administratively, consists of 14 provinces, with 169 municipalities and the Special Municipality of Isla de la Juventud. Geographically it is an archipelago formed by the island of Cuba, Isla de la Juventud and 4,195 cays and islets. Together, they occupy a surface area of 110,992 km².

PRINCIPAL DEMOGRAPHIC DATA (National Statistics Office, 2008)			
2008	Women	Men	Total
Urbano	4,298,393	4,166,502	8,464,895
Rural	1,309,759	1,461,445	2,771,204
Total	5,608,152	5,627,947	11,236,099

Sex		Area of residence	
Women	Men	Urban	Rural
50 %	50 %	75 %	25 %

As part of its governmental structure, Cuba has Municipal Assemblies. These represent the highest level of State power with authority to exercise state functions at a local level. The Municipal Assemblies elect administrative councils to guide local level economic entities, production and services so as to satisfy the economic, health and welfare, educational, cultural, sports and recreational needs of the region's population.

The Municipal Assemblies also rely on People's Councils situated at the level of cities, towns, neighbourhoods, settlements and rural zones. People's Councils serve to inform the Municipal Assembly of the operations that local entities undertake within their respective territories, including those related with disaster risk reduction.

People's Councils act in close coordination with the social organizations in their area of responsibility. The majority of Cubans are members of different social organizations such as the Committees for the Defence of the Revolution (CDR), the Cuban Women's Federation (FMC), and the National Association of Small Farmers (ANAP), among others. These organizations are the mobilization cells through which Cubans engage in local prevention and preparedness actions. Examples include systematic campaigns in the fight against vectors or in support of sanitation and hygiene. This mechanism of mobilization is also visible in the evacuations in the event of an imminent hazard or the recovery work following a natural disaster. This decentralization of responsibilities, together with the full and active participation of the population in local development processes and disaster risk reduction, contributes greatly to the reduction of human and economic losses.

Throughout the process, local governments play a determining role in disaster risk reduction management. They have a greater ability to influence and act on decisions that affect the local population and the local development agenda.

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Current Cuban legislation regarding disaster risk reduction designates the presidents of Provincial and Municipal Assemblies as the heads of Civil Defence in their respective territories. In this capacity, they are responsible for elaborating territorial disaster reduction plans, which are supported by Civil Defence.

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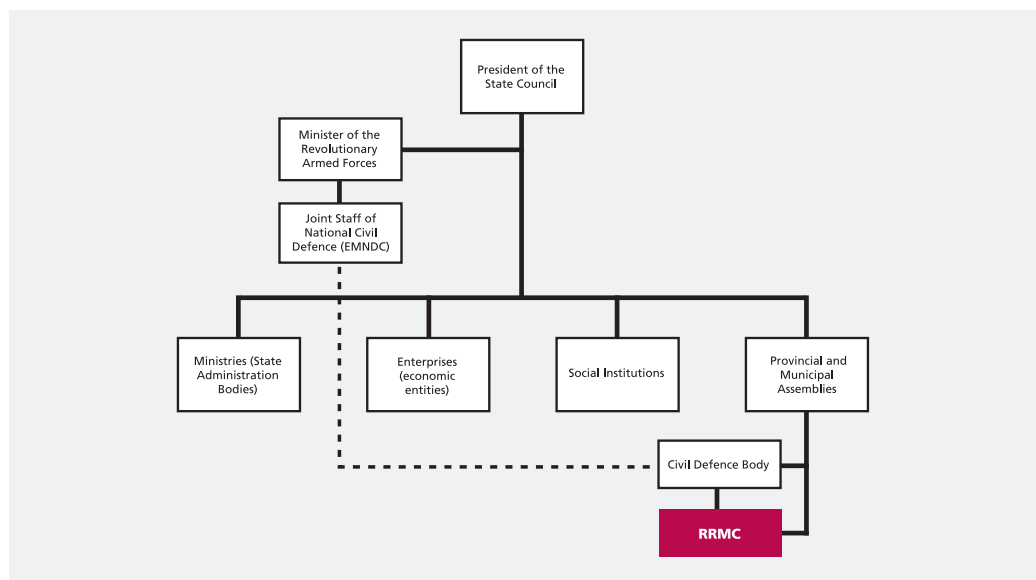


Diagram 1. Location of RRM in Cuba's Civil Defence structure.

2.2 LEGAL FRAMEWORK FOR ESTABLISHING RISK REDUCTION MANAGEMENT CENTRES IN CUBA

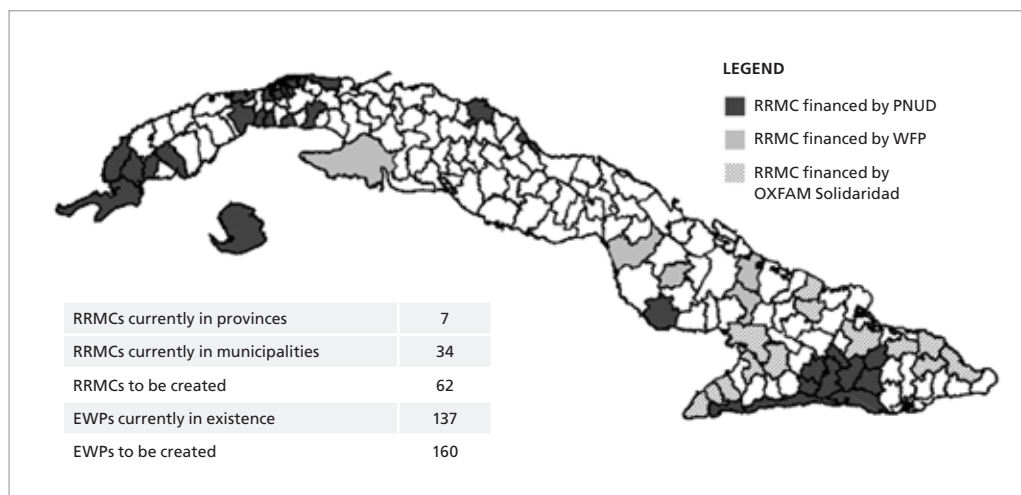
The Cuban initiative to create Risk Reduction Management Centres (RRMs) makes it easier for local governments to monitor the decrease of vulnerabilities at this level. These centres contribute to the coordination process, and promote training and preparedness of leadership bodies and the community.

In the May 1997 Decree-Law 170 of the Civil Defence System an explicit definition of disaster reduction appears for the first time. It is defined as a *group of activities for prevention, preparedness, response and recovery aimed at protecting the population, the economy and the environment from the destructive consequences of natural or other types of disasters or catastrophes*.

On the 30th of November 2004, authorities convened a national meeting to analyze the impact of, response to and recovery from 2004 Hurricanes Charley and Ivan. As a result, the Vice-President of the National Defence Council issued Directive N° 1. This directive mandated anew how to plan, organize and prepare for disaster risks in the country. It established the process and development of disaster risk assessments and studies as a requirement for elaborating disaster reduction plans for regions and economic sectors.

After assessing risk in a municipality, the government establishes an order of priorities to reduce identified vulnerabilities. This implies planning the necessary material and financial resources for the gradual reduction of risk, until it reaches a level considered acceptable for all. To facilitate this work at the local governmental level, Cuban Civil Defence created the Risk Reduction Management Centre strategy and prioritized their implementation for the most vulnerable municipalities. The first RRM created in Havana and Pinar del Río, with the assistance of the UNDP, were a result of the analysis of the impact of Hurricanes Charley and Ivan.

Cuba, through its Civil Defence System and legal framework, institutional capacities and social organization, has developed instruments and tools that enable it to assess risk and draw up a set of actions for prevention, preparation and effective response to disasters. Thus, the society is increasingly in a better position to influence the elements that create vulnerabilities and to transform the human causes of disasters.



Location of Risk Reduction Management Centres, financed by different international cooperation agencies between 2005-2009. The inset shows the number of RRMCs and EWPs currently in operation as well as those in the process of being implemented.

2.3 FUNCTIONS AND STRUCTURE OF RISK REDUCTION MANAGEMENT CENTRES

The main function of Risk Reduction Management Centres is to create better access, documentation and transmission of critical information. To do this, RRMCs use existing and appropriate suitable technologies to help local governments make decisions. The aim is to reduce loss of life and economic assets, and ensure a better quality of life and local sustainable development for the territory.

MAIN FUNCTIONS OF RISK REDUCTION MANAGEMENT CENTRES

- Facilitate analysis and periodic assessment of local risks and factors that produce vulnerabilities, with the participation of territorial institutions and organizations
- Control the reduction of vulnerabilities and risk when hazards occur
- Compile process and prepare information derived from surveillance and monitoring activities
- Participate in the preparation of territorial disaster reduction plans
- Document and preserve historic memory of disaster events and reduction actions
- Contribute to the promotion of a disaster reduction culture in the population, as well as influence their preparedness
- Participate in the response to and recovery from disaster situations

The centres are also responsible for transforming information into a vital input, making it useful to different institutions, organizations and local actors for purposes of knowledge, learning, feedback and exchange of tools. The aim is to foster collaboration in decision-making regarding development processes and disaster risk reduction in the regions. In addition, an important feature of a centre is that it offers access to other available information sources through Intranet and Internet to the entities involved.

At the direction of the head of the Joint Staff of National Civil Defence, the RRMCs are directly subordinate to the presidents of the local Municipal Assemblies, in their capacity as territorial heads of Civil Defence. The local head of Civil Defence will assist the president in the task of making the RRMC

operational and functioning. The Assembly President signs resolutions and other normative documents which regulate the internal functioning of the centres based on respective needs and possibilities. This includes the designation of a *director* and *two staff members* specifically skilled to coordinate the centre and adequately identify, collect and analyze relevant information. These regulations provide the legal character to the process that ensures that the centre's role will continue to function beyond the duration of project.

In addition, the centres rely on the systematic assistance of *specialists of local sectors and institutions*, and on *members of multidisciplinary groups* which have been created to conduct local level disaster risk studies and assessments. The specialists and the multidisciplinary groups complete the team; they are an essential component and ensure that information is held in common and enriched by the exchange. *Community leaders* and other community members are also integrated into this work scheme and relate to the centres through *early warning points (EWP)*.

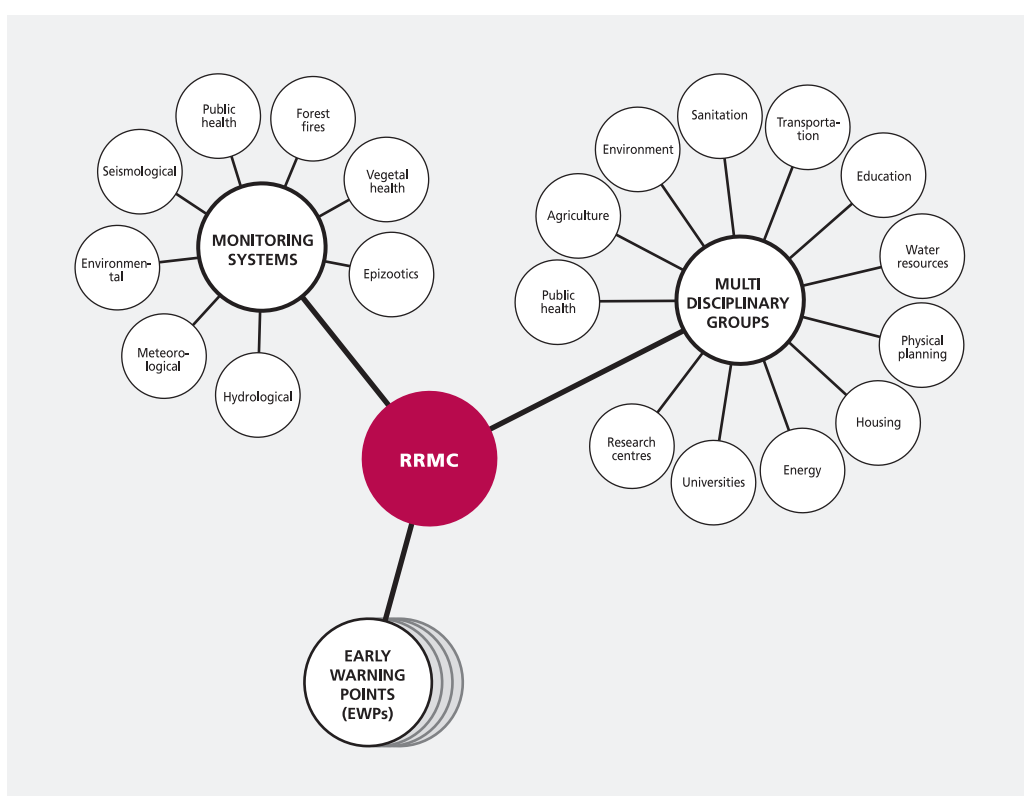


Diagram 2. Actors and participation in the Risk Reduction Management Centres.

