“PROMOTING THE PARTICIPATION OF ALL STAKEHOLDERS IN DROUGHT MANAGEMENT”,PAP005838.

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1. EXECUTIVE SUMMARY

The National Water Directorate (DINAGUA), Ministry of Housing, Land Planning and the Environment, has been focused in incorporating risk management of drought in the formulation and implementation of public policies.

For this reason and responding to the presence of a Niña event in 2010, DINAGUA contacted the National Emergency System (SINAE) to take measures in advance to mitigate the negative precipitation anomaly expected for the subsequent summer and fall. Due to the characteristics of the department of Canelones, with high vulnerability as well as with high concentration of population, DINAGUA took the initiative and led for the first an unprecedented response, with **concrete products** and with the **identification of future steps to follow.**

The ultimate goal of DINAGUA during the emergency was to provide technical support, so that the Municipality of Canelones and the Emergency Coordination Center (CECOED) would meet the demands of those affected by the drought (drinking water and troughs for cattle). The **methodology** followed was essentially participatory, interdisciplinary, and intinstitutional, with strong involvement of local institutional and producers' associations which gives an innovative character to the experience. More than 20 meetings were held. DINAGUA also participated in the emergency committee meetings in Canelones and also in the local rural development table. The **process** started with the evaluation of interventions in the drought of 2008 - 2009, the systematization of pre-existing and scattered data, and the incorporation of new dimensions of analysis of hydrometric and hydrogeologic data to address the problem.

Among the achievements are:

1. The development, with a participatory process, of:
    - the **Surface Water Risk Map** that served as a management tool for the Municipality, the Ministery of Agriculture and Fishery (MGAP), and the Fire Department
    - the **Groundwater Accesibility Map,** with participation of DINAGUA, DINAMA (National Environmnetal Directorate), DINAMIGE (Mining and Geology National Directorate), State Water and Sanitation Works (OSE)
    - A survey of **Good and Bad Practices of water resources use**
2. The strong synergy that was created between the national government and the local government, through the department of production development
3. The contributions to the formation and to the agenda of the Santa Lucia River Basin Committee.

The work presented in this report covers the activities that took place from November 2010 through March 2011.

1. INTRODUCTION

1.1 THE EMERGENCY

Responding to the National Emergency System call in late October 2010 to national and departmental government organizations to respond to the expected negative anomaly of precipitation expected for late 2010 and the beginning of 2011, **DINAGUA chose to develop a strategy with a strong and broad institutional participation to give technical support to decision makers of those institutions (Canelones Municipality and CECOED) that recieve the demands for drinking water and troughs.**

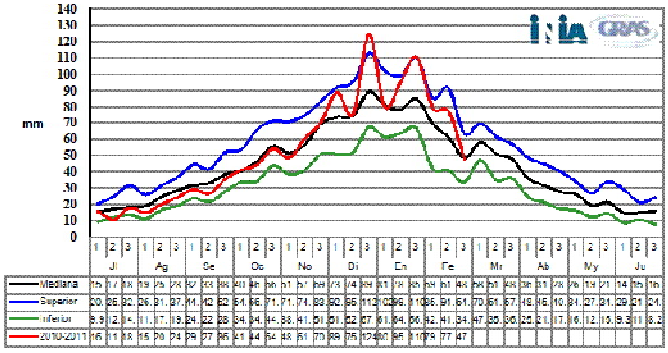
The starting point was the strong belief on the need to address the problem from an interdisciplinary and interinstitutional dimension and as one of the best tools for planning and action. Trigger questions were: how much water was distributed? What was its use? What is the minimum to satisfy demand? Which is the minimum demand to meet? How many tanks and pumps are available?

The Department of Canelones was proposed as a drought planning pilot case, for its high risk (small family production units, lot sizes, low water availability) and for the high concentration of demand in droughts.

This drought was preceded by months with rainfall close to the historical average. For this reason, the starting point (with good water storage in reservoirs and high groundwater levels) was not as severe as in the 2008-2009 drought. However, the 2010-2011 drought, had its own characteristics. From an agronomic point of view, this drought could be classified as “hard and dramatic”, with low humidity records, high temperatures, and significant wind speeds, which, combined, caused very high evapotranspiration values (Agr. Eng. Coiro, Canelones Municipality).

From November to March of 2011, the evapotranspiration was always above the historical average as is shown in the figure below, with peaks that exceeded the record highs. The increase in evapotranspiration, potentiated the effects of the rainfall deficit registered during the period.

