

## **Management of Scarce Water Resources in Pernambuco – Brazil**

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### **1. Introduction**

This work includes information about the legislation, the institutional framework and the management system existing in Brazil and in Pernambuco. It is very important to know that nowadays there is a National Law and a National Plan for water resources and also that there is a National Water Agency to make the supervision about whom, how and where there is water utilization in Brazil. As 12% of the total amount of freshwater in the world is located in this country, the water resources management is extremely necessary today.

Pernambuco is one of the states located in the Brazilian Northeast Region. Unfortunately Pernambuco is the state where less water resources of Brazil are available however it has as well as the country its own Water Resources Law for surface and groundwater sources. Furthermore it has also own institutional settings and an administrative public system. Only 3 % of the total amount of water resources available in Brazil is in the Northeast Region, in spite of this 27.6 % of the Brazilian population lives there.

Thus this work shows some examples about water shortage and about leakage of water because both can be witnessed in Pernambuco. In the forest zone it is more common to find leakage of water as a result of the deficient water supply services. Finally the work makes some propositions to solve the problems and to increase the water resources management in Pernambuco and furthermore to implement the state policy for sanitation services and water resources management in an efficient way.

Some questions are very important at the present time. The first question is the water resource management when we talk about multiple uses of reservoirs, e.g. for urban water supply, irrigation and rural water supply. Every day it is possible to see and to feel how our water resources are polluted from sewage and a lot of other sources of pollution.

The second one is to monitor the amount of available water, because in some region there is water shortage and the water rates per capita become lesser every year. Also here an evaluation has to be made between the utilization for urban and rural areas as well for irrigation. We must realize that the water consumption for households is less than the irrigation consumption.

Finally it is necessary to study and to know the costs when we take water from reservoirs for urban areas and for rural areas; to evaluate the point after that it is very expensive to irrigate and when it is necessary to find another kind of irrigation. In both cases costs are very close to the electric power without to forget that nowadays the environmental costs are going to get a special position in all projects for water utilization.

### **2. Water Resources Legislation and Management in Brazil**

Since many years a lot of people like teachers, technicians, students and a lot of environmental and sanitary associations fought for changes in the Brazilian water resources sector. Their idea

was to create laws and a public management system sustainable and strong enough to keep the water resources protected and under a rational utilization way. After a long time we can say that today we have a new view and some implemented examples of water resources management in Brazil.

Nothing could be done if the population doesn't have fought for changes. When politicians realized that something had to be done they began to work together with the population to create rules, laws and the public organization system to manage the water resources in Brazil. Today we have commemorated because there are laws, administrative system, water utilization plans, government federal regulation and a Brazilian policy for the water sector.

But everybody knows that there are still many things to do. In spite of this today it is possible to find in many states examples about plans using watersheds as the base for planning. On the other hand it is common at the present time many kinds of water's consumers working together in watersheds committees where subjects like reforestation, raw water cost, pollution, contamination, water protection and watershed protection are discussed.

Another thing to mention is that there is an agency to control, supervise and create rules about water utilization in Brazil. The Water National Agency called in Portuguese ANA has one of the most important positions in our water management system which means that today the control over the federal water resources is increasing.

Finally it is interesting to say that in the Federal Government Organization there are two Ministers which work in the water resources sector. The first one is the Environment Ministry that is in charge for the Brazilian's environmental policies. All federal public offices that manage the national environment system are under that Ministry and they work following the National Plan and the Integrated Management System of Environment. Another important task is the participation in the National Environment Council which is an organism created to make resolutions and to keep laws and rules utilized by everyone in Brazil. Nobody is able to abstract water without getting an environmental license.

The second one is the National Integration Ministry where there is a federal administrative organism called Water Resources National Secretary which is in charge to monitor, to control and to manage the National Policy of Water Resources. There is also a National Council of Water Resources and an Integrated National System of Water Resources. Today almost all the waterworks in Brazil have to send all data about their water abstraction points in rivers, lakes, reservoirs and deep wells. It is very important to recognize these actions but it is significant to mention that in this Ministry there are federal public offices working on the institutional side and others working building water systems for consumers in the irrigation sector and in the rural water supply. Maybe there is a mistake here. While there are no changes about what was mentioned above it is important to point out that in Brazil the idea of granting water right is getting stronger and stronger to be an useful tool to make sure that water resources are going to be a real economic and social assets.