2.4 RELATIONSHIP BETWEEN RISK REDUCTION MANAGEMENT CENTRES AND LOCAL SECTORS AND INSTITUTIONS

LOCAL SECTORS AND INSTITUTIONS

Limitations regarding necessary computer facilities in local entities and institutions make it difficult to obtain updated and timely information. As a result, analysis and then decision-making becomes more complex. Risk Reduction Management Centres (RRMC) offer a solution to this problem by making the

equipment, a physical space and time available to different sectors and institutions. This improves the breadth and depth of the results pertaining to surveillance systems and the control of indicators measuring reduction in vulnerability.

Health, housing, agriculture, environment, water, sanitation and land planning are the sectors and institutions with the greatest representation in the work of the RRMC. This is due to the fact that these institutions play key roles in the local development and investment agenda and are the greatest beneficiaries of risk reduction strategies. Specialists of each sector work closely with the RRMC to provide and update information concerning their respective institution's scope of work. S/he would also obtain information from other sectors in a feedback mechanism through the centre. For example, provincial and municipal health authorities deliver information on the health status of municipalities and People's Councils. In turn, they receive health status assessments and updates on other services and resources required for their operation. This feedback mechanism would include updates on the condition of critical services such as water, electricity, public works, sanitation and transport.

MULTIDISCIPLINARY GROUPS

Local level multidisciplinary groups are formed in response to instructions from the head of the Joint Staff of National Civil Defence. Their objective is to conduct a local territorial vulnerability analysis, in accordance with the country's established legal framework. This is used to update the local risk levels. Based on approved methodologies, these groups inform the local government and Civil Defence of the scientific and technical elements necessary to take into account when a decision is required to prevent or respond to disasters or plan for sustainable territorial development.

RRMCs make communication tools and resources available in order to conduct the risk studies. As a central hub function, it is the role of the RRMC to receive these studies and use them to update municipal disaster reduction plans. This allows for more efficient decision-making in situations of both socio-economic development and disasters.

In Cuba all regions possess adequate human resources, by sector and within institutions, with the capacity to develop the above-mentioned studies. What is innovative about the RRMC model is that these human resources are permanently integrated into a local level multidisciplinary group, with the defined aim of analyzing topics related to risk reduction in their territories. As a result, municipalities and their communities do not depend on externally trained human resources – either from national institutions or international consultants - in order to conduct these studies or to provide advice to decision-makers.

2.5 EQUIPMENT FOR RISK REDUCTION MANAGEMENT CENTRES

The centres are generally located in government headquarters. They rely on a suitable allocation of technological infrastructure for their operation, mostly in terms of support for information management.

The centre should have a fluid communication system with a variety of channels to strengthen information compilation, dissemination and distribution. It should have within its reach a set of communication devices and tools that facilitate the above three tasks, in addition to information analysis and geo-referencing.

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As standard guides for the risk analysis, multidisciplinary groups use the *Guide for Conducting Risk Studies for Disaster Situations*, prepared by the Joint Staff of National Civil Defence of Cuba, and the *Methodology for Risk Assessment*, elaborated by the Ministry of Science, Technology and the Environment.

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REQUIREMENTS FOR PREMISES SELECTED FOR RISK REDUCTION MANAGEMENT CENTRES

- Preferably located in the headquarters of the provincial or municipal local government
- Dimensions of the locale must not be less than 5 metres in length by 4 metres in width (20m²)
- Adequate security and protection for safeguarding of designated resources
- The building type and condition of the structure must guarantee safety and function in a disaster situation
- Availability of at least 4 electric sockets of 110 volts and 1 socket of 220 volts, to facilitate the installation of equipment and two permanent telephone lines
- Provision of 2 double lamps for illumination

MODULE FOR EQUIPPING A CENTRE

- Up to 3 computers, with printer and modem with Internet connection
- Minimum of 2 telephone numbers
- Portable 2.3 kW generator
- Television set
- DVD Player
- Communication radio (shortwave and very shortwave)
- Portable communication radios
- Radio recorder
- Rechargeable emergency lamp
- Digital camera
- Flashlights
- Acrylic blackboard
- Rain capes, boots and safety hats
- Furniture
- Acrylics and boards for signage



The initial investment in these resources is approximately \$12,000 USD. Maintenance, operating and replacement costs are assumed by governments within their operating budgets, including costs for human, or communication resources as well as the locale and other facilities required. These expenses are, without question, much less than the total value of the benefits provided by a risk reduction emphasis when a region is affected by a natural hazard.

2.6 EARLY WARNING POINTS AND EQUIPMENT

In Cuba, the early warning system (EWS) is understood as an integrated process including surveillance, monitoring and analysis of natural and other variables that might constitute a hazard for the population and economy. These variables are assessed by civil defence authorities to facilitate decision-making and the compliance of the measures approved in the disaster reduction plans for each phase of an event, by agencies, organizations, economic entities, social institutions and the population of the region.

This system is appropriate for the socio-economic characteristics, institutional strengths, social organization, and level of education and preparedness of the population. Protection measures are adopted and executed efficiently, allowing for minimal human and economic losses. For these reasons, Civil Defence has established, as a requirement in municipalities where RRMCS are created, the implementation of early warning points (EWP). These are intended for communities of 300 or more inhabitants that are likely to be incommunicado in case of an event, or have a greater incidence of natural or other hazards. The EWP is a basic element for the operation of the early warning system.

MODULE FOR EQUIPPING AN EARLY WARNING POINT

- Portable 2.3 kW generator
- Communication radio (shortwave and very shortwave)
- Personal communication radio
- Megaphones
- Rechargeable Emergency Lamp
- Radio
- Flashlight
- Rain Capes, Boots and Safety Hats



The EWPs are the responsibility of the community leaders, namely the presidents of the People's Councils, who in turn depend on the help of community members to operate the equipment. The EWP equipment is located either in the premises of the People's Councils, schools, entities such as post offices or water resources offices, or even family homes when the situation demands it, where its function, preservation and use is guaranteed.

The RRMCS send the EWP essential information regarding the occurrence and characteristics of a hazard, as well as decisions, regulations, established phases and actions for the community to carry out in response to it. The People's Councils undertake the planned and approved protection measures laid out in the disaster risk reduction plan and publicize necessary information throughout the community, including norms of conduct to adopt in face of a hazard.

The EWPs provide feedback to the RRMCS by sending them information regarding the situation in the communities and the nature and variables of the risks that affect them. Using this information, the municipal government is able to analyze different situations and adopt the anticipated measures.

2.7 GEOGRAPHIC INFORMATION SYSTEMS: A TOOL FOR DECISION-MAKING

A geographic information system (GIS) is an organized integration of hardware, software and geographic data designed to capture, store, edit, analyze, share and display geographically referenced information. It is used to resolve complex problems of planning and management. In a more general sense, the GIS is a tool that allows its users to perform interactive requests, analyze spatial information, revise data and maps, and present results of these operations.

To satisfy the concrete information needs of the RRMCS, a vectorial model of data has been constructed based on the geo-reference of graphic information, as established by Directive No. 1/2005.

REQUIRED DATA FOR DISASTER REDUCTION PLANS ESTABLISHED IN DIRECTIVE NO.1/2005

- Territorial boundaries
- Location of command posts and points
- Main vulnerable areas
- Main reservoirs, rivers, canals, water conductors, pumping stations and waterworks plants
- Airports, small plazas for helicopters, air corridors, areas for protecting watercraft
- Medical institutions and institutions for veterinary medicine and plant health
- Firefighting squads
- Entities that handle dangerous substances
- Shelters and food preparation centres
- Evacuation site for livestock
- Location of ham radio operators
- Generation plants and high voltage electrical lines
- Transport bases
- Meteorological stations, radars and other monitoring and forecast institutions

This cartographic information can be classified into three types:

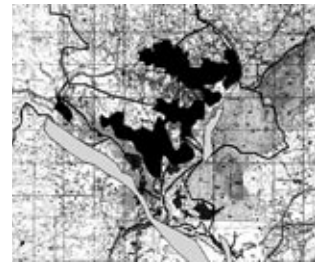
- *Basic digital cartography*: this contains the main topographical elements of the terrain such as surveys, hydrographics, relief, and vegetation and is obtained from topographic maps. Existing Digital Terrain Models (DTM) with different scales are used, as well as other Digital Cartographic Data Bases (DCDB).
- *Thematic data bases*: this is a geographically reference information established by Directive No.1/2005 that is not included in topographic maps. This information is obtained from other cartographic materials, aerial or satellite photographs, geographic and risk studies, vulnerability and territorial risk, direct survey or with GPS.
- *Disaster reduction plan data bases*: these are created to geographically reference different elements of the terrain depicted in the digital cartographic base such as defence zones or population points. These data bases include:
 - Population still requiring protection
 - Livestock to evacuate
 - Protected population
 - Economic and social installations and service networks that might be affected by a hazard
 - Flood areas depending on rain fall pattern
 - Population affected by storm surge

MAIN OBJECTIVES OF GIS FOR THE CENTRES

GIS is a tool for planning and coordination that facilitates decision-making in complex development processes. In terms of disaster risk reduction, the use of GIS in the RRMCC has resulted in increased awareness among local authorities and the population in general about the dimension of risk to which they are exposed and what to do about the original causes.

The main objectives of the GIS are:

- Control different risk zones, for each type of disaster hazard identified
- Geographically reference the economic installations that might cause technological and public health disasters, as well as those that are at risk of being affected by them
- Geographically reference the different declared phases for protecting the population and economy, and evacuation plans for human and material resources
- Position and automatically plot hurricanes, in anticipation of their possible movements and locations of impact
- Surveillance and early alert of forest fires
- Establish bases for inserting these systems into the National Spatial Data Infrastructure of the Republic of Cuba (IDERC)

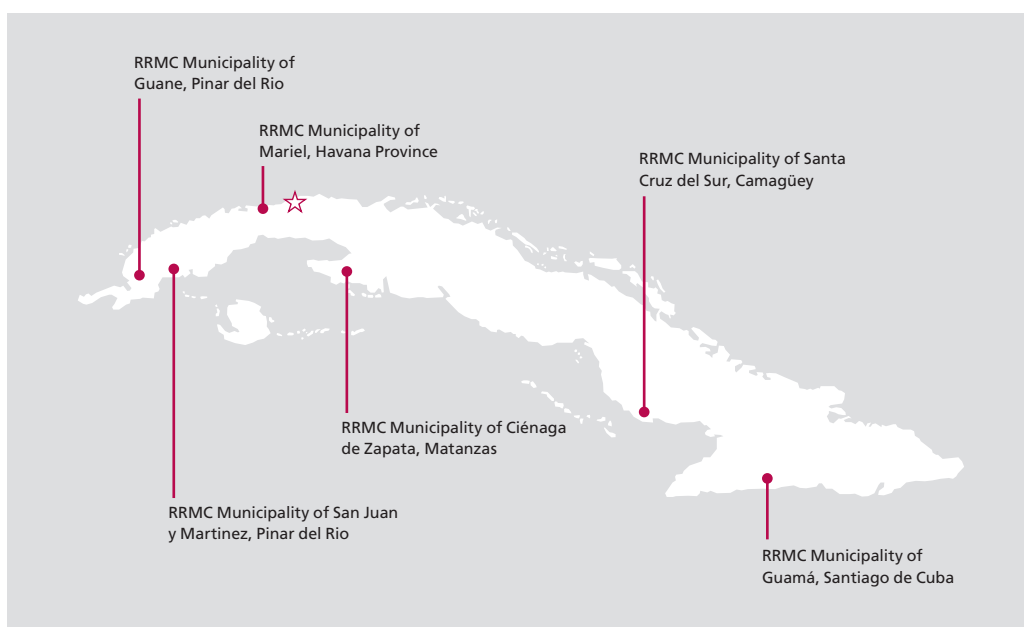


Examples of a digital terrain model, a geographically-referenced satellite image and an affectation map used by risk reduction-oriented GIS.