The following graph illustrates the evolution of the evapotranspiration in those months.



Source: National Institute for Agricultural Research (INIA) 2011

1.2 PLANNING: THE NATIONAL PLAN OF INTEGRATED WATER RESOURCES MANAGEMENT AND THE SANTA LUCIA RIVER BASIN COMMITTEE

Although this work is framed in a drought emergency phase, it took also into account the need to start thinking about planning for the short, medium, and long term to incorporate drought risk management, hence the recommendations for future action raised in the conclusions.

The Canelones Department is included in the area under the jurisdiction of the Regional Council of Water Resources for the Rio de la Plata and its Maritime Front. In addition, much of the department of Canelones is included within the Santa Lucia River Strategic Basin, for which the conformation of a Basin Committee is scheduled for this year. This work contributes to the formation of this committee to the extent that:

- During the process, several stakeholders have been identified
- Knowledge has been generated over a wide area of the basin, identifying strengths and vulnerabilities
- Participatory planning and management processes have been started

At the national level, this experience serves as a case-study to be considered in formulating the National Plan of Integrated Water Resources Management to be held in 2011-2012, in relation to the chapter of extreme events.

2.CONCEPTS

2.1 BASIN MANAGEMENT AND INTEGRATED MANAGEMENT OF WATER RESOURCES

Basin management is established in Article 47 of the Constitution. There is also a strong regional demand for basin management (which arises from the fact that the Uruguayan territory covers basins shared with other countries), and local demands, clearly expressed in initiatives that have resulted in, for example, the committee of Los Rochas creek basin or the one of Laguna del Sauce.

Basin management leads to the systemic consideration of several dimensions of water (integrated water resource management), for example surface water with groundwater, quantity with quality. In turn, the water system interacts with other systems, ranging from terrestrial to other environmental systems, impacting on issues such as flooding and non-point source pollution. A third dimension to be considered relates to the interactions between the economy, the society and the environment, of which water is but one component. Basin management also implies the consideration of water users that historically had not been contemplated, as water resources management was focused on irrigation and industrial uses, users that did all the paperwork to obtain rights for water use. For example, at the national level in the agricultural area, it means to move from a universe of 2500 to one of 57,000 farms, most vulnerable to droughts.

Water used in troughs for cattle does not need a water right therefore those users do not have a direct relationship with DINAGUA. However, for the management of a basin, it is relevat to know all the water uses.

Based on that, criteria and management tools should be developed, because the behavior of the total universe of users is not the same as those registered users (registered users currently irrigate every year while the majority of producers do it just on critical years).

For the implementation of the management tools it becomes critical to design and implement the quantity and quality monitoring network and its baseline, and make water users get involved in the monitoring of the microbasins.

2.2 RISK MANAGEMENT

Risk is defined as "the relationship between a threat and the vulnerability of the society that is impacted, a latent or potential condition that depends on the intensity of the threat and the existing levels of vulnerability. In this view the risk is a dynamic changing condition, theoretically controllable". Moreover, risk management is defined as "the complex social process through which the aim is to achieve a reduction of the risk levels of the society and promote construction processes of new production and settlement opportunities in the territory under safe and acceptable sustainable conditions".

Given the climate variability and the notorious accentuation of extreme events in Uruguay, in particular droughts, the concept of risk management should be incorporated in the water resources management models.

3. OBJECTIVES

General Purpose
Incorporating Risk Management of Drought in the formulation and implementation of public policies.

Specific Objectives
• To provide technical support for the institutions (the Municipality, CECOED) receiving the demands of access to drinking water and water for troughs, as well as to support the Fire Department.
• To generate tools during the emergency, that will also be useful for planning for the short, medium and long term.

4. LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 Legal Framework

The legal support for the management of water resources, and focused particularly on issues related to drought, is contained in all the hierarchy of legal norms, namely:

- At the Constitutional level:
  Since the reform of art. 47 of the Constitution, which was held in 2004, water is recognized as an essential resource for life, establishing its sustainable management through the integrated management of water resources, based on the concepts of the hydrological cycle and river basins
- At the legislative level:
  Before the constitutional reform there were in our legal system laws and decrees governing the use and control of water resources.
  Thus, the Water Code (Decree Law 14,859, 1978) stood as the largest regulatory body for the management policy of water resources and establishes the Executive Power as the Water Authority who is the administrator of the resource and the formulator of policies regarding water, taking into account as a first priority the supply of drinking water.

