



A REFLECTION BASED ON INSTITUTIONAL EXPERIENCES:
"Problem and Solutions Identification Analysis to Share Information Between Different Levels (National and Regional)"



Photograph UNGRD – Alta Guajira

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ACRONYMS AND ABBREVIATIONS

UNGRD: National Unit for Disaster Risk Management

SNGRD: National System for Disaster Risk Management

GRD: Disaster Risk Management

UNCCD: United Nations Convention to Combat Desertification and Drought.

IDEAM: Hydrology, Meteorology and Environmental Studies Institute

DIMAR: Maritime General Directorate.

IGAC: Agustín Codazzi Geographical Institute

SGC: Colombian Geological Survey

DNP: National Planning Department.

INS: National Health Institute

MADR: Ministry of Agriculture and Rural Development

MADS: Ministry of the Environment and Sustainable Development

MINVIVIENDA: Ministry of Housing, City and Territory

MINMINAS: Ministry of Mines and Energy

SIATA: Valle de Aburrá Early Alert System

IDIGER: District Institute for Risk Management and Climate Change

CCO: Colombian Ocean Commission

ERFEN: Regional Study of the El Niño Phenomenon

CIIFEN: International Research Center on El Niño Phenomenon.

WMO: World Meteorological Organization

UNISDR: United Nations International Strategy for Disaster Reduction

IRI: International Research Institute for Climate and Society

NOAA: National Oceanic and Atmospheric Administration of the United States

CAR: Regional Autonomous Corporation of Cundinamarca

CENICAFÉ: National Research Center on Coffee

CENICAÑA: Colombian Sugar Cane Research Center

CHEC: Caldas Hydroelectric Power Plant

CORPOCHIVOR: Regional Autonomous Corporation of Chivor

CORPOGUAJIRA: Regional Autonomous Corporation of La Guajira

CORPOICA: Colombian Agriculture Research Corporation

CORPONOR: Regional Autonomous Corporation of the Northeastern Border

CVC: Regional Autonomous Corporation of Valle del Cauca

EAB: Bogotá Aqueduct Company

EMPOPASTO: Water Works Company of Pasto

EPM: Public Companies of Medellín

FEDEARROZ: National Rice Growers Federation

INVEMAR: Marine Research Institute

PNNC: National Natural Parks of Colombia

PRESENTATION

Even though the response strategies for ENSO Events (El Niño-La Niña) have been restructured based on the lessons learned from climate effects and the socioeconomic impact in Colombia as a consequence of the occurrence of these events, there are still challenges to strengthen climate monitoring in Colombia and early warning systems due to drought as important elements for effective drought management.

If during the past years we have had the opportunity to work on risk reduction, the next decade will be the opportunity for knowledge, visualizing it as a crosscutting and essential strategy to build the solid foundations of our future as a country and not as a purely academic and a scientists' matter.

The National Disaster Risk Management Plan 2015-2025 has participation and research mechanisms aimed at resolving difficulties that, in the specific case of drought, arise with regards to information protocols, production of outputs that must be incorporated into the response plans of each sector that could be affected.

Although the sectors affected by water deficit have become aware of the need to adequately manage information in a comprehensive and interdisciplinary manner, there are still challenges to achieve these information dissemination mechanisms.

This is why this document aims at serving as a support to identify some alternatives to improve the consultation, the flow of information, the required analyses, and the communication mechanisms between regional and national public and private institutions, so that they can take the necessary actions and thus avoid the consequences that a drought brings with it.

I appreciate the support offered by the Secretariat of the United Nations Convention to Combat Desertification - UNCCD for the trust placed in the professionals that lead this project.

I want to thank the group of professionals from the Ministry of Agriculture and Rural Development, Ministry of the Environment and Sustainable Development; Ministry of Housing, City and Territory; Ministry of Mines and Energy, IDEAM, DIMAR, SGC, IGAC, CORPOGUAJIRA, UPME, DNP, EPM, ISAGEN, CIAT, FEDEARROZ, FENALCE, FAO, FINAGRO, ECOSAGA, ASOHOFRUCOL, the Superintendent of Public Services, for their inputs and contributions, who with their expertise and lessons learned from the point of view of affectation in their sectors, made the necessary recommendations on the weaknesses and possible solutions to consolidate recommendations for an Early Warning System for Drought in Colombia, which have resulted in this document.

