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OR WHOM THE RIVERS DRY UP?

ABSTRACT

This paper analyzes the distribution of population in Brazil, one of the starting points for understanding the formation of cities and enduring social inequality. Its goal is to describe and to reflect about the decisions of architectural planning, territory design, and urban planning, and to propose a possible course correction. Two scenarios served as its backdrop: the state of violence and misery to which poor people are subjected in Brazilian urban centers and how one faces the water issues in Brazil, especially in its Northeast Region. At its core, this paper questions the vector mode for planning growth in a territory and analyzes two points: the behavior of populations and the knowledge of the waters. It starts out from the statement that the Brazilian Northeast exports two products: man and water. It also provides a brief analysis about a project to divert part of the São Francisco River to fight the desertification process in the Brazilian semi-arid region and discusses a national alternative to face this problem.

KEYWORDS

Design decisions, territorial planning, formation of cities, social inequality, diversion of the São Francisco River, semi-arid, migration, water management.

POR QUIÉN LOS RÍOS SE SECAN?

POR QUEM OS RIOS SECAM?

RESUMEN

Este artículo se propone una reflexión sobre las obras que son adoptadas para combatir la sequía en la región Nordeste de Brasil. Deriva de la tesis doctoral "*Habitar o Sertão*", (AMORIM, 2001), desarrollada en la Faculdade de Arquitetura e Urbanismo da Universidade de São Paulo, bajo la orientación del profesor Dr. Sylvio Sawaya. Trae dos enfoques. El primer llama la atención para las formas cómo se da la distribución de la población brasileña. Lejos de agotar el tema, su núcleo cuestiona el modo vectorial de planificar el crecimiento económico en el territorio del país. El segundo enfoque, al que se dedica más énfasis, busca reflexionar sobre una manera posible de gestionar el agua en el Semiárido del Nordeste brasileño y cómo esta forma podrá generar riqueza material, a través de logros técnicos y humanos. Para tal, llama la atención para los principios que rigen los dispositivos técnicos y espaciales adoptados en el Proyecto "*Habitar el Sertão*". El objetivo de este trabajo es proponer una posible corrección del rumbo en la política de conducción de las aguas en el Semiárido brasileño, bien como reflexionar sobre las posibles consecuencias de esa decisión en la redistribución de la población en Brasil.

PALABRAS CLAVE

Obras de combate a la sequía. Revegetación del Semiárido del Nordeste. Semiárido brasileño. Transposición del río São Francisco. Distribución de la población brasileña.

RESUMO

Este artigo propõe uma reflexão sobre as obras que são adotadas para o combate às secas da região Nordeste do Brasil. Deriva da tese de doutorado "*Habitar o Sertão*", (AMORIM, 2001), desenvolvida na Faculdade de Arquitetura e Urbanismo da Universidade de São Paulo, sob a orientação do Professor Dr. Sylvio Sawaya. Traz duas abordagens. A primeira chama a atenção para as formas pelas quais se dá a distribuição da população brasileira. Longe de esgotar o assunto, seu cerne questiona o modo vetorial de se planejar o crescimento econômico sobre o território nacional. A segunda abordagem, a que este artigo dedica maior ênfase, busca refletir sobre uma forma possível de gerir a água no Semiárido nordestino, e de como esta forma poderá gerar riqueza material, por meio de conquistas técnicas e humanas. Para tanto, chama a atenção para os princípios que regem os dispositivos técnicos e espaciais adotados no Projeto Habitar o Sertão. O objetivo do artigo é propor uma possível correção de rota na política de condução das águas no Semiárido brasileiro, assim como refletir sobre as possíveis consequências dessa decisão na redistribuição populacional no Brasil.

PALAVRAS-CHAVE

Obras contra a seca. Revegetação do Semiárido nordestino. Semiárido brasileiro. Transposição do rio São Francisco. Distribuição populacional brasileira.

Two situations are the background of this text: the state of violence and penury to which poor people are subjected in Brazilian large urban centers, and the way the water issue is faced in this country, especially regarding the Brazilian Northeast. Thus, two points will be covered: the conduction of the populations, and the knowledge of the waters.

To reflect upon population distribution over the national territory can be one of our starting points in order to understand the formation of our cities and the persistence of social inequality.