3. Risk Reduction Management Centres at the local level: best practices and tools

Cuba's experience in the area of local level risk reduction and the establishment of RRMC is diverse; the process begins with the application of concepts, methodologies and tools designed at the national level. These practices are constantly enriched through applying them in different socio-economic contexts and realities, and vary depending on the community and local authorities' experience in responding to natural hazards.

RRMCs enjoy the support of the Cuban government and numerous international cooperation organizations, but above all, of the local authorities and the general population, because of the concept, mission and corresponding actions of the risk reduction strategy. These best practices and tools are a modest but significant contribution to the efforts of the international community to reduce the risks associated with disasters.



Location of the Risk Reduction Management Centres included in the systematization.



3.1. MUNICIPALITY OF GUANE, PINAR DE RÍO

This centre was established in April 2006, in the seat of the Municipal Assembly, with UNDP funding.



GEOGRAPHIC LOCATION

Southwest Pinar del Río Province

BOUNDARIES

Mantua Municipality to the North; Ensenada de Cortés to the South; Minas de Matahambre and San Juan y Martínez municipalities to the East; Sandino and Mantua municipalities to the West.

SURFACE AREA

717.29 km²

POPULATION

35,760 inhabitants, 53.4% in urban areas, 46.6% in rural areas.

POPULATION DENSITY

50.15 inhabitants/km²

SETTLEMENTS

8 People's Councils, 22 settlements of more than 200 inhabitants and 12 with less than 200 inhabitants.

TOPOGRAPHY

Undulating, 55% plains and 45% elevations and mountains.

ECONOMIC ACTIVITIES

Tobacco cultivation, forestry, fishing and mixed crops.

DISASTER HAZARDS

Natural origin: Hurricanes, intense rains, severe local storms, storm surges, intense droughts and forest fires.

Sanitary origin: Diseases that can cause epidemics, epizootics, epiphytotics and quarantined pests.

RISK STUDIES

Territorial disaster risk study

EARLY WARNING POINTS

Three (3) EWPs

ACHIEVEMENTS AND BEST PRACTICES

Creation of a municipal information system for risk reduction, which allows information generated by the municipality's different social and economic sectors to be transmitted and received either electronically or directly in digital form. An example of this would be territorial health information which reflects the state of environmental sanitation, and in particular, water. The territorial health analysis would provide information concerning the control of liquid and solid wastes, the main contamination focal points, vectors and measures to eradicate them, and educational activities. It would also include an analysis of the principle diseases, incidence of mortality and morbidity rates distributed per People's Council, residential block composition, and the organizations at the block level.

Preparation and updating of digital data bases in the service of risk reduction. These tools contribute to municipal decision-making when faced with the impact of natural hazards, and other risks that might occur in the municipality. The government utilizes the updated information regarding the population in high risk areas that may require evacuation. This information, used to plan evacuations, is categorized in four ways: by type of hydro-meteorological risk, by People's Councils, by voting registry, and by block organization (CDR). The information also helps in the preparation of a control plan for all municipal transport vehicles, based on type of vehicle and technical condition, the entity to which the vehicle belongs, and the communities to which they are assigned to for evacuation and other activities to protect the people and economy.

Joint identification, promotion and participation with other sectors and institutions in local preparedness and training projects for disaster risk reduction, through the Guaní-Sciences project. This community preparation project has conducted capacity building activities in several communities vulnerable to disaster risks, including Catalina, Bailén, Paso Piedra, Laguna Vieja and La Güira. Municipal authorities from culture, health, education, science, technology and the environment were key collaborators, among others.

TOOLS GENERATED

- Municipal information system methodology
- Procedures for updating databases by municipal sectors and institutions
- Training programme for communities vulnerable to natural risks
- Input provided to update the territorial disaster reduction plan and risk studies
- Historical documentation on natural hazards that have affected the municipality: *Las fieras del Caribe a su paso por Guane* and the video *Experiencias del Centro Municipal de Evacuación al paso del huracán Ike*



3.2. MUNICIPALITY OF SAN JUAN Y MARTÍNEZ , PINAR DEL RÍO

The centre was constituted in May 2006, in the seat of the Municipal Assembly, with UNDP funding.

GEOGRAPHIC LOCATION

Southwest Pinar del Río Province

BOUNDARIES

Minas de Matahambre Municipality to the North; Ensenada de Cortés to the South; Pinar del Río and San Luis municipalities to the East; Guane Municipality to the West.

SURFACE AREA

4,092 km²

POPULATION

45,030 inhabitants, 34.4% in urban areas and 65.6% in rural areas.

POPULATION DENSITY

113.9 inhabitants/km²

SETTLEMENTS

10 People's Councils, 63 concentrated settlements, 3 are urban cores.

TOPOGRAPHY

53% mountainous zones and 43% plains.

ECONOMIC ACTIVITIES

Tobacco cultivation, forestry, fishing and mixed crops.

DISASTER HAZARDS

Natural origin: Hurricanes, intense rains, storm surges, intense droughts and forest fires.

Sanitary origin: Diseases that can cause epidemics, epizootics, epiphytotic and quarantined pests.

RISK STUDIES

Territorial disaster risk study

EARLY WARNING POINTS

Three (3) EWPs

ACHIEVEMENTS AND BEST PRACTICES

Preparation and updating of a digital data base of the vulnerabilities associated with the municipality's key sectors. These data bases include analysis from the education, public health, housing, physical planning, hydraulic resources, communications and transport sectors. Such a data base allows different sectors to elaborate work strategies to reduce vulnerabilities. The housing sector data based is a good example of this. It records that, between 2002 and 2009, 10,900 residences out of a 12,000 strong housing stock were affected by hurricanes. In response, a series of actions monitored by the RRMC have been taken to reduce the vulnerability of these houses to hazards.

Creation of a geographic information system (GIS) to reduce municipal risk. GIS provides key details about the People's Councils, evacuation shelters and food preparation centres. GIS facilitates, through a digital terrain model, the identification of areas affected by dam rupture, intense rains and storm surge. It also helps identify geo-referenced points of interest through the use of satellite images. A good example is the geo-referencing of tobacco curing sheds, key economic locales which are vulnerable to hurricanes and strong winds.

Perfection of disaster reduction measures for forest fires. The municipal has a goal of diminishing the extent of this hazard throughout its territory. The plan called for improvement to the surveillance and early warning system, the creation of two specialized brigades and 6 voluntary brigades, and public awareness campaigns for the population living in areas of greatest risk of forest fires.

TOOLS GENERATED

- Maps of damaged housing and population at risk from intense rains
- Territorial zone and land-use plan for the housing sector
- Inputs to update the disaster reduction plan and studies on vulnerability and disaster risk
- Guide to action in the event of forest fires
- Digital information and its cartographic representation
- Public awareness programme on forest fire prevention measures



3.3. MUNICIPALITY OF MARIEL, HAVANA PROVINCE

The centre was established on 15 January 2007, in the seat of the Municipal Assembly, with UNDP funding.



GEOGRAPHIC LOCATION

Northwest Havana Province

BOUNDARIES

Florida Straits to the North; Guanajay and Artemisa municipalities to the South; Caimito Municipality to the East; Bahía Honda Municipality, Pinar del Río, to the West.

SURFACE AREA

272 km²

POPULATION

43,169 inhabitants, 78.86 % in urban areas, 21.14 % in rural areas.

POPULATION DENSITY

158.63 inhabitants/km²

SETTLEMENTS

5 People's Councils, 32 settlements in the municipality, 8 are urban and 24 are rural. Of the latter, 9 have more than 200 inhabitants and 15 have less than 200 inhabitants.

TOPOGRAPHY

Undulating, 35% plains and 65% hilly.

ECONOMIC ACTIVITIES

Cement production and export, electrical generation, marble processing, export and import of goods at Mariel Port, forestry, fishing and mixed crops.

DISASTER HAZARDS

Natural origin: Hurricanes, severe local storms, prefrontal lightning storms, intense rains, intense droughts, storm surges, earthquake, landslides, fires in rural areas.

Technological origin: Rupture of hydraulic works, building collapse, dangerous substance accidents, large fires in industrial complexes and social buildings, traffic accidents, hydrocarbon spillage.

Sanitary origin: Epidemics, epizootics, epiphytotics.

RISK STUDIES

Disaster risk studies: health, landslides, hydrocarbon spillage, seismological, and storm surges.

EARLY WARNING POINTS

Three (3) EWPs

ACHIEVEMENTS AND BEST PRACTICES

Creation of a municipal information system for risk reduction. This information system allows for the reception of information generated by the municipality's different social and economic sectors either electronically or directly in digital form. An example is the state of territorial health and environmental sanitation, in particular water: distribution in both quantity and quality, critical areas that do not receive water services, chlorination levels, and health warnings.

Reception of information from national and provincial warning and monitoring systems.

The RRMCC receives meteorological, seismological and hydrological information, such as water levels in dams and precipitation levels. The RRMCC transmits, in real time, this information to the Municipal Assembly and to People's Councils that have Early Warning Points. The acquired equipment, along with available municipal information and communication facilities, also allows for access to international warning systems and Internet based information.

Training in the most vulnerable communities. In the urban area of Mariel target training in disaster reduction has been offered to the population living in landslide zones. In addition, training in risk management has been provided to approximately 300 officials in the health, housing, physical planning, and education sectors as well as to members of political and mass organizations and enterprises.

TOOLS GENERATED

- Municipal information system methodology
- Procedures for updating databases by municipal sectors and institutions.
- Training programme for communities vulnerable to natural hazards
- Input provided to update the territorial disaster reduction plan and risk studies
- Landslide risk map
- Documentation on natural hazard that have affected the municipality of Mariel



3.4 MUNICIPALITY OF CIÉNAGA DE ZAPATA, MATANZAS

The centre was established in April 2008, in the administrative office of the Municipal Assembly, with funding from the World Food Programme (WFP).

GEOGRAPHIC LOCATION

South Matanzas Province

BOUNDARIES

Jagüey Grande Municipality to the North; Caribbean Sea to the South; Aguada de Pasajeros Municipality, Cienfuegos Province, to the East; Unión de Reyes Municipality to the West.

SURFACE AREA

4,162.40 km²

POPULATION

8,821 inhabitants

POPULATION DENSITY

2 inhabitants/km²

SETTLEMENTS

3 People's Councils, 19 settlements, 64.5% in urban areas and 35.5% in rural areas.

TOPOGRAPHY

The territory has the largest wetland found in the Caribbean, characterized by 228,224 hectares of forest areas, 147,976 hectares of swamp and 184 kilometres of coastline.

ECONOMIC ACTIVITIES

Woodland forestry, ecotourism, fishing (shelf and reservoirs), beekeeping and on a lesser scale, handicrafts.

DISASTER HAZARDS

Natural origin: Hurricanes, intense rains, severe local storms, storm surge, intense droughts and forest fires.

Sanitary origin: Diseases that can cause epidemics, epizootics, epiphytotics and quarantined pests.

RISK STUDIES

Disaster risk study and environmental impact study.

EARLY WARNING POINTS

Three (3) EWPs

ACHIEVEMENTS AND BEST PRACTICES

Creation of a monitoring and early warning system for municipal forest fires. The objective is to strengthen local capacities in forest fire prevention and monitoring, and to protect the population, forestry resources and biodiversity as a whole. The system has communications established with all surveillance sites and information centres; it also expedites the confirmation and verification of information received from land, maritime, air or satellite detection systems.

Development of the technological capacities for the Municipal Defence Command post. This post supervises disaster reduction measures for natural hazards situations, in particular forest fires. This involves equipment for the communication system, which permits a) follow up to the response actions envisaged in the disaster reduction plan, and b) access to necessary information about the evolution of hazard situations.

Completion of a regional and urban disaster risk study. This study includes an analysis of all possible hazards that might affect the territory, determines the vulnerabilities of different sectors and the ecosystem, and defines structural and non-structural actions that are necessary to reduce risk. As a complement to this risk study, an environmental impact study was conducted on forest fires. A photographic registry was also created to document the prevention and response actions carried out by the region.