CARLOS IVÁN MÁRQUEZ PÉREZ
Managing Director

INTRODUCTION

The lessons learned from the El Niño events in previous years have shown us that although we have advanced in the knowledge of climate effects and their socioeconomic impact, there are still challenges. The impact that occurred in the last Niño suggest that there are still many factors to be solved.

Based on the fact that the climate effects of El Niño in Colombia are related to rain deficit, but not to its total absence, it is very difficult to establish when a drought begins or when a drought ends. We can still not relate this to the beginning or end of an El Niño phenomenon.

From the moment that ocean-atmospheric indicators tend to evolve towards the formation of this event, there are difficulties in issuing drought alerts, given that it is not certain when the indices weaken or increase. At the beginning of an El Niño phenomenon and during its formation stage there is a high degree of uncertainty that makes it difficult for decision-makers to know when their contingency plan begins.

Therefore, drought risk management is everyone's responsibility, from the technical entities that perform the monitoring, the productive, environmental and health sectors, among others, with the implementation of their response plans, to the entities of the National Disaster Risk Management System that coordinates response strategies with departmental and municipal councils.

However, despite the fact that each one has its responsibilities, a gap has been felt in interdisciplinary work, to strengthen the knowledge, technical and computer skills for the warning system to be effective, where it integrates each entity's information of the hydro-meteorological stations with other parameters and indicators of drought, hydrology, vegetation, soil moisture, reservoir status, water shortage information and other parameters, in order to obtain optimal monitoring results to use this information in a timely manner and prevent the consequences due to this threat.

With the aim of drafting some actions, this document tries to identify problems with their causes and effects and to define objectives in search of solutions that lead to the generation of better climate predictions that allow identifying the areas that would present rainfall deficits and inform these results in advance.

1. Context of Drought in Colombia



Photograph UNGRD – Uribia, La Guajira

1. Context of Drought in Colombia

Weather in the territory is influenced by several phenomena that establish rain conditions in seasonal and intra-seasonal conditions: Trade Winds, Intertropical Confluence Zone, Eastern Caribbean Waves, Tropical Cyclones, Pacific and Amazon Synoptic Systems, Influence of Troughs of Mean Latitudes of the Northern Hemisphere, Tropical Trough of the Upper Troposphere and Mesoscale Convective Systems among the main ones¹. These atmospheric phenomena are strongly influenced by the distribution of topography and vegetation on the surface within Colombian territory². These processes make forecasts complex.

Colombia has 245,342 km² in dry areas, approximately 21.5% of the country. The Orinoquía and Caribbean regions have the greatest extension of these areas, with 94,096 and 91,522 km² respectively. In the Andean region, the distribution of dry areas is related to the valleys and canyons in the shadow of rain. In the Orinoquía region, the savannas of Vichada, Casanare and Arauca are affected. 72.81% of the Caribbean region is found in savannas, swamps, gallery forests and mangroves only differ as wet, much of the mountainous region of the Sierra Nevada of Santa Marta.³

Based on the latter, drought in Colombia associated with the occurrence of an El Niño phenomenon, receives more and more attention given that the effects on the agricultural, health, water, energy and environmental sectors have been notorious.

Despite the lessons learned in previous El Niño phenomena, the last Niño phenomenon 2014-2016 caused great impact. In that time there was registry of 28 departments, 719 municipalities, 367 public calamities decreed (237 due to water shortage, 30 due to forest fires and 100 due to agricultural impact), 6,388 fires, 188,650 hectares burned. The 4 most affected departments by water shortage were Boyacá (25 municipalities), Magdalena (26 municipalities), Santander (23 municipalities) and La Guajira (15 municipalities). The National Government invested 1.6 trillion pesos through the execution of the National Contingency Plan for the El Niño Phenomenon.

Despite the fact that the energy sector has been considered one of the most prepared in periods of water deficit, the strong impact that the last El Niño phenomenon 2014-2016 had on the country's water bodies and reservoirs resulted in a high possibility of energy rationing.

As the El Niño Phenomenon and water deficit are recurring threats to the country's socioeconomic activity, Colombia has a national early warning system within the framework of the National Risk Disaster Management System for the for the cases of the ENSO Phenomenon. However, there is still a long way to go in terms of consolidating an early warning system due to drought in the country.

One of the great challenges is to find a way to share information intra and institutionally on the monitoring component of the hydro-meteorological variables, which is the reason for the intention of identifying the difficulties and the possible alternative solutions.

The institutional public entities related to drought and early warning systems in Colombia are listed in table 1.