We will start from the verification that Brazilian Northeast exports two products: men and water.

It is known that the displacement of populations happens due to the state of extreme poverty in which these individuals find themselves to be, and in the hope of a more prosperous life elsewhere. For that to happen there is a need of contingents of people to be handled. And that has always existed in huge quantities in the Brazilian Northeast. Today, the 950,000 km² of the so-called Drought Polygon is inhabited by nearly 30 million people, 40 million domestic animals, some thousands of wild animals, and billions of insects that live in the seasonality of the drought¹. People to grind sugarcane, extract rubber, move machines, build up cities...² Tasks of great usefulness which demand little education.

What may surprise is to know that the second biggest export product of the Northeast is water.

In the driest regions of the Brazilian Semi-arid, the total average annual rainfall is 400 millimeters. (Just to give an idea, the annual pluviometric average in California is 200 millimeters and in Israel is 35 millimeters.) Evaporation in the Semi-arid region, however, is 2,000 millimeters. In other words, there is five times more water being evaporated than what falls down in the form of rains. There is 2,800 hours of sunshine per year. This comes to an average of eight hours of sunshine per day. That total can reach fourteen hours in a day: ten hours of direct sunlight and four hours of reflected light. Winds reach up to 25 kilometers per hour³. That is enough energy to dry organic matter – to the point of whitening it to the naked eye – that insists on living.

Without going into the meaning of that solar energy capacity at this point, this data is to elucidate that, among other things, water is voraciously sucked by solar heat and transported by the wind, thus becoming rain somewhere else.

This data is to determine that, if we should conceive collectors, storage devices, conductors and distributors of water, we should opt for underground equipment design. Works of hidden beauty. This composes fundamental data for projects decisions which will define artifacts of architecture, infrastructure, urban design, and territorial planning.

Still not wanting to delve into technical descriptions of those devices – in view that they are already detailed in the thesis entitled *Inhabiting the Hinterlands* – from which the drawings we will see below were extracted – let's get back to the two reasons for this text to be: the conduction of the populations and the knowledge of the waters.

The fast population growth in some of the Brazilian capitals, in the last seventy years, has happened, also and mainly, due to the arrival of Northeastern migrants, out of the exodus from farming and cattle raising land that hadn't assimilated labor and manufacturing laws of the Estado Novo political regime due to its mono-cultural and feudalistic system of capital production. Its owners have preferred, in the short run, to expel the labor force from their latifundia and, in the middle run, to get mechanized, if such⁴.

That expelled population, still illiterate and unequipped, migrates to large urban centers⁵. Large part of this labor force is assimilated by the construction industry, by industrialization, commerce and services. It builds and inhabits the poorer regions of the city in terms of urbanization. Yet, it stabilizes itself and constitutes, until today, through its descendants and aggregates, the driving force of several productive segments of society. However, it is still within that population that we find a great work power that was not fulfilled or assimilated. It is within this population that indices of lower education and higher illiteracy are found. Statistics show direct and indirect involvement of large part of this population with the weapons industry of robbery, traffic, and commerce of purchased security. The agrarian memory of land cultivation and of fighting has sometimes led another part of this population towards the landless movements, searching for survival inland Brazil. Other times we find these memories in the offering of their labor force to illegal occupation of urban land, slave labor, or odd jobs and prostitution.

In view of these migrating masses which were not fully assimilated by its destination or purpose, questions are inevitable. In this specific case, one could think: could we interfere in the origin of the movement? Considering the vastness of the semi-arid land with no use⁶, which waits for viable projects, could we affect its quality to the point of making it apt to house back populations such as workers, families, groups linked to the land, or not even letting them leave?

Here is a challenge.

The first verifications have shown that this region is not suited to ecotourism; neither does it attract the installation of industries. Neither it adapts itself as agricultural land to the prevailing international model of agricultural and cattle raising⁷ because large part of its territory is covered, let me repeat it, by hot climate, with some rain and lots of evaporation, its soils are mainly shallow, with little fertility and subject to salinization⁸, its land and production structure is archaic and perverse, and its population is still illiterate, impoverished, and permanently subjected to exoduses.