TOOLS GENERATED

- Guide to action in the event of forest fires
- Proposal for forest fire observation points and necessary equipment
- Municipal risk map
- Photographic registry of disasters that have occurred
- Inputs provided for the municipal disaster reduction plan
- Methodology and protocols developed for the environmental impact studies



3.5 MUNICIPALITY OF SANTA CRUZ DEL SUR, CAMAGÜEY

The centre was established in April 2007, in the seat of the Municipal Assembly, with UNDP funding.



GEOGRAPHIC LOCATION

Southeast Camagüey Province

BOUNDARIES

Najasa and Vertientes municipalities to the North; Caribbean Sea to the South; Amancio Rodríguez Municipality, Las Tunas Province, to the East; and Vertientes Municipality to the West.

SURFACE AREA

1,119.20 km²

POPULATION

51,816 inhabitants

POPULATION DENSITY

46.20 inhabitants/km²

SETTLEMENTS

11 People's Councils, 78 settlements, three of which are urban and the rest rural.

TOPOGRAPHY

Flat, with low cumulative coasts

ECONOMIC ACTIVITIES

Agriculture (sugar cane), shrimp farming and fishing.

DISASTER HAZARDS

Natural origin: Hurricanes, intense rains, severe local storms, flooding and storm surges.

Sanitary origin: Diseases that can cause epidemics, epizootics, epiphytotics, and quarantined pests.

RISK STUDIES

Disaster risk study and environmental vulnerability study.

EARLY WARNING POINTS

Three (3) EWPs

ACHIEVEMENTS AND BEST PRACTICES

Update of the municipality's General Plan for Territorial Land Management and Urbanism. This plan includes three development alternatives taking in consideration the four variables of habitat, services, infrastructure and soil management. This plan envisages risk reduction actions in its territorial organizational model, such as limiting the growth of settlements in an area affected by a ruptured dam, flooding and storm surges. It also establishes the need to maintain and reconstruct the drainage channels in the southern part of the municipality.

Completion of a disaster risk study in three hydrographic watersheds (Najasa, Caimanes and La Honda). The study identified 33 settlements as most vulnerable to different kinds of natural hazards; it also outlines possible disaster scenarios for each one of the watersheds and establishes short- and medium-term preventive, response and recovery measures.

Conducted a study on risk perception within the population, with the aim of strengthening community response capacity, in particular for the most vulnerable, in the event of disaster. This study was further extended to different work collectives and population sectors. It now constitutes the base of Civil Defence's public awareness and communication programme, aimed at reducing the impact of natural and other hazards.

TOOLS GENERATED

- Input for incorporating risk reduction in the Land Management and Urbanism Plan
- Input provided to the municipal disaster reduction plan
- Municipal risk map
- Methodology for characterizing risk perception in vulnerable communities
- Digitalized historical documentation including text and images of historical and recent disasters such as the Hurricane Flora (Nov. 9th, 1932) and Hurricane Paloma (Nov. 8th, 2008).
- Data on the construction state of housing and materials used in the La Playa settlement



3.6 MUNICIPALITY OF GUAMÁ, SANTIAGO DE CUBA

The centre was established in June 2005, in the seat of the Municipal Assembly, with funding from CRMI, BCPR and the UNDP.

GEOGRAPHIC LOCATION

West Santiago de Cuba Province

BOUNDARIES

III Frente Municipality and Granma Province (Bartolomé Mazo y Guisa Municipality) to the North; 157 kilometres of Caribbean Sea coastline to the South; Pílon Municipality, Granma Province to the West; and Santiago de Cuba and Palma Soriano municipalities to the East.

SURFACE AREA

964.65 km²

POPULATION

34,878 inhabitants

POPULATION DENSITY

36.7 inhabitants/km²

SETTLEMENTS

10 People's Councils, 5 settlements with more than 2,000 inhabitants, and 160 with less than 2,000 inhabitants.

TOPOGRAPHY

Mountainous. Cuba's highest elevation (1,974 metres above sea level) is found in the Sierra Maestra.

ECONOMIC ACTIVITIES

Forestry, agriculture.

DISASTER HAZARDS

Natural origin: Hurricanes, intense rains, local storms, storm surges, earthquakes, intense droughts and fires in rural areas.

Technological origin: Catastrophic traffic accidents, dangerous substance accidents, large fires in industrial complexes or rupture of hydraulic works.

Sanitary origin: Diseases that can cause epidemics, epizootics, epiphytotics, and quarantined pests.

RISK STUDIES

Disaster risk study

EARLY WARNING POINTS

14 EWP's

ACHIEVEMENTS AND BEST PRACTICES

Creation of a monitoring and early warning system (EWS) for intense rains and flooding in the municipality. This EWS ensures the transmission of hydro-meteorological variables between ten People's Councils and the municipal government. It benefits over 160 communities that potentially could remain incommunicado for a period of up to 5 days, due to rising water levels in 32 rivers and 21 streams in the vicinity as well as the landslide risks from intense rains. The System has 14 early warning points (EWP) for areas of intense rains and fluvial or coastal flooding. These EWP's make possible direct response and recovery actions after the impact of a natural hazard.

Development of a training programme in disaster risk reduction for municipal health and education sector personnel. This programme increases the knowledge about the dangers that can affect the communities, the norms of conduct that the population should adhere to when faced with a possible natural hazard, and actions for prevention, response and recovery. The programme aims to prepare health and education professionals to lead training programmes for the general population and to support the presidents of the People's Councils. This contributes to effective responses to different risk situations.

Formation of a municipal "road builders" brigade for reconstruction and maintenance of mountain roads. In addition to benefitting the general population and food transport, the maintenance of mountain roads allows the mountain communities improved access to medical services. In disaster situations, these roads are critical in the evacuation of the population at risk to more secure locations. Different evacuation routes and hazard zones have also been indicated.

TOOLS GENERATED

- Municipal communication plan
- Training programme for communities vulnerable to natural hazards
- Maps of municipal evacuation routes
- Input provided to update the Disaster Reduction Plan and territorial risk studies
- Photographic documentation of the main disasters that have affected the region
- Project proposals for strengthening response capacities of the municipality's vulnerable communities



Ciénega de Zapata, Matanzas province.

3.7 SUMMARY OF RISK REDUCTION MANAGEMENT CENTRES GOOD PRACTICES AND TOOLS

RRMC	Guane, Pinar de Rio	San Juan y Martínez, Pinar del Río	Mariel, Provincia Habana
LOC	Seat of the Municipal Assembly	Seat of the Municipal Assembly	Seat of the Municipal Assembly
ACTORS	Government authorities, Civil Defence, social sectors representatives, social institutions representatives, scientists, forest rangers, radio hams, Cuban Red Cross.	Government authorities, Civil Defence, social sectors representatives, social institutions representatives, scientists, forest rangers, radio hams, Cuban Red Cross.	Government authorities, Civil Defence, social sectors representatives, social institutions representatives, scientists, forest rangers, Fire Department, entrepreneurs, community.
VULNERABILITIES	Structural (housing and community facilities in bad condition), crops and agricultural facilities with low resistance to strong winds, isolated mountainous forest areas which are prone to fires, settlements in low lands, water below dams.	Structural (housing and community facilities in bad condition), crops and agricultural facilities with low resistance to strong winds, isolated mountainous forest areas which are prone to fires, settlements in low lands, water below dams.	Structural (housing and community facilities in bad condition), areas prone to fires, settlements in low lands with nearby factories and port area with hazardous substances, landslide areas.
HAZARDS	Hurricanes, intense rains, severe local storms, storm surges, intense droughts and forest fires, epidemics, epizootics, epiphytotics and quarantined pests.	Hurricanes, intense rains, severe local storms, storm surges, intense droughts and forest fires, epidemics, epizootics, epiphytotics and quarantined pests.	Hurricanes, severe local storms, lightning storms, intense rains, intense droughts, storm surges, earthquake, landslides, fires in rural areas, rupture of hydraulic works, building collapse, dangerous substance accidents, fires in industrial complexes and social buildings, traffic accidents, hydrocarbon spillage, epidemics, epizootics, epiphytotics.
AVAILABLE TOOLS	<ul style="list-style-type: none"> • Municipal information system methodology • Procedures for updating databases • Training programme • Input provided to update the territorial disaster reduction plan and risk studies • Historical documentation on natural hazards: <i>Las fieras del Caribe a su paso por Guane</i> and <i>Experiencias del Centro Municipal de Evacuación al paso del huracán Ike</i> 	<ul style="list-style-type: none"> • Maps of damaged housing and population at risk from intense rains • Territorial zone and land-use Plan for the housing sector • Inputs to update the disaster reduction plan • Guide to action in the event of forest fires • Digital information and its cartographic representation • Public awareness programme on forest fire prevention measures 	<ul style="list-style-type: none"> • Municipal information system methodology • Procedures for updating databases by municipal sectors and institutions. • Training programme for vulnerable communities • Input provided to update the territorial disaster reduction plan and risk studies. • Landslide risk map • Historical documentation on natural hazards

Ciénaga de Zapata, Matanzas	Santa Cruz del Sur, Camagüey	Guamá, Santiago de Cuba	RRMC
Administrative office of the Municipal Assembly	Seat of the Municipal Assembly	Seat of the Municipal Assembly	LOC
Government authorities, Civil Defence, social sectors representatives, social institutions representatives, scientists, forest rangers, population, radio hams, Cuban Red Cross.	Government authorities, Civil Defence, social sectors representatives, social institutions representatives, scientists, population, radio hams, Cuban Red Cross.	Government authorities, Civil Defence, social sectors representatives, social institutions representatives, scientists, Forest rangers, radio hams, community services, population, Cuban Red Cross.	ACTORS
Structural (housing and community facilities in bad condition), isolated forest areas which are prone to fires, settlements in low lands.	Structural (housing and community facilities in bad condition), settlements in coastal low lands, water below dams.	Structural (housing and community facilities in bad condition), isolated mountainous forest areas which are prone to fires, settlements in low lands, river terraces.	VULNERABILITIES
Hurricanes, intense rains, severe local storms, storm surge, intense droughts and forest fires, epidemics, epizootics, epiphytotics and quarantined pests.	Hurricanes, intense rains, severe local storms, flooding and storm surges, epidemics, epizootics, epiphytotics, and quarantined pests.	Hurricanes, intense rains, local storms, storm surges, earthquakes, intense droughts and fires in rural areas, traffic accidents, dangerous substance accidents, fires in industrial complexes or rupture of hydraulic works, epidemics, epizootics, epiphytotics, and quarantined pests.	HAZARDS
<ul style="list-style-type: none"> • Guide to action in the event of forest fires • Proposal for forest fire observation points and necessary equipment • Municipal risk map • Photographic registry of previous disasters • Inputs provided for the municipal disaster reduction plan • Methodology and protocols developed for the environmental impact studies 	<ul style="list-style-type: none"> • Input for incorporating risk reduction in the Land Management and Urbanism Plan • Input provided to the municipal disaster reduction plan • Municipal risk map • Methodology for characterizing risk perception in vulnerable communities • Digitalized historical documentation • Data on the construction state of housing and materials 	<ul style="list-style-type: none"> • Municipal communication plan • Training programme for communities vulnerable to natural hazards • Maps of municipal evacuation routes • Input provided to update the disaster reduction plan and territorial risk studies • Photographic documentation of the main disasters that have affected the region • Project proposals for strengthening response capacities of the municipality's vulnerable communities 	AVAILABLE TOOLS

4. Sustainability of Risk Reduction Management Centres

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To ensure the sustainability of the centres beyond the life of the project, it is necessary to demonstrate that the social, economic and environmental benefits they provide compensate for the costs involved in their creation, development and operation.

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The Cuban Government is committed to the continuity of the Risk Reduction Management Centres (RRMC) as a response to the Civil Defence System's strategy to make this model available to all municipalities in the country, starting with the most vulnerable. This commitment is independent of the technical and financial support provided to date from the United Nations and other international cooperation agencies present in the country. The legal corpus developed and the actions undertaken confirm government support for this strategy.