¹ Climatological Atlas of Colombia. IDEAM, 2005

² Taken of the document titled: Regionalization of Colombia According to the Seasonality of Average Monthly Precipitation, through the analysis of the main components (ACP), IDEAM, 2014.

³ Source: "Diagnosis elements and recommendations of action to be included in the national action plan in the fight against desertification and management of dry land ecosystems in Colombia. (NAP) phase 1. IDEAM 2003 "

Table 1. Identification of public entity competencies in Drought.

LEVEL	ENTITY	ROLES
NATIONAL	UNGRD National Unit for Disaster Risk Management	<ul style="list-style-type: none"> To coordinate, promote and strengthen capacities for risk knowledge, risk reduction and disaster management, and its coordination with the national and territorial development processes of the National Disaster Risk Management System - SNGRD. To guide and support national and territorial entities in their institutional strengthening for disaster risk management and advise them in the inclusion of a disaster risk management policy in territorial plans.
	IDEAM Colombian Hydrology, Meteorology and Environmental Studies Institute	<ul style="list-style-type: none"> To monitor and communicate the respective warning due to hydro-meteorological phenomena, where its impact on the national territory is likely. To coordinate with international organizations related to climate services, such as WMO, CIIFEN NOAA, and IRI.
	DIMAR Maritime General Directorate. CIOH Oceanographic and Hydrographic Research Center of the Caribbean	<ul style="list-style-type: none"> To control, monitor and manage the entity's measurement systems of oceanographic and meteorological parameters in its jurisdiction To provide technical-marine support services, oceanographic and hydrographic data, physical, chemical and biological analyses, equipment metrology and laboratory elements for research and other maritime activities. To study and execute research and assessment projects of oceanographic, hydrographic and marine pollution phenomena, according to the programs of the Maritime General Directorate.
	Ministry of the Environment Ministry of the Environment and Sustainable Development.	<ul style="list-style-type: none"> To design and regulate public policies and general conditions for environmental sanitation, use, management, exploitation, conservation, restoration and recovery of natural resources, in order to prevent, suppress, eliminate or mitigate the impact of polluting, deteriorating or destructive activities on the environment or the natural heritage, in all economic and productive sectors. To support the other Ministries and state entities in the drafting of public policies which have environmental and sustainable development implications. To establish environmental criteria that should be incorporated in the drafting of sectorial policies. To guide the actions tending to prevent the ecological risk in coordination with the National Disaster Prevention and Attention System. To assess the scope and economic effects of environmental factors, their incorporation into the market value of goods and services and their impact on the development of the national economy and its external sector, its cost in medium and large infrastructure projects, as well as the economic cost of deterioration and conservation of the environment and renewable natural resources. To direct and coordinate the planning process and the harmonious execution of the activities in environmental matters of the entities that make up the National Environmental System - (SINA for its acronym in Spanish), to solve discrepancies caused by the exercise of their functions and establish criteria or adopt decisions when conflicts arise between them in relation to the application of standards or policies related to the use, management and exploitation of renewable natural resources or of the environment. To exercise the inspection and surveillance of the Regional Autonomous Corporations, and exercise discretionally and selectively, when the circumstances warrant, on the matters assigned to these corporations, assessment and preventive control, current or later, of the effects of environmental deterioration that may arise from the execution of activities or project development, as well as for the exploration, exploitation, transportation, benefit and use of renewable and non-renewable natural resources, and to order the national competent body to issue environmental licenses under the Ministry of Environment and Sustainable Development, the