These factors have made the Northeastern semi-arid region one that does not correspond to the international demands of the agribusiness economic policies⁹, logics that normally applies to other Brazilian agricultural regions, where the land can be fertilized and produce more than one harvest per year.

Without being part of an economically active agenda, either nationally or internationally, Northeastern Brazil will have to be thought in another way.

For such, it is necessary to know the several ecosystems of the region and understand how did the degradation of the environment has happened and has been happening¹⁰.

All data demonstrates the presence of growing desertification: condition when and where it is not possible to extract significant organic wealth, exponentially difficult to generate any fertility in the soil.

There is no way-out. To keep the population linked to the Semi-arid territory, either in Brazil or elsewhere one needs to generate fertile soil. And this can be done through reforestation of the region¹¹. To give back to the territory the fertility it once had before its devastation carried out by cattle and human occupation¹². Shade the land and erect a forest. To have this as one item of the Nation's Plan, employment generation, distributed wealth, and balanced occupation of the national territorial.

Academic studies as well as the news have denounced that the process of desertification in the nine states of the Northeastern region and in the north of Minas Gerais state has been growing¹³ for over twenty years now. Today we have the worst drought that the present generation has ever lived. For sixty years, periods of fine weather have grown farther apart, and the soils have become desert. The drought is underway.

One could expect the solution to lie on perennial waters. Initially, let's elect the rivers as redeemers. The two only sources of fluvial perennial and superficial water for the semi-arid Northeast region are the Parnaíba and São Francisco Rivers.

The Parnaíba River, that separates the state of Maranhão from the state of Piauí, also bathes a small part of the state of Ceará. It is a river that runs on a plain which has a slope of 880 meters. Its tributaries that come from the left margin are all perennial, coming from great-volume rivers, typical of the Amazon region. The tributaries coming from the right margin are mostly temporary, coming from the Drought Polygon¹⁴.

The São Francisco River, endowed with great volume and length, has its spring at 1,200 meters of altitude, in the Canastra ridge, outside the Drought Polygon. Even though its basin of 631,133 km² is located in the Northeast region, it collects its waters in Minas Gerais and continues with a hydric deficit throughout the remainder of its course. To tamper with this hydric equation is something quite delicate.

The year of 2014 starts and shows images of a shallow São Francisco River, whose margins are exposed, eroded by deforestation and the poor urbanization along its course¹⁵. These images have made reappear an episode from the beginning of the year 2003, when Brazilian government directed once again its gaze to the environmental problem of the Brazilian Northeast, in the first month of the administration of President Luís Inácio Lula da Silva. On that occasion, the *Inhabiting the Hinterlands*¹⁶ project – whose design approaches the territory as a plan, a surface – was then presented to the Ministry of the Environment. It contradicts the vectorial design based on railroads, canals, roads, concentrating expansion of the territory along their courses.

The objective of *Inhabiting the Hinterlands* is the construction of forests through contingents of population distributed along the territory, in a more diffuse way of occupation. Populations united by the goal of building a reforested semi-arid, and by the creation of groups for meeting and potentiating plans.

However, the project was disregarded. The option made was for the vectorial project of the transposition of the São Francisco River.

Today, looking at the images of a silted São Francisco River, even before the first two canals of transposition have been activated, I am convinced that this will not provide the fertilization of the Northeastern territory in the short, mid, or long runs.

There is need of a design that proposes that the population disperses itself along the territory, willing to grow in small plots of land, in order to build the forest. This task will hardly be accomplished if most of the hinterlands' inhabitants live in small and mid-sized towns along long vectors.

This text ends its first topic here, and considers that there is still a lot to see about collectively planned "exoduses" and the permanence of the populations in their places of origin, in the pursuit of a more humane and less violent territorial distribution.

The second point is: how one gets to know the exact amount of water needed to fertilize the soil?