Sustainability of the RRMCs implies changes in work methodology and strengthening of local government capacities. This is achieved through the creation of permanent centres with suitable levels of technical and structural support, allowing for adequate information management for decision-making in development processes, investment projects, and disaster risk management, to be carried out by government with full community participation.

Local governments, entities, social institutions, the community and beneficiary families are committed to the RRMC model and have assumed responsibility for the maintenance and management of acquired infrastructure and equipment. The government assumes salary and operating costs as well as the maintenance and repair of infrastructure and equipment.

The majority of risk reduction actions carried out by the centres have had a much lower economic cost than the costs that would result from the impact of a hazard not anticipated in local development plans. In addition to this and other social benefits, the Cuban experience demonstrates the willingness of the country to invest resources and actions to protect or safeguard its population when faced by any kind of disaster risk.

4.1 WHAT RESULTS AND TOOLS HAVE THE CENTRES GENERATED?

The centres have increased efficiency in implementing the activities directed at disaster risk reduction and have imparted the technical resources necessary for the decision-making processes in local governments, with a broader participatory base of sectors, institutions and the community. The effective analysis of information received and distributed takes into consideration the majority of interests in the locality. It should be pointed out that all sectors and institutions are legally obligated to systematically contribute and update information from their area. Transparency and objectivity in decision-making is observed in the updated information received from throughout the region; this tendency extends to diverse development processes including those linked to disaster risk reduction.

In the case of a disaster hazard, the personnel, resources and means of the centres support defence councils activated at different levels. The RRMCs provide complementary information to that of ter-

territorial risk reduction plans, facilitate analyses and decision-making, and document all actions that are developed in response and recovery phases in the territory. This historical documentation constitutes a valuable source of information that is fed back and used to perfect the territory's disaster reduction plans and disaster risk studies.

4.2 COMMUNICATION EFFORTS IN DISASTER RISK REDUCTION

In the ex-ante phase, the centres have reinforced information preparedness and dissemination in the following manner:

- By having at their disposition available data bases and didactic materials developed by different entities and institutions, the RRMCS have enhanced the public awareness campaign preparation and dissemination of Civil Defence measures.
- The knowledge of local authorities, technicians, staff members and the population in general is increased due to systematic workshops, exchanges and trainings. With the creation of the first Risk Reduction Management Centre, a regional cycle of workshops was established to disseminate and share the RRMCS experience. Local authorities, directors and specialists in risk reduction management, and representatives of the United Nations System and international non-governmental organizations have participated in these workshops.

In the ex-poste phase, the centres have reinforced communications in the following manner:

- The existing communication resources in the territory have been reinforced with the RRMCS equipment, thus enabling better transmission of voice, data and images to different administrative levels and reducing "silent zones". Vulnerable communities are able to maintain radio communication between several of its members; this helps with the execution of established civil defence measures.
- The RRMCS provide alternative points for transmitting data, radio and local television. The functions carried out by the centres and their vitality in disaster situations has allowed them to transmit specific information in real time as well as informing the population of the measures and norms to follow to protect their lives and safeguard their belongings.

Among the tools that the RRMCS have generated are:

- The legal, methodological and organizational framework that guides their operation
- A Guide for conducting risk studies and a methodology for risk assessment
- Geographic information systems
- Thematic data bases and disaster reduction plans
- Early warning systems, including early warning points
- Inputs to incorporate into territorial disaster risk reduction plans
- Educational campaigns; didactic and preparatory materials
- Training processes and local, national and regional knowledge exchange

.....

These detailed actions, topics and contingency plans have grown through a process of exchange of experiences, knowledge and cooperation between the principal and diverse actors of regional risk reduction.

.....

4.3 LESSONS LEARNED

The Risk Reduction Management Centres (RRMC) in Cuba respond to a pragmatic medium- and long-term vision and priority. They are designed to resolve problems perceived by the leading risk reduction institution, the Joint Staff of National Civil Defence, and local governments, which provide the political will necessary for the implementation, development and sustainability of the centres.

As a result of this systematization process on the RRMCS, authorities, technicians and the population in general have identified lessons learned that are directly linked to the development and functioning of these centres. They are as follows:

- The country, the Civil Defence System and local governments are organized and possess a legal framework, disaster risk reduction plans, institutional capacity and human resources to develop actions for risk reduction in different territories. It is within this context that Risk Reduction Management Centres are inserted, facilitating the work of local governments, and in particular the decision-making process regarding disaster risk. **Based on these experiences, local governments have extended their use of the centres to other decision-making processes within their jurisdiction, including planning and resource management for development and investment projects.**
- Each local government and community faces a reality and scenario of different risks, and will ponder their actions based on their capacities, strengths, available resources and weaknesses. **One of the most important lessons that these centres have contributed is that local governments have identified their own strategies in accordance with the existing legal framework and have created various tools for incorporating risk reduction in development processes and investment projects.**
- Although the centres constitute a working tool of the government and Civil Defence, participating institutions, entities and communities have assumed ownership of the management processes allowing greater harmonization of disaster risk reduction planning in the territories.
- RRMCS and EWPs evolved in different and complementary contexts. The first on an institutional, strategic and informational level linked to decision-making processes; the second in the communities where hazards exist, linked to response actions. **Governments have correctly identified that the number of EWPs in their territory should respond not only to an analysis of the possibilities and financial decisions within a project, but must also be determined by conditions of vulnerability and population exposure to disaster risk.**
- Technological support for information and communications within the RRMCS and EWPs should be appropriate to the technical conditions and financial realities of the territories, and allow for connectivity to the principle networks of information, data and image transmission, among other things. **This allows governments and defence councils to be able to access, in real time, available information about the evolution of a hazard. Based on this, they then can adopt measures for the protection of the population, such as evacuation, when faced with hurricanes and intense rains, in accordance with the disaster risk reduction plan.**

The following table presents a summary of the best practices and lessons learned associated with the RRMCS, based on the most relevant aspects to their operation and sustainability:

	BEST PRACTICES	LESSONS LEARNED
INFORMATION	<p>Municipal information system for risk reduction.</p> <p>Preparation and updating of digital data bases in the interest of risk reduction.</p> <p>Geographic information system for risk reduction.</p>	<p>The effectiveness of using the developed methodology and info-communications in other decision-making areas which fall under government jurisdiction, including planning and resource management for development and investment projects.</p>
PLANNING	<p>Updating the municipality's General Plan for Land Management and Urbanism.</p> <p>Preparation of disaster reduction plan for forest fires.</p> <p>Development of technological capacities for Municipal Defence Command Post.</p>	<p>The need for governments to identify their own strategies in accordance with the existing legal framework, and to create different tools for incorporating risk reduction in the development processes and investment projects being implemented at the local level.</p>
MULTIDISCIPLINARY ASPECTS	<p>Identification, promotion, and participation with other sectors and institutions, in local preparedness and training projects for disaster risk reduction.</p>	<p>The need for different participating institutions, entities and communities to assume ownership of management processes, enabling a consolidation in the overall work being developed to reduce the risk of disasters in their territories.</p>
ANALYSIS AND RISK	<p>Completion of a disaster risk study at the territorial and urban scale.</p> <p>Completion of a disaster risk study in hydrographical watersheds.</p> <p>Integration of the results of different risk studies of natural and technological hazards.</p>	<p>The importance of disaster risk studies for decision-making in recovery and reconstruction processes, and strategic development, including sectoral investment plans.</p>
CAPACITY DEVELOPMENT	<p>Training in vulnerable communities.</p> <p>Preparation of a training programme in disaster risk reduction for personnel from municipal health and education sectors.</p> <p>Training of officials from health, housing, physical planning and education sectors, political and mass organizations, and enterprises and economic entities.</p>	<p>The importance of training processes for the population, and the education of human resources at different levels on topics of risk management. This has the capacity to transform the causes of disasters.</p>

4.4 TRANSFERRING THE MODEL TO OTHER COUNTRIES AND CONTEXTS OF THE REGION

Can the Cuban experience with Risk Reduction Management Centres be developed or reproduced in other countries and contexts? The response is affirmative. RRMCS, or any other tool dedicated to the same purpose, must respond to pragmatic medium and long-term visions and priorities. They must be designed to address and resolve problems perceived by governments at different levels, as this builds the political will to implement, develop and continue the model over time.

Elements of the Cuban experience with RRMCS that should be taken into account in the replication of this experience:

- Beyond political will and the legal framework that guarantees action, the centres require qualified human resources. In Cuba, investment is made in the development of human capital, and without a doubt, this constitutes a strength that guarantees the process.
- RRMCS in Cuba have been designed with the objective of providing relevant information for decision-making, through simple, participatory and up-to-date methodological tools. The technology for obtaining, processing, using or spreading information must be selected according to the social and economic reality of each territory or country.
- To develop a RRMCS in any given context, the existence of institutions or other organizational forms that are linked to development processes, land-use planning and risk reduction is critical and decisive. These organizations must have the capacity to obtain information and the commitment to share it.

The majority of national governments in the region have expressed their commitment to prioritize action in the field of disaster reduction. These governments are supported by different international cooperation organizations. Although political support alone should guarantee the success of this tool, the international collaborators should respond if, in fact, risk reduction forms part of the work agenda of national and, in particular, local governments. This is especially the case if the international collaborator's influence allows them to incorporate disaster risk reduction into development processes and investment projects in the territory.



Aftermath of 2005 hurricane season.

Annexes

The following annexes are examples of the type of information handled by the Risk Reduction Management Centres (RRMC). They include risk study samples, geographically-referenced imagery, control and resource organization charts and informational material aimed at raising population's awareness about risks. Also included are a reflection about the RRMC experience, and the CPAP's expected outcomes related to disaster risk reduction in Cuba.

It is our hope that these annexes contribute to a better understanding of the RRMC's functioning context, and its relevance as a key element for disaster risk reduction and improvement of quality of life in local communities.

A. EXAMPLE: TABLE OF CONTENTS, GUIDE TO CONDUCTING A DISASTER RISK STUDY

INTRODUCTION

GENERAL OUTLINES

Legal Base

Objectives of the Guide and Disaster Risk Studies

Procedures

General Aspects about Risk Management

RISK OR HAZARD STUDIES

Studies of Hazards of Natural Origin

Studies of Hazards of Technological Origin

Studies of Health Hazards

Conclusions

Recommendations from Hazards Studies

VULNERABILITY STUDIES

General Analysis of Physical Vulnerability

Conclusions

Recommendations from Vulnerability Study

RISK ASSESSMENT

Risk Assessment

Cost Benefit Analysis

OUTPUT OF RISK STUDIES

General Aspects

Specificities by type of risk study

Natural Risks Study

Technological Risks Study

Health Risks Study

B. EXAMPLE: DISASTER RISK STUDY AT THE TERRITORIAL AND URBAN SCALE: CIÉNAGA DE ZAPATA

Introduction

Located in the south of Matanzas province, Ciénaga de Zapata occupies an area of 520,000 hectares. It is bounded by Jagüey Grande Municipality to the North, Cienfuegos Province to the East, Unión de Reyes Municipality to the West and the Caribbean Sea to the South. This wetland, the largest in the Caribbean, includes 228,224 hectares of forest area and 147,976 hectares of swampy area. It also has 184 kilometres of coastline, with Bahía de Cochinos and Ensenada de la Broa standing out as the main geographical features. Because of its biodiversity, it is an important natural region, as much for its flora as for its fauna and the water resources it contains. For these reasons the Cuban State, through Decree-Law 197, declared it a Special Region for Sustainable Development and UNESCO granted it the category of Biosphere Reserve (2000). Likewise the Ramsar Convention on Wetlands granted it the category of Ramsar Site (2001), for being a Wetland of International Importance.

At present, Cuba is applying for the category of World Natural Heritage for this region. Obtaining it would make the Ciénaga one of the few natural areas of the world having such high recognition, where natural wealth and its endemism, uniqueness of various species, history, culture and the degree of conservation that it presents, all predominate.

Basic economic activities in the region are silviculture, ecotourism, fishing (shelf and reservoir), beekeeping and, on a lesser scale, handicrafts.

The Forestry Enterprise has a land holding equivalent to 477,774 hectares. It is the largest of its type in the country. Ecotourism, based on the variety of the region's landscapes, trails, fishing and other offers, makes a contribution to the economy of between \$9-11 million annually. Fishing has a capture plan of 800-1,000 metric tons/year. During the flowering season beekeeping, with 12-14,000 colonies, harvests between 500-700 metric tons of honey and other high-value added products such as wax, propolis and propoline.