LEVEL	ENTITY	ROLES
		<p>suspension of work or activities when deemed appropriate.</p> <ul style="list-style-type: none"> To coordinate, promote and guide the research activities on the environment and renewable natural resources and alternative models of sustainable development.
	PNN National Natural Parks	<ul style="list-style-type: none"> To advance studies for the reservation, boundary demarcation, delimitation, declaration and expansion of the areas of the National Natural Parks System. To propose to the Ministry of Environment and Sustainable Development the policies, plans, programs, projects and standards regarding the National System of Protected Areas -SINAP. To grant permits, concessions and other environmental authorizations for the use and exploitation of renewable natural resources in the areas of the National Natural Parks System and to issue a concept within the framework of the environmental projects licensing process, works or activities that affect or may affect the areas of the National Natural Parks System, in accordance with the activities allowed by the Constitution and the law. To acquire, through direct negotiation or expropriation, privately owned assets, property assets of public law entities and other rights established in properties located within the National Natural Parks System and impose the rights of way over such properties. To settle, charge and collect in accordance with the law, rights, fees, fines, contributions and rates by the use and management of the renewable natural resources of the areas of the National Natural Parks System and other goods and environmental services provided by these areas. To propose policies, regulations and strategies of buffer zones in the areas of the National Natural Parks System, together with the departments of the Ministry of the Environment and Sustainable Development.
	IGAC Agustín Codazzi Geographical Institute	<ul style="list-style-type: none"> To produce, research, regulate, arrange and disseminate geographic, cartographic, agrological, cadastral, geodesic and geospatial technologies information for application in the knowledge, planning and integral development management processes of the country
	SGC Colombian Geological Survey	<ul style="list-style-type: none"> To carry out basic and applied scientific research on the potential of subsoil resources and to manage the data and information on the national territory's subsoil. 3. To generate and integrate knowledge and collect, compile, validate, store and supply, in an automated and standardized way, information on geology, subsoil resources and geological threats, in accordance with the National Government's policies. 4. To update the Colombian geological map according to the national cartography progress. 5. To integrate and analyze the subsoil geoscientific information, to research the evaluation, composition and processes that determine the current morphology, structure and dynamics of the Colombian subsoil. To carry out recognition, prospecting and exploration programs in the national territory, in accordance with the policies defined by the Ministry of Mines or the National Government. 8. To perform the identification, inventory and characterization of the areas of greatest potential for natural subsoil resources, such as minerals, hydrocarbons, ground water and geothermal resources, among others.
	INVERMAR Marine and Coastal Research Institute	<ul style="list-style-type: none"> To develop coordination activities with other scientific institutes linked to the Ministry of the Environment and to support the Institute of Hydrology, Meteorology and Environmental Studies, IDEAM, in the management of information which is necessary to establish policies, plans, programs and projects as well as indicators and prediction models on nature's behavior and processes. To collaborate with the Colombian Oceanography Commission and the National Science and Technology System in the development of their activities.
<p>– ○</p>	Governorships of the 32	<ul style="list-style-type: none"> To project the National Government Policy out to the regions. They must be

LEVEL	ENTITY	ROLES
	departments of the country	accountable for the implementation of knowledge and risk reduction processes and disaster management within their territorial jurisdiction.
	Regional Autonomous Corporations. Environmental Entities.	<ul style="list-style-type: none"> To support the territorial entities of their environmental jurisdiction in the necessary studies for risk knowledge and reduction, and to integrate them into the Watershed Planning, Environmental Management, Territorial Zoning and Development Plans.
	John Von Neumann Pacific Environmental Research Institute (IIAP for its acronym in Spanish)	<ul style="list-style-type: none"> To develop and implement a systematization, dissemination and socialization process of relevant information for decision-making on the region's environment and on the processes that affect it. To develop and implement a type of research of the Colombian Pacific region, oriented to the population's welfare and based on the integrality of the natural, social and cultural aspects.
	Amazon Scientific Research Institute (SINCHI)	<ul style="list-style-type: none"> To provide the information deemed necessary to the Ministry of Environment and Sustainable Development, IDEAM and corporations. To collaborate with the Ministry of the Environment and Sustainable Development, corporations and regional or local authorities in the definition of variables that must be referred to in studies of environmental impact of projects, works or activities, which may affect the Amazonian ecosystems. To collaborate with the Ministry of Agriculture and the National Council for Science and Technology in the promotion, development and implementation of research projects and agricultural technology transfer with sustainability criteria.
LOCAL	MUNICIPALITY CITY HALLS.	<ul style="list-style-type: none"> To be directly responsible for the implementation of the of risk management processes in the district or municipality, including risk knowledge and reduction and disaster management in the area of their jurisdiction. The Municipal Administration must integrate strategic and priority disaster risk management actions in the area into the local development planning, especially through land use plans, municipal or district development and other public management instruments.
	OPERATIONAL ENTITIES: COLOMBIAN RED CROSS COLOMBIAN CIVIL DEFENSE NATIONAL POLICE NATIONAL ARMY COLOMBIAN AIR FORCE	<ul style="list-style-type: none"> To fulfill their missionary activities in matters related to the preparation, recruitment for response and community work.
	NATIONAL FIREFIGHTERS DIRECTORATE	<ul style="list-style-type: none"> To coordinate and technically and operationally support the fire brigades in the emergency response related to the integral management of fire risk, the preparations and rescue service in all its modalities, and the response to incidents with hazardous materials. To promote and carry out the analyses, studies and research in their area of competence.
	GENERAL COMMUNITY	<ul style="list-style-type: none"> To know the threat and evacuation routes. To participate in drills organized by the municipality and operating entities. To have a rally point in case of disaster. To have a family emergency plan and an emergency kit prepared. To report an event in case of forest fires.
	NGOs present in the municipalities.	<ul style="list-style-type: none"> To know the threat and to include an action plan within the projects that are being implemented in case of emergency caused by the events associated with drought.