### **3. Water Resources Legislation and management in Pernambuco State**

In 1999 the State Government created a new Secretary to implement the institutional framework of Pernambuco's water resources management as an administrative behavior. Before this some technicians and the antecedent state government had sent a proposal to the Legislative Assemblage to create a Water Resources Law and its following policy, plans and integrated man-

agement system in Pernambuco.

From 1999 until 2002 that Secretary works just as an enterprise, building infrastructure like pipelines and dams. That means nothing was done about the implementation of the law and the institutional framework which needed a change in the way the water resources utilization in Pernambuco was realized. After reelecting the state government decided on another strategy and dissolved the Secretary taking all resources from it to the Environment, Technology and Science State Secretary as a Management Unit.

Thus today there is one place where the water resources management in Pernambuco is being done. However is not possible to say that everything is going well. Pernambuco has a State Law for water resources utilization including a special law only for groundwater. These laws follow the same model from the National Law. And now one could ask how far we are? Well from the start in 2003 until now positive changes could be witnessed, in fact the institutional process started. Besides many studies were contracted to know the status of the watersheds including the knowledge about the water quantity and quality of the main rivers; furthermore the Water Resources Unit coordinates the creation of committees, the granting of water rights and at least, the water resources information.

An interesting and very important project recently concluded is known as Water Resources Utilization Plan. This project gives information about how many sources there are and the amount of the flow of the main rivers.

To a lot of experts in Brazil the present model looks weak. Perhaps having one Secretary dedicated to manage all issues involved with water resources management might be better for getting the utilization of water resources a governmental policy.

#### **4. Water distribution in Brazil**

As we can see in the following maps, Brazil holds on average 12% of the total water storage in the world. Even so there are regions in the country that doesn't have enough water to supply all needs. On the other hand the pluviometric index is varying very much by the different geographic regions and the index of water resources seems not to be just for the population and the environment.

The Northeast Region is one of the driest places in the Brazilian territory with almost 27% of the total population living there, while the water availability is just 3.3% of the total amount of water resources available in Brazil. Some parts of this region are going to become a desert and scarcity of water is a real problem. In spite of this the pluviometric index has an average of 800 mm/year reaching in the rainy season 1.500 mm/year, nearest the littoral. Furthermore the region witnesses an irregular distribution of rain that causes scarcity in some places and water surplus in others, refer to fig. 1.

Looking at the main watersheds in Brazil (see fig. 2) the rich net of rivers in the Brazilian territory can be seen. The Amazon River Basin is still one special landscape although in 2005 a very severe drought has caused a lot of damages to people and environment. Meanwhile the Amazon River Basin is the biggest in the world with an average flow of 180.000 m<sup>3</sup>/s/year. There are other important and significant watersheds like São Francisco, Araguaia, Tocantins, Paraná. Furthermore it is also important to mention the aquifers as the Guarani aquifer (transboundary) and others inside the Brazilian territory.