From the hydraulic viewpoint, the Hatiguanico, Salado and the Rice-Growing Plan Magistral Canal flow into our municipality. It also receives the discharge from all the province's southern springs, yielding a fresh water reserve in Laguna del Tesoro.

The population of our municipality is 8,821 inhabitants of whom 5,696 are urban residents and 3,125 are rural, with an overall population density of 2 inhabitants/km². They are distributed in 19 population settlements.

The main roadways are:

- Playa Larga – Jagüey Grande Road
- Playa Larga - Girón – Aguada de Pasajeros Road
- Playa Larga – Soplillar Road
- Improved roads are:
 - Buenaventura – Santo Tomás – Vínculo
 - Playa Girón – Guasasa – Cocodrilo
 - Hondones – Cayo Ramona
 - Hondones – Rice-growing Plan – National Highway
 - Palpite – Soplillar – Hondones

System for producing electricity

The territory has a 33 kW sub-transmission network which is fed by the Jagüey Grande 110 kW substation. Three substations are located in the towns of Palpite, Playa Larga and Playa Girón from which 13 kW enters the distribution network.

Water supply

The territory's water supply is provided through 4 Pumping Stations located in San Isidro, Playa Girón (El Peaje), Cayo Ramona and Guasasa. These supply more than 75% of the municipal population. The remainder is supplied with water from tank trucks and wells.

The state of buildings:

The predominant constructions in the municipality are 1 and 2 stories. In the town of Playa Girón there are 2 buildings with 4 stories. Overall, the most numerous buildings are of wood with light roofs. However, because of the vulnerability of these roofs and as a result of the passage of Hurricane Michelle, the municipal housing stock later improved considerably with canted constructions and blocks.

Each year, the region is threatened by different meteorological events and by those of a technological origin. This puts the stability and natural resources of the wetland at risk, as well as the housing and administrative infrastructure created by the Revolution.

The accumulated experience of previous and present generations facilitates preventive conditions to minimize such high risks. It prevents the loss of human lives as the priority, as well as the significant economic damages caused by hurricanes, and impacts from a technological or human origin.

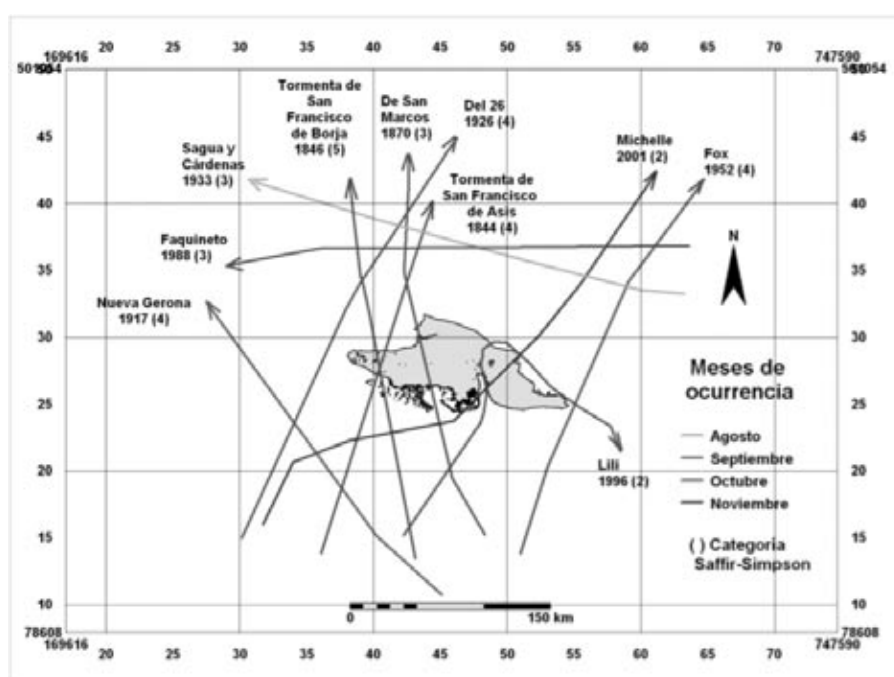
In a summary form, we are going to show the magnitude of the risks to which we are exposed in the Ciénaga de Zapata, their scale, and the possibilities to decrease and even prevent some of them. Risk prevention requires a preventive warning system that is guaranteed and appropriate to each situation. Many of the values and figures that we show are based on meteorological and technological events and from the noted effect of anthropogenic actions.

The Zapata region can be affected by:

1. High intensity hurricanes
2. Storms
3. Intense rains and inundations
4. Intense droughts
5. Naturally-occurring fires and fires produced through human action
6. The Girón international air corridor
7. Pests and foreign diseases
8. Sea penetrations
9. Hydrocarbon spillage

1. High intensity hurricanes

Hurricanes are the most important of the severe hydrometeorological events that impact our territory. The greatest impact is produced in association with strong winds, intense precipitation, sea swell and storm tides. This is why coastal zones, in general, are the most affected. Some 41% of hurricanes that hit Cuba have occurred between 21 September and 20 October (Rodríguez, 1989). As is shown in the map below, the Ciénaga de Zapata region has been affected by 10 hurricanes between 1844 and 2003. Of these hurricanes, one was category 5, four were category 4, three were category 3 and two were category 2 on the Saffir-Simpson Scale. Moreover, seven of them were registered in the month of October, and one respectively in August, September and November. These events have caused incalculable material and human losses, which is the case whenever they hit an extremely flat territory, with inadequate drainage and low coasts.



Trajectory map of main hurricanes that impacted the territory.

A hurricane of great intensity that can affect the territory would cause significant damage to housing units with light roofs, to the power grid due to the existence of above ground distribution lines, and to ships moored to the docks.

All activities related to tourism, agroforestry, and *organopónicos*, (above all, the hothouses and máquina fregat, a type of irrigation equipment) are impacted.

If the hurricane is accompanied by strong precipitation it complicates the work of evacuation; the Ciénaga is an extremely low-lying territory with very slow drainage. If it floods, communities are left incommunicado. As well, the wave train can produce accumulations in the lowest zones, becoming most critical in the towns of Playa Girón, Buenaventura, Caletón and Guasasa.

Hurricane Michelle (Category 4) caused the following impact:

Areas affected	Areas damaged	Volume affected	Volume recovered	Recovery time	Observations
<i>EMA V.G.</i>	100,000 hectares	4 billion cubic metres	1,620,000 cubic metres	4 years	Totally damaged 51 hectares of urban area
<i>Beekeeping</i>	100,000 hectares	700 metric tons/year	650 metric tons	4 years	2002 without production
<i>Fishing</i>	Shelf and Capture	541 metric tons	459 metric tons	4 years	Capture decreased by over 50%
<i>Housing</i>	Roofs and totally destroyed	1,678 and 1,270	1,678 and 1,270	4 years	At present 50% would be affected (\$19,957,000)
<i>INRH (water resources)</i>	Population	6,050 people	Total	2 years	
<i>Commerce and Gastronomy</i>	16 and 19 units	16 and 19	16 and 19	3.5 years	
<i>EMP Services</i>	Roofs and shutters	Total	Total	3 years	Would affect \$2,730

2. High intensity storms

The annual incidence of severe local storms increases from the coast to the north, corresponding to the distribution of genetic squall zones associated with wind convergence zones. These short-lived but great intensity events are significant in the northern region. They occur in every period, mainly at the start of the season (May-June) and extend until October.

In the first case, they are usually electric storms and many times tend to cause fires in areas where lands are covered in peat. This has a severe impact for ecosystems corresponding to grasslands. They can also affect forest areas. When these storms are accompanied by strong rains, sea penetrations occur in areas near the coast, above all in the communities of Guasasa, Girón, Playa Larga, Caletón and Buena Ventura.

3. Flooding

The region is also affected by inundations in areas corresponding to the communities of Cocodrilo, Guasasa, Girón, El Rincón, La Ceiba, San Blas, Helechal, Cayo Ramona, Girón, Los Hondones, Soplillar, Palpite, Playa Larga, Mario López, Caletón, Buena Ventura, Santo Tomás and El Vínculo. Some years ago, when precipitation levels exceeded 1,500 mm annually, various communities were flooded for months. This limited all productive activities and services for the population, and eventually increased the risks of an outbreak of acute diarrheal and other diseases.

4. Intense droughts

Over the last 20 years, precipitation levels have been decreasing considerably. Rainfall levels were between an all-time high of 1,400-1,700 mm annually (from May until October). In the last decade, however, rainfalls have dwindled

significantly. In the last two years, they did not surpass 541 mm, less than a third of the all-time highs.

Connected to this is water leakage from the Ciénaga to the sea, due to the lack of completion of a group of hydraulic works which became paralyzed because of the arrival of the Special Period. Among these is the Soplillar-Hondones bridge floodgate system, culvert #24 (in front of the La Boca Complex) and periodic cleaning of some canals. This situation causes the annual loss of 34 to 42 million cubic metres of water. If this water had been retained, it could have reached the forest areas and maintained the moisture, thereby preventing huge forest fires and the enormous economic and ecological damage that the wetland forest heritage is experiencing.

5. Naturally-occurring fires and fires produced through human action

Each year areas with peat in their soil are subjected to intense drought and then ignite as a result of high temperatures, and burn up. The same thing happens from electrical discharges or lightening. Both are naturally-occurring fires. Many other fires occur; the most dangerous is because of human intervention. This can be because of furtive activity such as capturing and cooking turtles, burning to ward off a plague of mosquitoes and sand flies, smoking in the outdoors, and/or not using ashtrays or measures to control the sparks. This result is a loss of thousands of hectares of forest each year

6. The Girón International air corridor

The Ciénaga de Zapata region is crossed by the Girón International air corridor through which hundreds of airplanes pass each year. On the one hand, there are risks of a plane going down and the resulting consequences this brings. On the other hand, this is a route that the enemy might use to penetrate and spread foreign pests and diseases which could cause serious damage and consequences for the population as well as for the economy. It is sufficient to point to the entrance of *Thrips palmi* to Cuba. It caused great damage in the early years of the Special Period to more than 100 species of cultivated plants, which were the main food sources sustaining the population in the highly difficult times after the collapse of the socialist camp.

Also arriving at our coast are drugs, which put at risk very susceptible segments of the population such as youth. Thanks to the coastal brigades this has not produced greater repercussions.

7. Pests and diseases

With 180 km. of coastline exposed to sea currents carrying different contaminants, Ciénaga de Zapata faces high risks from pests and diseases. These can cost human lives, and affect animals and crops with significant losses for the national economy.

Among these risks are the following:

1. The existence of the international air corridor.
2. The existence of migratory birds, originating from the North American continent.

3. The existence of vector species that transmit disease.
4. North American and other visitors who introduce diseases and pests such as West Nile Fever, aphthous fever and screwworm.

8. Sea penetrations

Because of strong storms, great intensity hurricanes in the Caribbean area or an extratropical low, the sea level can rise and entire low areas of the coastland become flooded. This affects several communities located in the coastal zone, their entire infrastructure and population of 1,183 inhabitants.

9. Hydrocarbon spillage

The territory has several points for possible hydrocarbon spillage: La Boca, on the borderline with Laguna del Tesoro, which has a retail fuel pump for tourism and watercraft (with 10,000 litres of fuel), and; René Ramos Latour Fishing Cooperative in Caleta Sábalo, which has the 36,000 litre fuel tank. The possibility of a maritime accident involving supertankers transporting fuel by the southern Caribbean Sea cannot be discarded. Because of ocean currents, spilled fuel could arrive on our coasts, with serious consequences for the wetland environment.

Vulnerability

The Ciénaga de Zapata region presents high risks from the effects of natural phenomena, as well as from those of technological origin.