Source: Own development, UNGRD

The National Operational Protocol document for forest fires was found during the review of the entities' competencies. It includes the activities and functions that each entity related to forest fires must carry out.

2. Problem Identification



Photograph UNGRD – Alta Guajira

2. Problem Identification

Through the workshops held in the Framework of the "Pilot Project on Early Warning for Drought in Colombia" with the participation of experts from the different environmental, productive, energy and water supply sectors, a deficiency in the coordination of the information that must be available to monitor drought in Colombia was identified. A problem tree with causes and effects has been developed in order to propose some solutions that indicate the way forward for information integration.

For the construction of the problem tree, the Conceptual Manual of the General Adjusted Methodology (MGA) of the National Planning Department of July 2015 was used.

As Figure 1 shows, there are institutional, infrastructure, financial, and technical knowledge causes that lead to consequences of institutional incoordination, duplication of efforts, inappropriate use and management of information, an inefficient regional drought alert system, uncertainty in decision-making. This all leads to an indirect cause such as the lack of timely information for decision-making that reduces the risk of drought in Colombia.

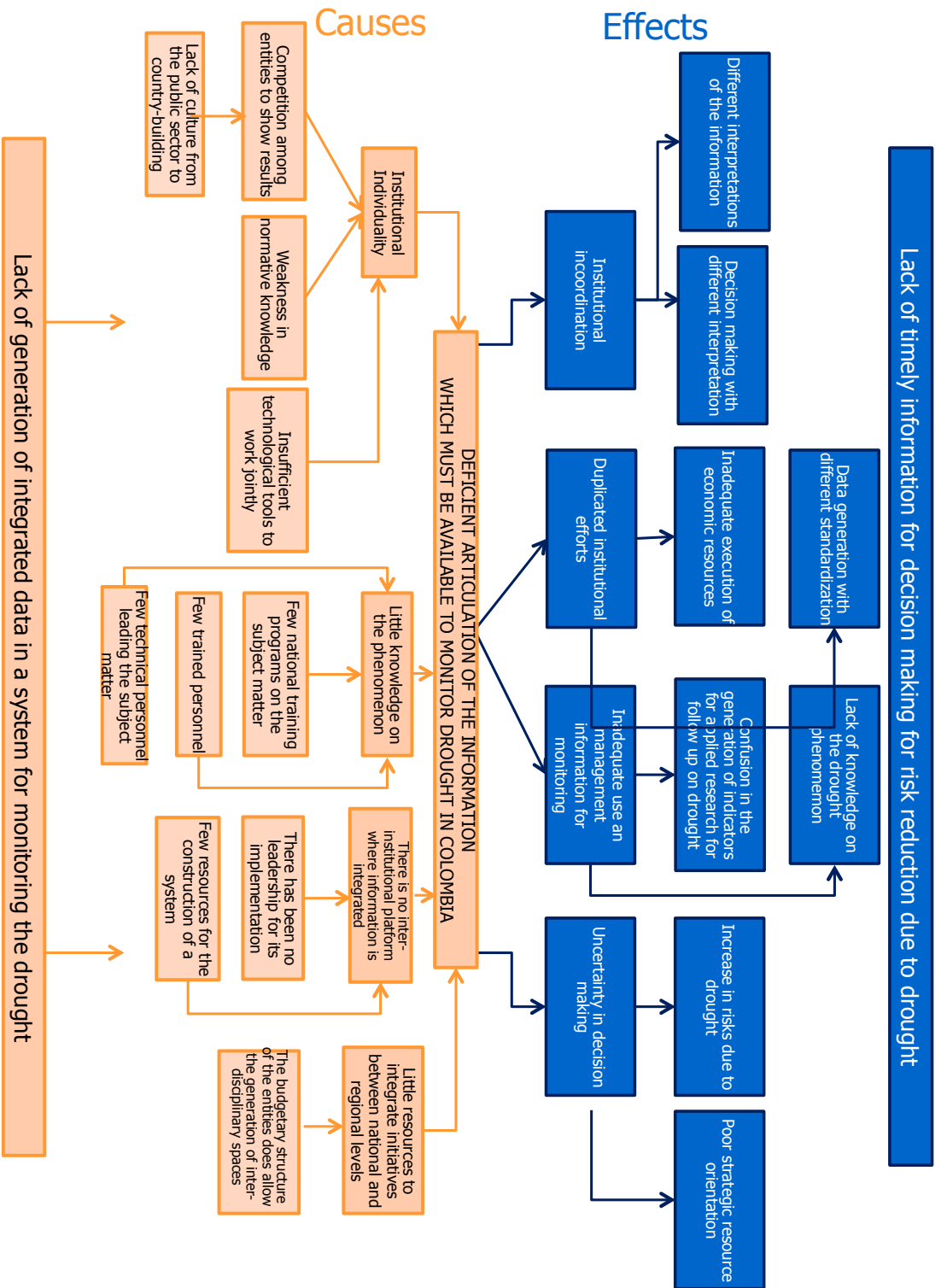


Figure 1. Problem tree of the information coordination for the monitoring of drought in Colombia

3. Definition of Objectives



Photograph UNGRD – Alta Guajira

3. Definition of Objectives

3.1 General Objective

The main objective is to facilitate the coordination of information that should be available to monitor drought in Colombia that may lead to timely information for decision-making for the reduction of risk due to drought.

3.2 Specific Objectives

The following specific objectives were proposed as well as actions that facilitate the coordination of the information that must be available to monitor Drought in Colombia. See Table 2.

- To promote concurrence of wills and inter-institutional partnership agreements.
- To improve knowledge on the drought phenomenon through indicators.
- To facilitate building an inter-institutional platform where information is integrated.
- To increase resources to integrate national, regional and local initiatives.

3.3 Formulation of Actions

Table 2. Formulation of Actions that Enable Achieving the Objectives

SPECIFIC OBJECTIVES	ACTIONS
Objective 1: ➤ To promote concurrence of wills and inter-institutional partnership agreements.	➤ Generate spaces to socialize regulations ➤ Coordinate policies related to comprehensive water management. ➤ Develop more technological tools to work together. ➤ Adopt concurrence of wills.