  Subsequently the Irrigation Law No. 16,858 dated 03/09/1997 (and its regulatory Decree 404/2001) established a policy especially focused on the use of water for agricultural production. Being irrigation an activity that combines soil and water resources, it establishes a series of concurrent jurisdiction when evaluating and granting permits and concessions requested by users.

  In the year 2005 by Law No. 17,930, DINASA (now DINAGUA) was created for the purpose of being the competent directorate under the terms established in the second paragraph of article 47 of the Constitution regarding water issues. With the art. Act 251 of the Law 18,251, all the competences related to the use, control, and management of water resources were transferred from the MTOP to the MVOTMA.

  With the Law 18,308 it was established the regulatory framework for land management and sustainable development for the purpose of prioritizing a concept of territory on the basis of a sustainable planning use, based on strategies, guidelines and programs at national and regional level.

  On October 2, 2009, it was adopted Act No. 18,610 entitled "Water Policy" establishing the guiding principles in accordance with the provisions of paragraph two of art. 47 of the Constitution and determining the tools of this policy (art. 9)

  With Law No. 18,621 of the Executive Branch in 2009 created the National Emergency System as a permanent public system whose purpose is to protect people, property and the environment, upon the occurrence of potential or actual disasters by the joint coordination of the State with proper use of public and private resources, so as to create conditions for sustainable national development.

4.2 INSTITUTIONAL FRAMEWORK

Given the variety of constitutional, legal and regulatory powers assigned to different organs of the State in water matters, the Decree No. 335/2004 was issued which systematized the concurrent competences in that matter.

It establishes that the management of water resources is the task of the Executive Power, who is the Water Authority at the national level, to carry out the water policies and water resource management, being authorized to suspend water supply during drought (art. 1 lit. h) from the Decree mentioned before and in accordance with the provisions of art. 3 of the Water Code).

So it is the Executive Branch, through its Ministries, that will carry out this task. It is to be noted that the focus on water tends to the coordination of sectoral ministries MGAP, MTOP and MVOTMA.

In turn, Decree 335/2004 has been amended by subsequent regulations that have been transferring competences from one ministry to another, so that according to current regulations, currently the Executive Branch distributes the competences as follows:

a) Ministry of Housing, Land Planning and the Environment (MVOTMA):

MVOTMA's competences in water matters are exercised primarily with the involvement of two National Directorates: the Directorate of the Environment (DINAMA) and the National Water Directorate (DINAGUA).

It is competence of DINAMA to control that the public and private activities comply with the standards of environmental protection and natural resources; water protection from harmful effects, including those that may alter the ecological balance of the wildlife and damage the environment, effluent discharges, etc .-

It is competence of DINAGUA the formulation of national policies for water and sanitation and the management, use and control of water resources; improve the quality of life of the population and ensure the sustainable use of the water resources in the country, including the participation of all stakeholders and coordination with other public policies. Its Vision is: To institutionalize the integrated and sustainable management of water resources, addressing the different uses and demands for services from the population, in a planned and participatory manner.
Exercising the aforementioned competence, the National Water Directorate role includes:

a) to administer and evaluate the use of water resources of the country; to draft and elaborate policy proposals for the use and sustainable development of the water resources and monitor the compliance with current regulations.
b) to set and adjust the allocation of water considering the hydrological cycle, the regulatory capacity of ther reservoirs, the volume of available water, and the requirements of each use, and seeking to establish the maximum use compatible with the water resources of the basin (Article 5 of the Water Code);
c) to grant concessions and permits for private use of the public waters (Article 165 of the Water Code), authorize amendment and provide for its expiration (articles 171 and 173 of the Water Code), grant special use permits, necessary for the provision of public services (Article 190 of the Water Code);
d) to grant a license to drill to parties seeking to perforate the ground to investigate or to reach or search for groundwater (Article 45 of the Water Code), to authorize the search for underground water and drilling to have access to it (Article 46 ofthe Water Code)
e) to maintain a register of holders of rights to water use in the public domain - Public Register of Water - (Articles 8 and 11 of the Water Code);
f) to approve the construction projects for the construction of waterworks for irrigation and grant the respective rights for water use (Article 21, Law No. 16,858);
g) to keep an updated inventory of water resources of the country, recording location, volume, capacity, level, degree of utilization and other relevant technical data (Article 7 of the Water Code);

b) Ministry of Livestock, Agriculture and Fisheries (MGAP)