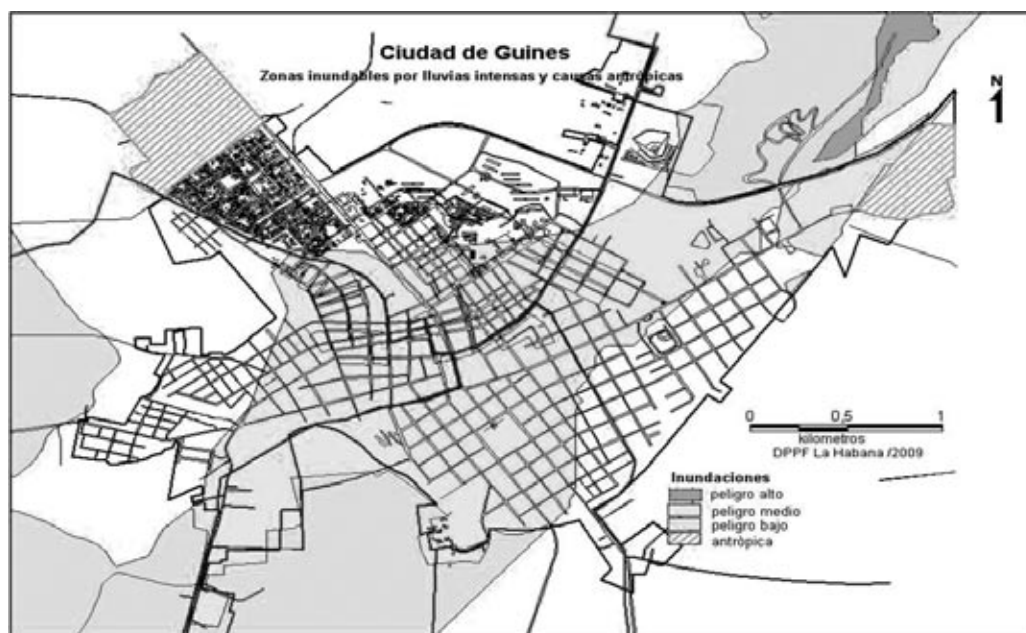
As a consequence of the flooding produced in the lower stretch of the Hanábana River from Hurricanes Kate, Lili, Irene, Michelle, it was necessary to carry out a new hydrological study to specify maximum costs of different project possibilities for modifying the existing Soplillar Chute.

The Soplillar Canal was conceived of in 1959 with the objective of drawing runoffs from the Hanábana River. Formerly, these runoffs emptied into the Hatiguanico River (Laguna Tesoro) towards the sea, without causing large inundations in the areas proposed for reclamation for agricultural use through the Polders system. At the same time this canal would intake waters produced from the pumping and drainage of the above-mentioned areas. This canal, in its centre and lower stretch, has a gradient height less than zero. Engineering, geological and hydrogeological conditions encourage drainage of subterranean waters from Zone B to the canal. The penetration of sea water inland also goes through the same watercourse. Thus, in the above-mentioned project, a budget was provided for the construction of a control chute which would have the following main objectives:

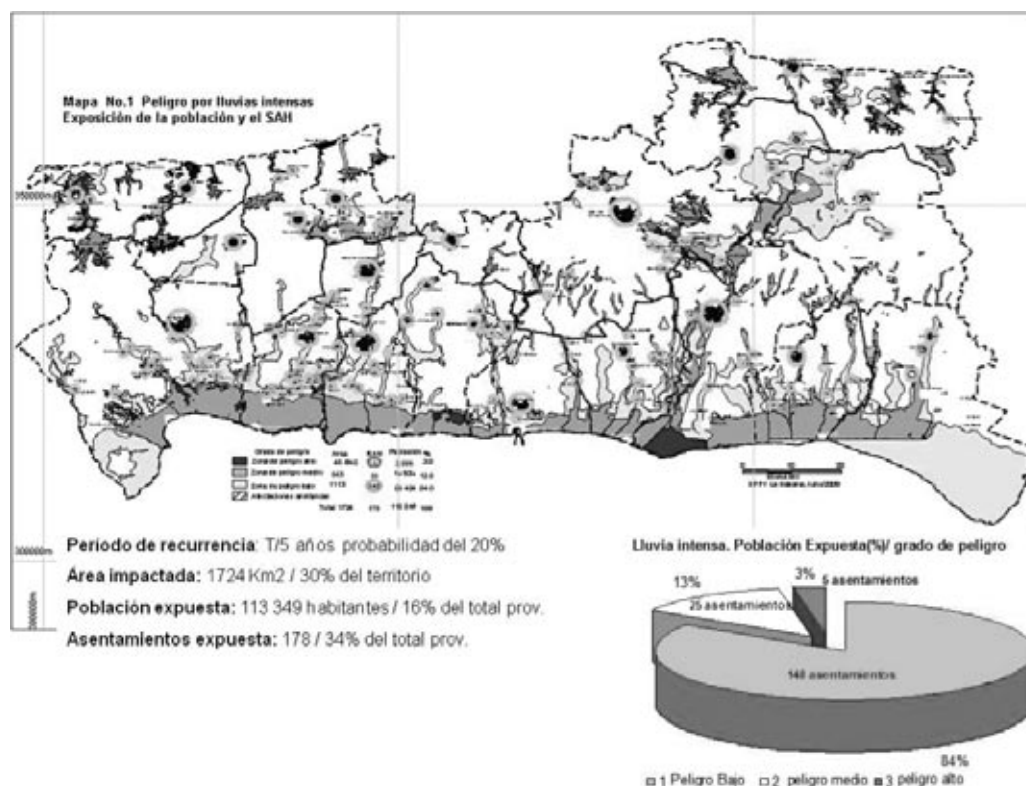
1. Prevent sea water penetration inland, through the watercourse, to the Eastern Ciénaga, which would result in an ecological disaster in the territory.

2. Change the flood course of the Hanábana River during unusual water events, which avoids rapid drainage towards the sea.
3. Guaranteed the gravity feed drainage for the waters pumped from Polders and from the Hanábana River towards Bahía de Cochinos.
4. Control subterranean water drainage from the southern watershed.

C. EXAMPLES OF RISK MAPS GENERATED BY THE RISK REDUCTION MANAGEMENT CENTRES



C1. Risk Map associated with heavy rains in the City of Guines, Havana Province: This risk map illustrates the flood zones caused by intense rains and anthropic causes and cross-references it with population concentration. The map index lists risk the risk levels associated flooding, from high to low .



C2. Risk Map associated with heavy rains in the Province of Havana: This risk map illustrates the provincial areas of risk in situations of heavy rains. The map provides reference to: period of recurrence, area impacted, exposed population and exposed settlements. In the pie chart, the information is divided between low, medium and high risk and is complemented by an analysis of the population exposed in terms of number of settlements.

D. EXAMPLES OF INFORMATION PROVIDED BY RISK REDUCTION MANAGEMENT CENTRES

D1. List of transport vehicles available, technical condition, who it belongs to and who it will be assigned to in a state of emergency.

TRANSPORTE CONTROLADO POR TIPO Y ESTADO TÉCNICO MUNICIPIO GUANE									
No	TIPO DE TRANSPORTE	MARCA	MODELO	CHAPA	COMBT.	PERTENECE	ESTADO TÉCNICO		
							B	R	M
1	Auto	Lada	2105	PSB 453	Gasolina	Forestal Maricao	X		
2	Jeep	Waz	469	PSE 192	Gasolina	Forestal Maricao	X		
3	Jeep	Waz	469	PSE 571	Gasolina	Forestal Maricao	X		
4	Jeep	Waz	469	PSE 303	Gasolina	Forestal Maricao	X		
5	Jeep	Waz	469	PSD 728	Gasolina	Forestal Maricao	X		
6	Jeep	Aro		PSD 726	Diecel	Forestal Maricao	X		
7	Jeep	Monduno		PSD 927	Gasolina	Forestal Maricao	X		
8	Jeep	Toyota		PSD 573	Gasolina	Forestal Maricao	X		
9	Jeep	Toyota		PSD 703	Gasolina	Forestal Maricao	X		
10	Plataforma	Ismaz	4310-1	PSN 930	Diecel	Forestal Maricao	X		
11	Plataforma	Ismaz	4310-1	PSN 660	Diecel	Forestal Maricao	X		



D2. Pamphlets designed for public and community education purposes. This pamphlet provides information on fire season and risks in rural areas. It outlines how fires can be avoided, what to do in the case of a fire and its long term impact on the environment.



D3. Posters designed for public and community education purposes. The poster on the left reminds the population of the dates of the hurricane season. The poster below pertains to actions to be taken in case of an environmental risk.



E. REFLECTIONS ABOUT RISK REDUCTION MANAGEMENT CENTRES

RISK REDUCTION MANAGEMENT CENTRES:

EXPERIENCES IN EASTERN HOLGUÍN

By Cleanel Ricardo Tamayo

Since remote times, the essentials of the story of hydrometeorological events have been written about Eastern Holguín, a province in eastern Cuba. Predictions or realities coming from that rich strip saturated with nickel, born in very ruddy Moa and reaching to Mayarí, where the important mineral is also extracted and processed, inspire fear.

One knows that these natural events are particularly cruel there, among other reasons because Eastern Holguín also carries the weight of the province's mountainous zone, marked by much more notable annual rainfalls, and grooved by powerful rivers that give life with as much force as they use in the attempt to make it disappear.

That is how it has always been, in an extensive area made up of four municipalities of the present-day province, until the 20th century brought, among its indisputable innovations, the development of the nickel industry. Surrounding this industry are dangers that were always known, although perhaps without an adequate appraisal of the real risks, such as those that, because of ignorance or inadequate judgement, become the accidental event for a regrettable disaster.

The Risk Reduction Management Centre (RRMC), with its risk and vulnerabilities studies, helps provide a more comprehensive focus about the realities of Eastern Holguín. This tool facilitates a continuity of work to evaluate and monitor with precision the why and wherefore of cause and effect categories, independently of whether the analyzed event is of a natural, technological or health origin.

SAGUA DE TÁNAMO MUNICIPALITY

Cut through by the Sagua River, one of the largest in Holguín which is born in the province's mountainous area, Sagua de Tánamo municipality has, aside from the well-known risk of hurricanes that affects the entire country, an additional risk from flooding because of intense rains that originate even further beyond its territorial borders.

It is known that hurricanes and intense rains can cause considerable damage in the thirteen zones or population settlements in Sagua de Tánamo, where building construction, mostly those of wood, are on slopes that make them vulnerable to these events, no matter what their category.

The monitoring and early warning system, which includes seven points with radio plants and rain gauges, and in four of these a scale system in the rivers, works to provide timely warning to the Municipal Defence Council (CDM). At the level of the Hydraulic Resources Office, a computer processes information about the rise in water levels and their time of arrival into the municipality, which allows authorities to take accurate measures to protect people and the economy.

So that the alert works well, a system was created that allows communicating the approaching risk to the CDM, Work Groups, Zonal Defence Councils (CDZ) and the population, using, in addition to the technical means of the communications system, the local radio station *Ecos de Sagua*, and cars with loudspeakers and megaphones, always with the participation of political and mass organizations.

With mutual relations of cooperation, one can count on neighbouring municipalities to provide lifesaving resources and rescue equipment when requested. If the event occurs when students are working in the Field Camp, surveillance is maintained over the encampments at risk of being incommunicado and they are demobilized according

to orders set down by provincial authorities.

In calm periods, one knows how many people must participate in the mobilization to protect people and economic means and to consolidate administrative agencies, the quantity of vehicles required to carry out these movements, and even the number and exact location of the shelters that must receive those evacuated. It is an organized way to considerably reduce human and economic losses when faced with the impact of foreseeable natural hazard, with the preparation of regulations and the establishment of phases for state agencies and organizations, economic entities, social institutions and the territorial population, in a way that guarantees risk impact reduction, while promoting a true culture of prevention.

MAYARÍ MUNICIPALITY

In Nicaro, a locality in Mayarí municipality, a nickel-cobalt processing plant has been operating since 1943. It has been dumping, in its proximities, solid wastes in the form of dust, referred to as tailings which are stored in dams that, nowadays, are necessary to monitor attentively so as to prevent, to the greatest length possible, negative effects to the area's coastal and marine ecosystems.

For a long period, the situation of the old tailings dam of Nicaro constituted a disaster hazard for the Arroyo Blanco inlet, and caused considerable impact on the population, with blackish dust carried by strong winds that prevailed from March to September.