Objective 2: ➤ To improve knowledge on the drought phenomenon	➤ Build indicators for drought determination. ➤ Promote national training programs on drought. ➤ Increase the number of people trained on drought knowledge. ➤ Involve more technical staff on drought.
Objective 3: ➤ To facilitate a inter-institutional platform where information is integrated	➤ Create spaces for discussion among technicians for proposals of the architecture and content of the information ➤ Contribute resources from state and private entities involved in drought to build the platform.
Objective 4: ➤ To increase resources to integrate national and regional initiatives through annual operating plans	➤ Restructure the annual operational programs to commit resources that generate interdisciplinary spaces among national and regional technicians.

Source: Own development. UNGRD.

4. Solution Alternatives



Photograph UNGRD – Alta Guajira

4. Solution Alternatives

The following is stated with regards to the solution alternatives that can lead to the achievement of the specific objectives:

- Protocol for the exchange of information between the institutions involved in monitoring drought.
- Creating spaces for strengthening knowledge capacity.
- Creating an interdisciplinary technical working group that would be activated when a drought is foreseen.
- Creating a platform where the information on each sector's the entities can be integrated.
- Contributing financial resources for inter-institutional meetings between national and regional entities and for the development of the proposed Platform.
- Implementing the programs and projects identified in the National Disaster Risk Management Plan 2015-2025. See annex 1.

With regards to the platform for integrating information from entities, we recommend starting from the platform built by the Desertification, Land Degradation and Drought Observatory (DLDD) in Latin America, which contains geo-referenced information from Colombia, in such a way that allows monitoring drought in Colombia with its own indicators and at the same time feeding the Region's platform (Latin America). For more information, see Figure 2.



Figure 2. Desertification, Land Degradation and Drought Observatory (DLDD) of Latin America. Source: <http://edo.jrc.ec.europa.eu/scado/php/index.php?id=3000>



5. Benefits

Photograph UNGRD – Alta Guajira

5. Benefits

The actions and alternative solutions recommended in this document would generate benefits in:

- Greater institutional coordination
- No duplication of institutional efforts
- Appropriate use and management of information
- A more coordinated regional early warning system that allows sectorial preparation.
- Reduction of uncertainty in decision-making.

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