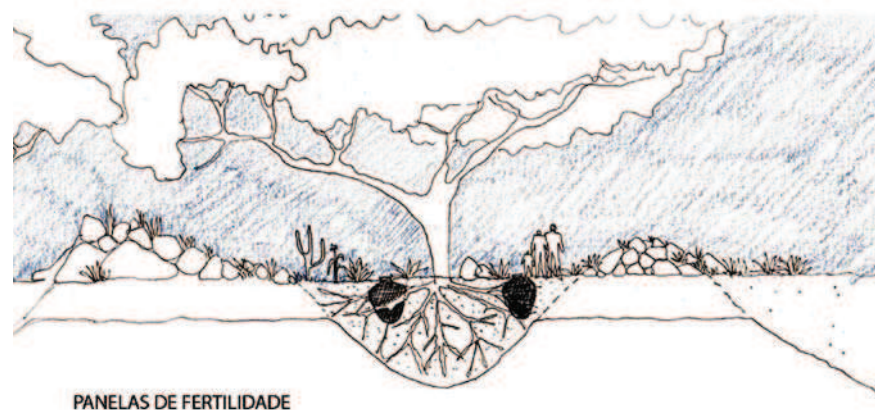
It is not rare to see organic matter turning white in the soil of this region, in a type of pre-calcination. Brazilian savannah, the Caatinga, as this biome is called here, has the vigor of an extract. Its native forests have a dense latency period. This is the real separation between desert and fertility, put to test by its adaptability to dry weather. This must be our starting point.

The proper amount of water needed for reforestation is, at first, the measure given by the natural fact. And this pre-existence shows us that water is sucked by osmosis¹⁷. Not in the intensity of dripping. Not in the intensity of aspersion.

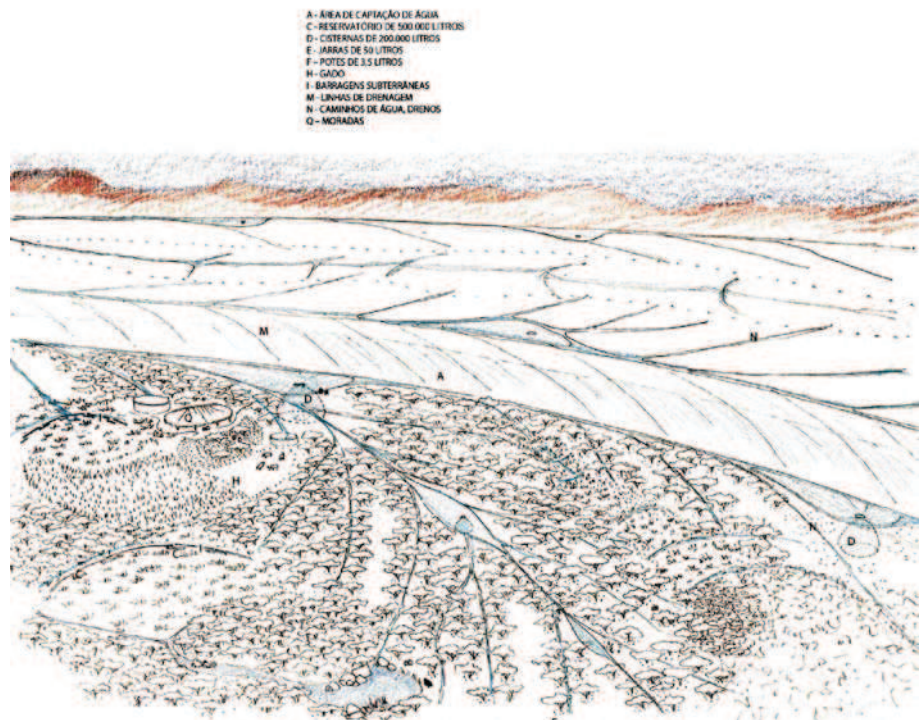
Also one has to acknowledge that it is very unlikely that a population that today is functionally illiterate will not read and follow the instructions of an insert, referring to drip irrigation¹⁸.

It has to be recognized that aspersing water on a shallow soil¹⁹ that contains salt demands draining measures to hinder the surface of the soil from salinizing – let's not forget that the Hinterlands Depression was once the bottom of the Ocean²⁰. Two installations are needed: one to asperse and another to drain. Therefore, consists in two separate costs.