Studies by enterprises, specialized agencies and the RRMC multidisciplinary group, all at the direction of the Mayarí municipal authorities, allowed them to conclude that the tailings dam is a key contaminant for the surrounding ecosystems and people vulnerable to dust emissions. Therefore, it is essential to correct this situation through technical solutions.

They analyzed the possibilities of covering the entire dust-emitting area of tailings with another type of material that could develop into suitable vegetation, improving the dikes and using more adequately the tailings dam through its division into sections.

To counterbalance dust emissions, it was decided to cover the emitting area, which is some 365 hectares, with a 30 centimetre layer of carbonated material that still allows the development of suitable vegetation. At the same time, it was confirmed that pollution of Arroyo Blanco bay has been resolved through the establishment and reforestation of dikes, levelling the ditches and constructing terraces on the slopes of the dam's basin up to the East banks.

By breaking up the active tailing dam into sections, which would make five micro-reservoirs with a useful life of five years each, it would be possible to obtain increased storage capacity for tailings for an additional twelve years of the industry's operation, eliminating atmospheric pollution and spillage of the tailing to the detriment of the area's coastal and marine ecosystems.



Pollution from tailings in Nicaro has impacted marine and coastal ecosystems.

The previous measures, which perhaps appear small or debatable, would eliminate dust emissions into the atmosphere (increasing air quality), significantly reduce surface hydric erosion to decrease breakdowns of the dikes and prevent the escape of tails into the inlet, and in the long run, improve three details: the quality of water that empties into the inlet, the landscape of the surroundings with their flora and fauna, and the conditions of life for the inhabitants of Nicaro, Mayarí and other nearby population centres. In other words, the essentials. To take care of human health, the flora, the fauna and the life of the planet.

F. COUNTRY PROGRAMME ACTION PLAN, UNDP CUBA 2008 - 2012

National Priority: Ex-Ante Risk Reduction to preserve human lives and conserve the well-being of the population, the environment and economic resources.			
Direct Impact UNDAF: Strengthened national and local for the comprehensive management of risk reduction, with an emphasis on the local and most vulnerable territories.			
BASELINE AND TARGETS	OUTPUTS	INDICATORS, BASELINE AND TARGETS	CO-PARTICIPANTS
Result 1: Increased prevention and post-disaster recovery with an emphasis on the most vulnerable territories, taking into consideration climate change and a gender perspective.	1.1 RRM and EWS strengthened in the most vulnerable territories to support local government management through inter-sectorial efforts and the incorporation of ICT.	<p>1.1.1: Number of RRM and EWS implemented, with ICTs incorporated and personnel trained in the most vulnerable territories. Baseline: 24 RRMCS, 51 EWS / Target: 20 RRM, 45 EWS.</p> <p>1.1.2: Number of documents produced for the multi-sectorial groups in the RRMCS for the purpose of decision-making. Baseline: 21 documents prepared / Target: 20 additional documents.</p> <p>1.1.3: Number of applications of GIS used by the RRM. Baseline: 24 GIS / Target: 20 GIS.</p> <p>1.1.4: Number of vulnerable communities connected with communication systems to the EWS. Baseline: 51 communities / Target: 45 additional communities.</p>	<p>Multi-lateral Cooperation: BCP, OCHA, ECLAC, WFP, UN-Habitat, FAO, WHO, UNICEF, UNESCO EIRD, CDEMA, CARICOM, ACS, CCCC.</p> <p>Bilateral Coop.: Canada, Switzerland, Spain, Belgium.</p> <p>Decentralized Coop.: Oxfam, CARE Canada, FAMSI.</p> <p>National Institutions: Central State Administration bodies, Joint Staff of National Civil Defence, territorial governments, universities.</p>
	1.2 Damage Assessment, Territorial Planning and Information Management is strengthened at all levels by way of multi-sectorial integration and the use of ITC.	<p>1.2.1: Number of institutions of the National Office of Statistics strengthened, with trained personnel in damage assessment and articulated in the RRMCS. Baseline: N/A / Target: National Office of Statistics, 8 Provincial Offices and 32 Municipalities strengthened with 90% of their technical personnel trained in damage assessment.</p> <p>1.2.2: Number of damage assessments conducted by the National Office of Statistics (incorporating gender indicators) and linked to the RRMCS. Baseline: N/A / Target: At least 1 integrated damage assessment by sector conducted at a provincial level following an extreme event.</p> <p>1.2.3: Number of Territorial and Urban Planning Plans which incorporate risk reduction and are utilized by the RRMCS. Baseline: N/A / Target: At least 10 Territorial and Urban Planning Plans that incorporate risk reduction and are utilized by the RRMCS.</p>	
	1.3: Educational activities developed in prevention and risk management, for the decision-makers, technical specialists and the general population, with an emphasis on gender.	<p>1.3.1: Number and % of inhabitants of vulnerable territories trained in prevention and risk management (women and men). Baseline: 30% of the inhabitants / Target: 70% of the inhabitants of vulnerable territories (women and men).</p> <p>1.3.2: % of decision-makers and technical specialists trained in integrated risk management and local territorial planning in the most vulnerable territories. Baseline: 50% of the decision-makers and technical specialists (women and men) / Target: 85% of the decision-makers and technical specialists (women and men).</p>	
	1.4: Capacity in comprehensive disaster management strengthened in key sectors (housing, hydraulic resources, communication, health) that guarantee the security of the population and safeguard livelihoods and economic resources prior to a disaster.	<p>1.4.1: Number of beneficiary families taking comprehensive risk management actions, by sector, at a local level. Baseline: 2,300 families / Target: 5,000 families.</p> <p>1.4.2: Number of local entities in the housing system that have strengthened their capacity. Baseline: 57 local entities / Target: 25 local entities strengthened.</p> <p>1.4.3: Number of automatic EWSs and number of EWSs activated for the flood prevention in the watersheds with the greatest risk in the East. Baseline: 0 / Target: Hydraulic infrastructure in 5 watersheds.</p> <p>1.4.4: Number of actions by other key sectors that strengthen their capacity. Baseline: 4 actions / Target: 5 actions of other key sectors to strengthen their capacity.</p>	
Result 2: Strengthened knowledge management and collaboration in risk reduction at a national and international level.	2.1: Documented and shared best practices and lessons learned in risk management.	<p>2.1.1: Number and type of best practices and lessons learned documented and shared nationally and internationally. Baseline: 6 best practices shared / Target: 10 new practices.</p>	
	2.2: Support Cuban collaboration to vulnerable and disaster affected countries in the region.	<p>2.2.1: Actions of horizontal cooperation achieved, systematized and shared in the region. Baseline: 1 / Target: 5 actions.</p>	



Cuban Civil Defence System ensures rapid response.

Glossary

The following terms have been taken from the United Nations International Strategy for Disaster Reduction publication *2009 UNISDR Terminology on Disaster Risk Reduction*. The UNISDR Terminology aims to promote a common understanding and usage of disaster risk reduction concepts and to assist the disaster risk reduction efforts of authorities, practitioners and the public.

Capacity: The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals.

Capacity Development: The process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions.

Coping capacity: The ability of people, organizations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters.

Disaster: A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disaster risk: The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.

Disaster risk management: The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.

Disaster risk reduction: The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Disaster risk reduction plan: A document prepared by an authority, sector, organization or enterprise that sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives.

Early warning system: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

Hazard: A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Mitigation: The lessening or limitation of the adverse impacts of hazards and related disasters.

National platform for disaster risk reduction: A generic term for national mechanisms for co-ordination and policy guidance on disaster risk reduction that are multi-sectoral and inter-disciplinary in nature, with public, private and civil society participation involving all concerned entities within a country.

Natural hazard: Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Preparedness: The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.

Prevention: The outright avoidance of adverse impacts of hazards and related disasters.

Public awareness: The extent of common knowledge about disaster risks, the factors that lead to disasters and the actions that can be taken individually and collectively to reduce exposure and vulnerability to hazards.

Recovery: The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

Resilience: The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Response: The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.

Risk: The combination of the probability of an event and its negative consequences.

Risk assessment: A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.

Risk management: The systematic approach and practice of managing uncertainty to minimize potential harm and loss.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Vulnerability: The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

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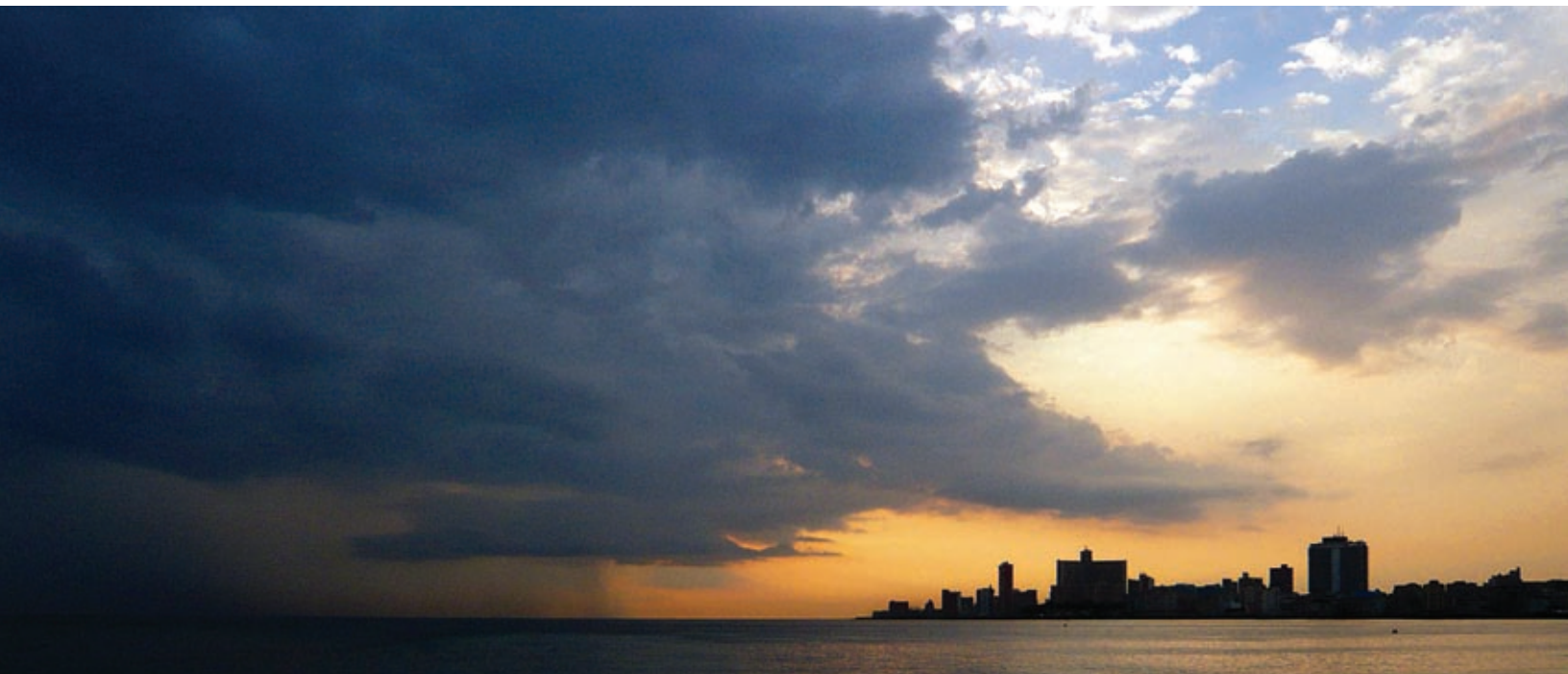
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The **Caribbean Risk Management Initiative** (CRMI) project is a knowledge network designed to promote best practices and build capacity in the region in the fields of risk management and climate change adaptation. CRMI aims to provide a platform for sharing the experiences and lessons learned between different sectors, languages and cultural groups across the Caribbean in order to facilitate improved disaster risk reduction. CRMI acknowledges the support of various donors such as: the Italian Ministry of the Environment, Land and Sea; Norway's Ministry of Foreign Affairs; Spain–UNDP Trust Fund; the UNDP's Gender Thematic Trust Fund (GTTF); and UNDP core funding from the Regional Bureau for Latin America and the Caribbean (RBLAC) and the Bureau for Crisis Prevention and Recovery (BCPR).



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