## **GEOGRAPHIC REGIONS**



fig. 1: POPULATION AND WATER RESOURCES STORAGE BY REGION

fig. 1: Population and Water Resources storage by region

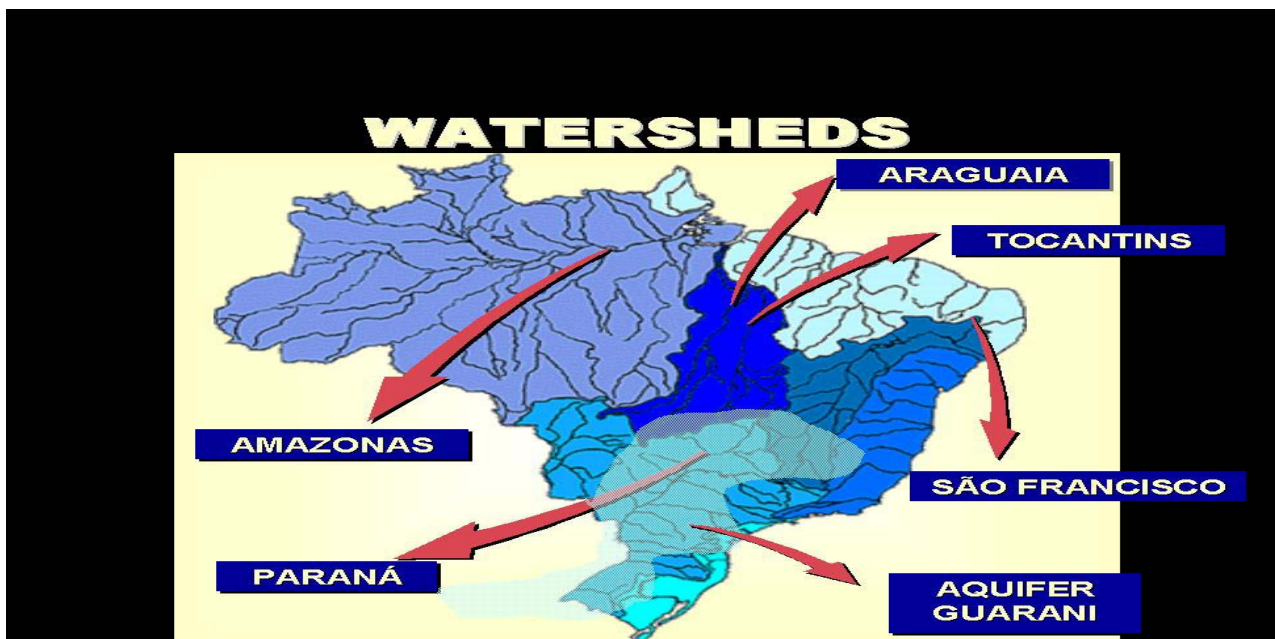


fig. 2: Main watersheds, rivers and aquifers

## 5. Water resources in Pernambuco State

Pernambuco is one of the most important states in Brazil. Located in the Northeast Region it has around 7.9 million inhabitants and Recife is its capital. Pernambuco is divided in five social-geographic-economic regions called development zones (fig.3, which are: the Metropolitan Region of Recife located in the littoral with 14 towns and 3.9 million inhabitants; the Forest Zone with only 11% Atlantic Forest of the territorial area; Agrestic which cover 20% of the area; Backland where the water resources face a severe scarcity and at least the Zone of São Francisco, a special region where we can find arid fields very well irrigated with the waters of São Francisco. The water supply system in the whole State uses mainly surface water and only a small amount of ground water. The predominant geologic formation in Pernambuco is rock and just 3% is located into a sediment basin.

To face the problems with the scarcity of water we have first to understand the definition because we also face leakage of water in a lot of other places. Due to many studies and examples Pernambuco suffers both. As we can see in fig.3 the water scarcity is exactly located in the backland and in the agrestic regions. But there is also scarcity in some parts of São Francisco Zone, especially along the boundary to the agrestic Zone. One question is why since a long time ago the same thing has occurred: water bowser crossing the roads selling water for poor people? Another question comes up, why it is so difficult to keep water in reservoirs or to build long pipelines? What's the reason of the lack of sustainable and effective water management system?

To answer those questions it is necessary to explain shortly what we want to say when we talk about leakage of water. A classic example for us is the Metropolitan Region situation at the present time. As a result from the lack of public integrated policy and administration for urban areas that Region has grown without control. Because of this and due to other causes in the Metropolitan Region of Recife there are water sources, reservoirs and intake points but there is no water to supply the population. The water flow to that region is today  $10.7 \text{ m}^3/\text{s}$  and the rate of total loss is around 55 %. The water supply system operates in an intermittent way since 1987 until nowadays. Why, someone could ask, if there are sufficient water resources to supply that region?

Recently the State Government has contracted a master plan to study and determine how much water is available to supply the southern part of the Metropolitan Region and itself. COMPESA has contracted a demand study to know how much is the demand for the urban, rural, domestic, public, commercial and industrial sector in the Metropolitan Region. With these studies and the Master Plan it will be possible to design a new and updated water supply system.