The MGAP competence in water matters is carried out mainly with the intervention of the General Directorate of Natural Resources and its principal concerns are to prevent and control erosion and soil degradation; the conservation of surface water intended for agricultural purposes; the establishment of technical standards on the use of irrigation water; and the approval of plans for the use and management of soils and waters in relation to agricultural activities; and to contribute to the conservation of biological diversity.
According to those competences, the Department of Water Use and Management has to:
• Implement activities related to the classification of irrigation water for agricultural purposes
• Establish and lead the national system of monitoring water quality for irrigation
• Propose and disseminate laws regarding the use and conservation of water for irrigation and monitor the compliance (Basic Technical Standards)
• Authorize the use and management plans for soil and water related to water used for agricultural irrigation and monitor the compliance

The Rural Development General Directorate of the MGAP - through the Rural Uruguay Project, the Livestock Project, and the Responsible Production Project Manager, has to:
• strengthen the organizations of family farmers and poor rural families;
• promote the adoption of integrated management systems of natural resources and biodiversity, sustainable from the social, economic and environmental standpoint .

In addition the MGAP is responsible for participating in the formulation of public policies concerning agriculture, agrobusiness and fisheries, and management, conservation and development of renewable natural resources and monitor the development of those that have been approved (Decree N ° 24 / 998 of January 28, 1998) and promote course of actions to optimize the interrelationship of the Ministry with

national, regional and other international organizations, of interest to the agriculture, agrobusiness and fisheries and for the area of natural resources (Decree No. 24/998 of January 28, 1998);

There are other organizations with responsibilities in the management of water resources, including:
The State Water and Sanitary Works (OSE): descentralized service, that is related to the executive branch through MVOTMA. It is independent in terms of making decisions within its powers, but the executive branch controls the legality or appropriateness of its actions.
It is responsible for the provision of drinking water and sanitation across the country throughout the territory except in Montevideo, where the Municipality is in charge of the sewage.

The Ministry of Industry, Energy and Mining (through the National Directorate of Mining and Geology - DINAMIGE) – The Hydrogeology Area within DINAMIGE Geology Division, is the technical sector dedicated to the study of groundwater nationwide. Among them are local and regional hydrogeological studies, water quantity and quality monitoring of different aquifers, boreholes for groundwater through agreements with other agencies, etc.. DINAMIGE currently has the largest hydrogeologicla database of Uruguay, that began in1912, date of the creation of the Agency.

Departmental Governments .- Under the provisions of the Law of Land Planning and Sustainable Development, is the competence of the departmental governments to establish and enforce regulations on land use, subdivision, development, construction, demolition, preservation, soil protection and territorial police, throughout the department through the development, approval and implementation of the Instrument of Land Management and Sustainable Development: The Ordinance, guidelines, local plans, and interdepartmental plans of land use and sustainable development (Law 18,308).

In the orbit of the Presidency of the Republic, the National Emergency System (SINAE), whose tasks are: • To articulate the roles and responsibilities of institutions and public bodies, institutions and individuals in the prevention, mitigation, care, rehabilitation and disaster recovery. • To effectively and efficiently integrate public and private efforts, according to the requirements imposed by each of the phases of activity of the system. • To ensure timely, effective, and efficient management of all human, technical, administrative, and economic resources indispensable for the implementation of necessary actions.
The Departmental Emergency Coordination Centre (CECOED) has among its responsibilities: • To promote a coordination environment for actions to be executed by various institutions for the prevention, mitigation, disaster relief and rehabilitation under the National Emergency System, • To receive, organize and transmit to the Department of Emergency Committee and the National Emergency Directorate the necessary information for the identification of phenomena that could determine the operational activation and do the follow up • To organize training at the departmental level in coordination with the National Emergency Management, the National Advisory Committee for Disaster Risk Reduction and Disaster Relief, and the Emergency Departmental Committees. • To establish regular or extraordinary meetings in emergency situations, convened by the Mayor or an officer appointed by him.

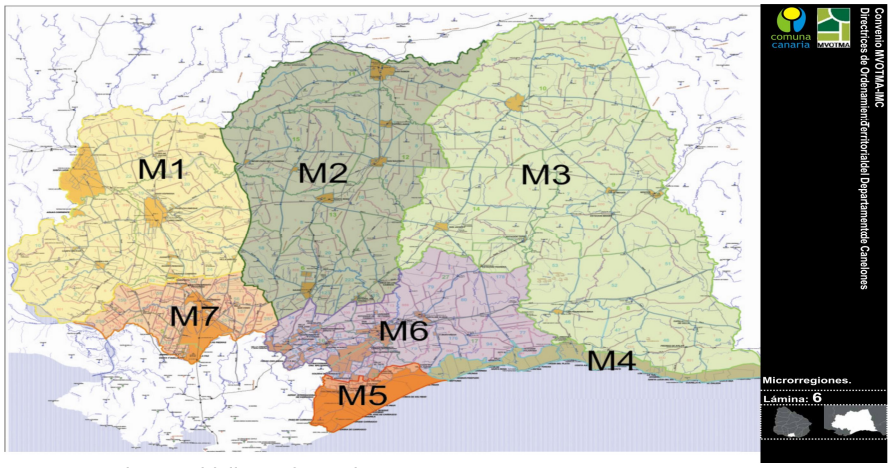
4.3 Departmental Guidelines of Land Planning for Canelones

According to that mandated by Law 18308, the Land Use and Development Guidelines are developed for the whole department of Canelones. However, it is clarified that the area of analysis may include larger areas, either from the metropolitan point of view or from a basin approach.

The department of Canelones is a diverse and heterogeneous territory considering the social, cultural, economic, and environmental aspects. The department's total area is 4534 km2, of which 10% is urban land and 90% is rural.

As for rural production, Canelones has 78% of hectares of agricultural use, a figure that does not include small farms of less than one hectare and no natural areas dedicated to production, either. 74% of farms are family farms and 87% of them have less than 50ha. Canelones department has the highest concentration of family production living there. There is great diversity of natural resources associated with the river system, the coastal ecosystem and agro - ecosystem.

In Canelones, the basis for local land use planning is the microregion. The name of microregion responds to an operational definition as intermediate territorial level, immediately above the local or municipal level. The delimitation of the microregions is according to their productive potential.



Source: Land use guidelines of Canelones. Progress Report

From an environmental perspective, priority was given to relevant environmental factors, including the status of natural resources.
Given their importance, the natural resource water required special consideration.
In this regard, we identified several elements that threaten the quality of the resource. Among them:
1. The development of productive activities (food, industrial) and pollution of hidrics resources, surfaces and ground waters.
2. The hydrographic network and their basins, which are the main departmental ecosystems such as wetlands of St. Lucia, which is shared by other departments. Important processes of eutrophication in many waterways with loss of biodiversity (and other aquatic species) and increased costs of drinking water (Aguas Corrientes River Basin Santa Lucia).

Canelones local goverment **(IDC**)considers water resources as essential and in this respect has taken steps according to the National Water Policy.

The main lines of action defined for the department of Canelones, resulted in the development of departmental guidelines of Land Management, which aims to establish departmental policies regarding the various issues of the Department.
They show the need to articulate and coordinate with other government departments and national level. MVOTMA participation and DINAGUA in particular, are essential to implement many of the guidelines of Land Management

Some of the concepts contained in the Departmental guidelines are:

• Preserve and protect water resources of the department by establishing specific policies.
• Promote the retention of the rural population. Promote the continued integration of the people familiar with the production chain according to their role of food producer.
• Encourage joint spaces between the actors of the territory at different scales.
• Ensure territory coordination of public policies.

5. METHODOLOGY OF WORK
5.1 SURFACE WATER - DROUGHT AND FIRE
5.1.1 AGENCY APPROACH

There were two levels of articulation:
- A first level of interdisciplinary and interagency coordination
- Receive a second level of demands and support in the distribution of water (institutional, civil society, producers) The Departmental Emergency Coordination Centre (CECOED).

It follows and it is key the strong synergy given between DINAGUA and Canelones Municipality throughout the process, allowing close links between the two levels and thus permit a continuous feedback.

It sought to alleviate the situation during droughts and for firefighting, participating in the first level:

- MVOTMA - DINAGUA and regional
- Canelones Govermnent through its Productive Development Department
- CECOED Canelones
- MGAP and regional through:
• Renewable Natural Resources General Directorate
• Farm General Management
• Rural Development General Directorate
- OSE and its regional
- RURAL DEVELOPMENT Bureau (INIA- Canelones, Producers Associations)
- National Fire Directorate
- Colonization National Institute

DROUGHT INFORMATION SYSTEMATIZATION 5.1.2 2008-2009

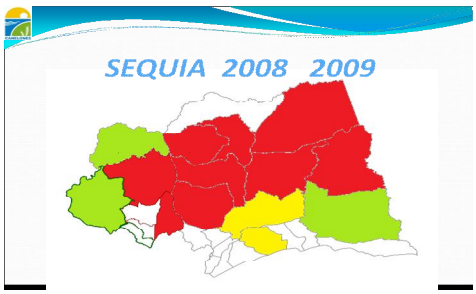
The closest record droughts in Canelones, are those that occurred in 1996, the 2000 and 2008-2009.