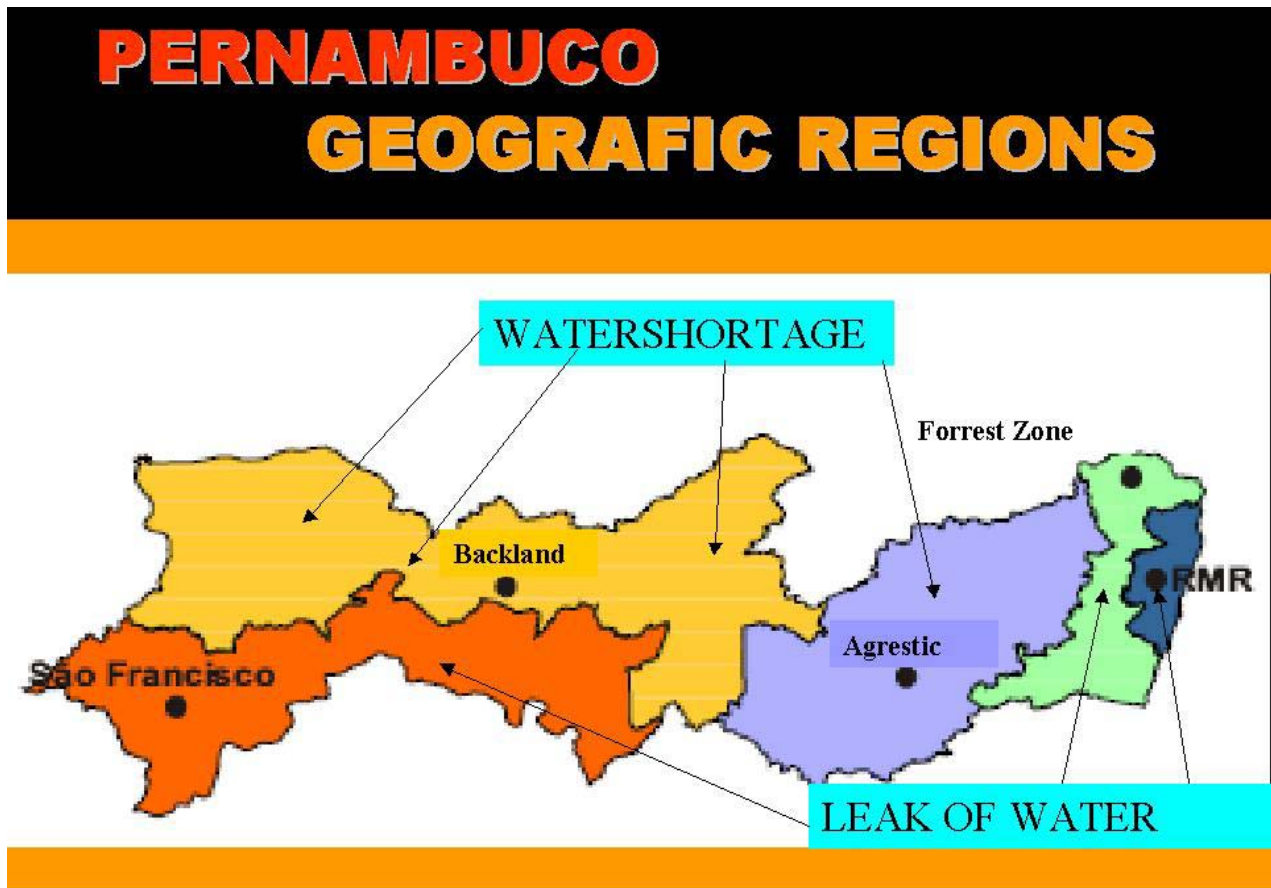


fig. 3: Areas of water shortage and leakage of water in the region of Pernambuco, Brazil