According to information from the IDC, the area where water had to be supplied to both, dispersed rural population and animals in 96 (with the support of firefighters and ose), and in 2000 (with support from OSE) and 2008-2009, (supported by OSE / Army) was similar.

In the first two operational, 96 and 2000 , 6 million water liters were distributed;in 2008-2009 18 million water liters . In volume is not much, but many steps may make the operation difficult to perform it: the carrying, the logistics, the site for the truck to park, that the pump can operate and also to have a reservoir where to discharge it.

The starting point in 2010 was better than 2008. The embankments at the beginning of the 2010 drought had 75-80% of full capacity while in 2008 were dry.

2008-2009 Drought
In this drought, there participated in the operation of emergency, OSE, the Army, Canelones Department the municipalities, the National Emergencies and the MGAP. The operation was organized into three working groups. One group participated in the NE of the department, a second group in the center and the third group, in the west.



2008-2009 Drought
Impact of drought regions, according to the number of procedures performed.
- Red Zone: Very High
- YELLOW Zone: High
- Green Zone: Medium

In 1200 interventions water was carried and distributing 18 million liters for human and animal consumption. Drinking water was distributed to 582 individual families (2 million liters). To 1693 farmers water was provided as well as for animal consumption. In Canelones most farms are less than 50ha.
Small farms are located on the road so production can be easily transported, they are generally on higher areas, that are far from water sources.

The fact that water was also delivered for animal consumption in 2008-2009 the volume of water distributed was much more important than in other droughts. Besides water delivery was not very efficient. The producers were not prepared to receive large volumes of water, so it was delivered where it was possible. It was placed in wells which were not waterproof, so losing a lot of water filtered or turned in almost dry embankments, greatly increasing the mud. Later sites were located where the IDC took water to supply water for livestock and / or irrigation.

5.1.3 CONSTRUCTION OF SURFACE WATER RISK MAP BASED ON PRE-EXISTING INFORMATION

The risk map was performed in a participatory manner with all stakeholders in this process and the information available as risk map means the crossing of resource availability and vulnerability. Since there are only gauging stations on the Rio Santa Lucia, resource availability was based on knowledge of local stakeholders and regional representatives of national government, marking the watercourses in the 2008-2009 drought that had dried and those which maintained water. The vulnerability was the identification of people who had been supplying water in the previous drought, both for human consumption and as cattle trough. It also marked the areas most vulnerable to fire.

Represented on the map: • most vulnerable area (population, livestock, fire) • channels in the 2008-2009 drought kept water and those which were dried The area northeast of the department of Canelones is the greatest risk. There is a large area without water, with very few internal sites from which to draw. There is increasing demand, not because the population grows, but because is consuming more.. It also identifies the coast as the area of greatest fire risk . The main problem is the fire in the Gold Coast, from the Solis Grande to Pando stream, Montevideo and west coast. They generally cater to the west from the Sirte Company in wells or from the hydrants network in Montevideo. In the Gold Coast is based on OSE hydrants, which had rarely been got from streams because until recently there were floating bombs .. They also feed in Cisne`s Lagoon where there is no need to ask for permission. In the fire department there are fewer people but is not significant compared to the coast. Usually, rural producer protects his home, separating it from the wood sites. Location of where the IDC took tap water authorized by SBI - location of places where firefighters draw water - location of places that the IDC study proposes to place hydrants - Location of the reservoir of the National Institute of Colonization that IDC believes could be exploited (currently about 40% used one of them)

5.1.4 TECHNICAL ANALYSIS

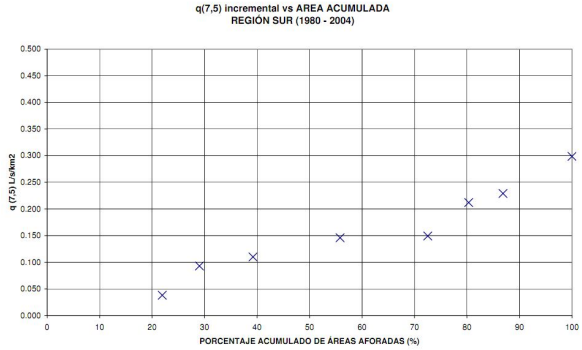
A hydrologic data processing was performed based on the demand for drought-affected which was a different approach from the usually done for the granting of water rights.

Monthly averages were compared between November 2008 and January 2009 and the lowest observed in the period (daily, 7 and 15 day moving) with the values for October, November and December 2010. In general there was a lag of one month, being the worse the situation of 2008-2009.
There was an indicator, although very simplified, to be developed together with the design of a monitoring network and the selection, implementation and operation of a hydrological model, so to create a warning system in stages, and certain associated actions.
SBI was coordinated with OSE during the emergency with weekly scale readings frpm.the Piedra Alta bridge; the same is being done at Paso Apache monitoring the levels in the dams.
Determination of runoff
Specific volumes were calculated q (7.5) (average minimum 7 calendar days in the summer months, with recurrence 5 years) determined for gauged basins in the south of the country and data between 1980 and 2004.
The chart below shows the percentages of the total watershed area intercepted by the gauge sections that have the given maximum.
Example:

+ in 100% of the observed area q (7.5) is less than 0.30 l/s/km2
+ at 50% is less than 0.15 l/s/km2

+ at 30% is less than 0.10 l/s/km2

It therefore takes the value of 0.15 l/s/km2.



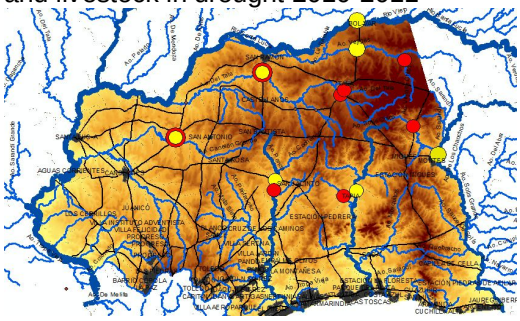
Extraction points

For the selection of the extraction sites it was taken into account: the area of greatest impact of drought in 2008, that the natural catchment area of contribution was greater than 100 km2 to allow a flow rate of about 16 l / second, trucks accessibility, and finally not affecting existing water rights.

5.1.5 PRODUCTS

5.5.1 RISK MAPS AS A TOOL FOR SURFACE WATER MANAGEMENT

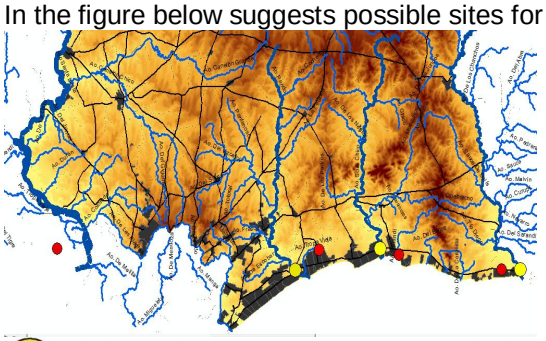
The following figure shows the water extraction sites 2008-2009 and the potential extraction sites for people and livestock in drought 2010-2011



SITIOS DE DONDE SE EXTRAJO AGUA 2008-2009

POSIBLES SITIOS PARA LA EXTRACCIÓN DE AGUA

In the figure below suggests possible sites for firefighting water extraction.



TOMAS PROPUESTAS EN Ao Pando, Solis Chico y Solis Grande

SIRTE, LAGUNA DEL CISNE, POTABILIZADORA OSE DE COSTA AZUL,TANQUE EN EL BALNEARIO ARGENTINO

5.2 GROUNDWATER

The working group was proposed as a palliative to the drought, a product similar to that made in surface water to groundwater, especially since the drought when surface waters are scarce. In the case of groundwater vulnerability was defined as the limited economic producers capacity, government aids and the threat CECOED according to presence or absence of groundwater.

5.2.1 INTER INSTITUTIONAL APPROACH

Again there were two levels of articulation:
- A first level of interdisciplinary and interagency coordination
- Receive a second level of demands and support in the distribution of water (institutional civil society, producers): Department of Canelones. The institutions that participated in this effort were:
MVOTMA - DINAGUA
Obras Sanitarias del Estado - OSE - Groundwater
National Directorate of Mining and Geology - DINAMIGE (Groundwater)
MVOTMA - DINAMA
Honorary Pro Eradication Commission Rural Housing Unhealthy - MEVIR (WELLS)
National Association of Milk Producers (WELLS) - ANPL

5.2.2 DATABASE

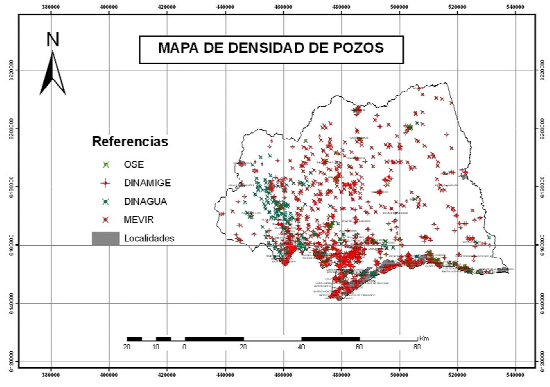
An unprecedented achievement and aims to be replicated for other areas of the country, was to share the existing databases in the following institutions: DINAMIGE, DINAGUA, OSE, MEVIR, PPR and Milk Producers Association.