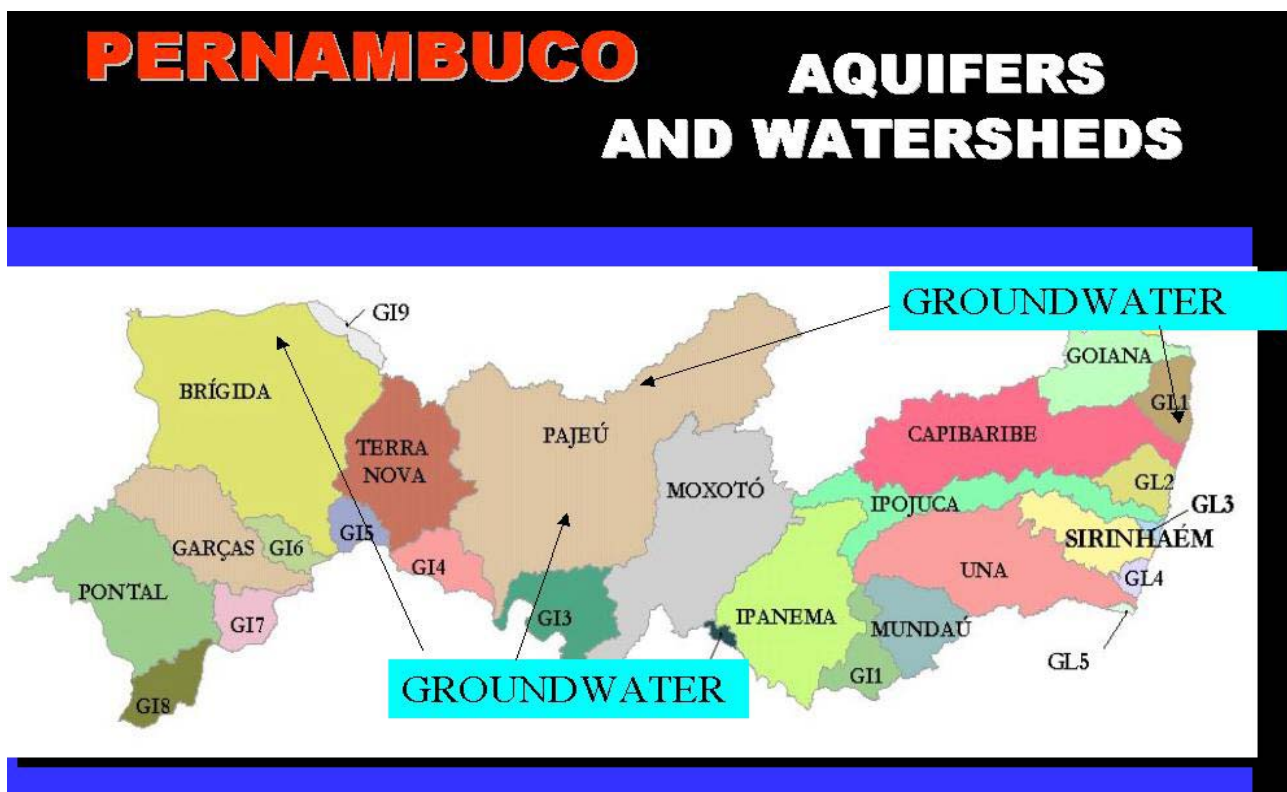


fig. 4: Aquifers and watersheds of Pernambuco, Brazil

## 6. Conclusion

There are a lot of things to do in Pernambuco when we talk about water management and also about waterworks, because they spent too much time waiting for regulation, laws and money. But is that the truth? Pernambuco already started working to transform its regulation and laws into effective management tools. COMPESA looks for changes and works hard to reduce and control water losses.

In the following paragraph some recommendations for actions and procedures are given to face water shortage and the leakage of water.

In general one has to introduce the following measures:

- Control and reduction of water losses in the distribution system as well as in the commercial area, because it is known where there is consumption but there isn't good metering;
- Recovery and modernization increase for automatic and long distance metering;
- Implementation of new management models with use in the private sector;
- Planning and new projects considering social, economical, technical and environmental assets;
- Finally to build a new water supply system under new concepts of management.

For facing the water shortage and the leakage of water the propositions are:

- Reutilization and rational utilization of water resources;
- Planning and update of the existing management;
- Water preservation, conservation and protection of the sources;
- Managing water resources in a professional way;
- To make the water resources management a state policy;
- Development studies and surveys about the existing system;
- Getting financial support;
- Integrated approach with municipality and inhabitants.