Analysis worked with geological map, 1:100.000

5.2.3 CONSTRUCTION OF RISK MAP OR MAP ACCESSIBILITY GROUNDWATER BASED ON PRE-EXISTING INFORMATION

The criterion adopted for it was based on the depth and average flow, admissible in economic terms for small producers.

The working methodology was to divide Canelones department in regions where a statistical analysis of these variables with available wells and also considering geology. In cases, which warrants further exploration in future instances, where there is a high standard deviation of flow and / or depth when is decided to run a well to optimize financial resources and result, Hydrogeological studies are needed with technical details.
Each base was treated and analyzed independently, as the source of the information derived in many cases the objective sought to achieve with the constructed drilling.



ANALISYS

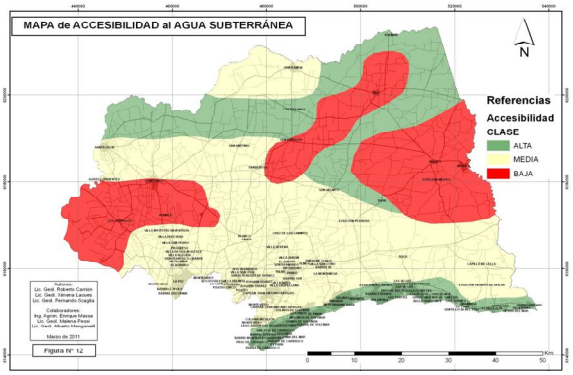
CAUDAL Q (m^3/h)	ACCESIBILIDAD
Q< 0.5	"BAJA"
0.5 < Q< 2.0	"MEDIA"
2.0 < Q	"ALTA"

PROFUNDIDAD (m)	ACCESIBILIDAD
P< 30	"ALTA"
30 < P < 50	"MEDIA"
50 < P	"BAJA"

GLOBAL CLASSIFICATION OF ACCESSIBILITY
HIGH: If both are high or if the depth is accessible though the flow is high medium + CORRECTION WITH GEOLOGICAL MAP
MEDIA: IF BOTH ARE MEDIUM or if the depth is average although the flow is high + CORRECTION WITH GEOLOGICAL MAP
FLOOR: IF ANY OF THE VARIABLES IS LOW + CORRECTION WITH GEOLOGICAL MAP

5.2.4 PRODUCT

The result was an ACCESSIBILITY MAP final groundwater during drought 1:300.000 scale, differentiated into three classes: LOW, MEDIUM and HIGH.



6. CONCLUSIONS AND CHALLENGES

It is proposed as necessary:

• extend the experience to the rest of the country with other characteristics.
• continue working in not deficit water times
• strengthen the instruments generated on surface and groundwater, adding information on: population, land use, land, etc, so that, once the emergency happens to be transformed into instruments of planning and long-term policies.
• continue working on information sharing and building common databases, which is how to carry out long-term policies
• monitoring and modeling to set minimum flows and runoff to know-how the resource and availability
• monitoring groundwater level and increase awareness of groundwater
• improving hydrometeorological and indicators based on identifying warning stages and actions to take in each case.
• incorporate water quality, both surface and groundwater, to determine resource availability
• enter the information generated to the information system of water and environmental information system
• making an inventory of uses of water, including those who do not need to be registered (to continue the effort, incorporating harvesting Production Program Manager, as provided by producer associations and MEVIR)
• develop a good practice guide, which includes measures to take, such as how to handle the low availability of water or appropriate forms of distribution
• consider multiprediales measures, shared wells, shared storage, knowing that not only work but also the management is to be considered.
• continue to provide technical support to fire fighting

• create opportunities for outreach and education for displaying and prioritizing the issue on the public agenda
• generate free access information

As steps are identified the need to incorporate risk management of drought:

• planning national and local public policies
• territorial planning, water resource availability incorporate in land Departmental Guidelines -