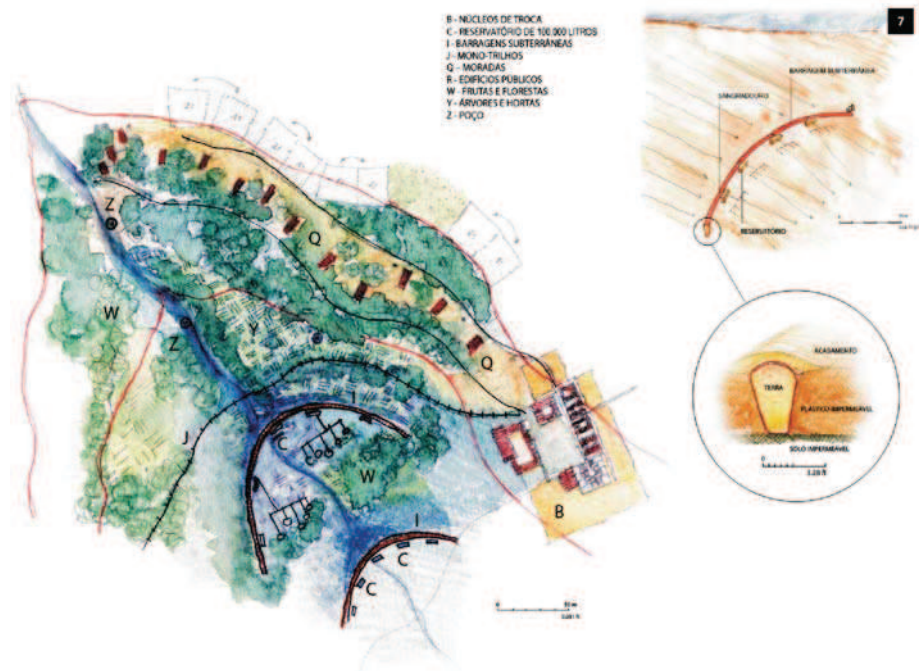
Fertility pans based on osmosis irrigation. 2014.
Drawing by the article's author.



Other infrastructure, other landscapes. 2014.
Drawing by the article's author.



Other infrastructure, other landscapes. 2014.
Drawing by the article's author.



Osmosis does not require draining or inserts. It is the plant that manages the proper amount of water it needs. In this way, the amount of water offered to the soil diminishes considerably, and the time it is in touch with the crop's active soil is extended, thus avoiding leaching.

This having been said, there it is, the confirmation of the need to plan the occupation of the territory having as guiding principles the topography of the place for conducting the waters, the quality of the soil one wants to fertilize, the devices that will feed the water system based on the amount of water needed for the plant's osmosis over time.

Those are new design projects of infrastructure, equipment, and housing aimed at collecting, conducting, storing, distributing, and absorbing rain waters²¹, apt to be fed by other systems as well. By reducing the amount of waters required to achieve the goal, we increase the number of possible sources of supply²².

Culturally we have seen large and sporadic rains to be revered by inhabitants of the hinterlands²³. It is high time, without any delay, to give them real offerings.

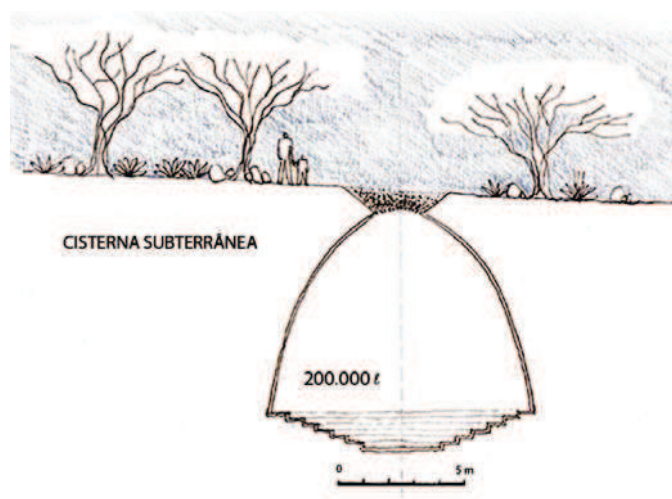
The real offerings will be when, on days of storms, waters would be conducted through built tracks, and collected by mouths in all sorts of underground cisterns, niches, caves, dams, and clay pits. Then, on that day, the song of the temporary rivers will be sung.

Let's filter the light and build cisterns. In one hundred years' time those places might be visited as ruins of a former fertile forest.

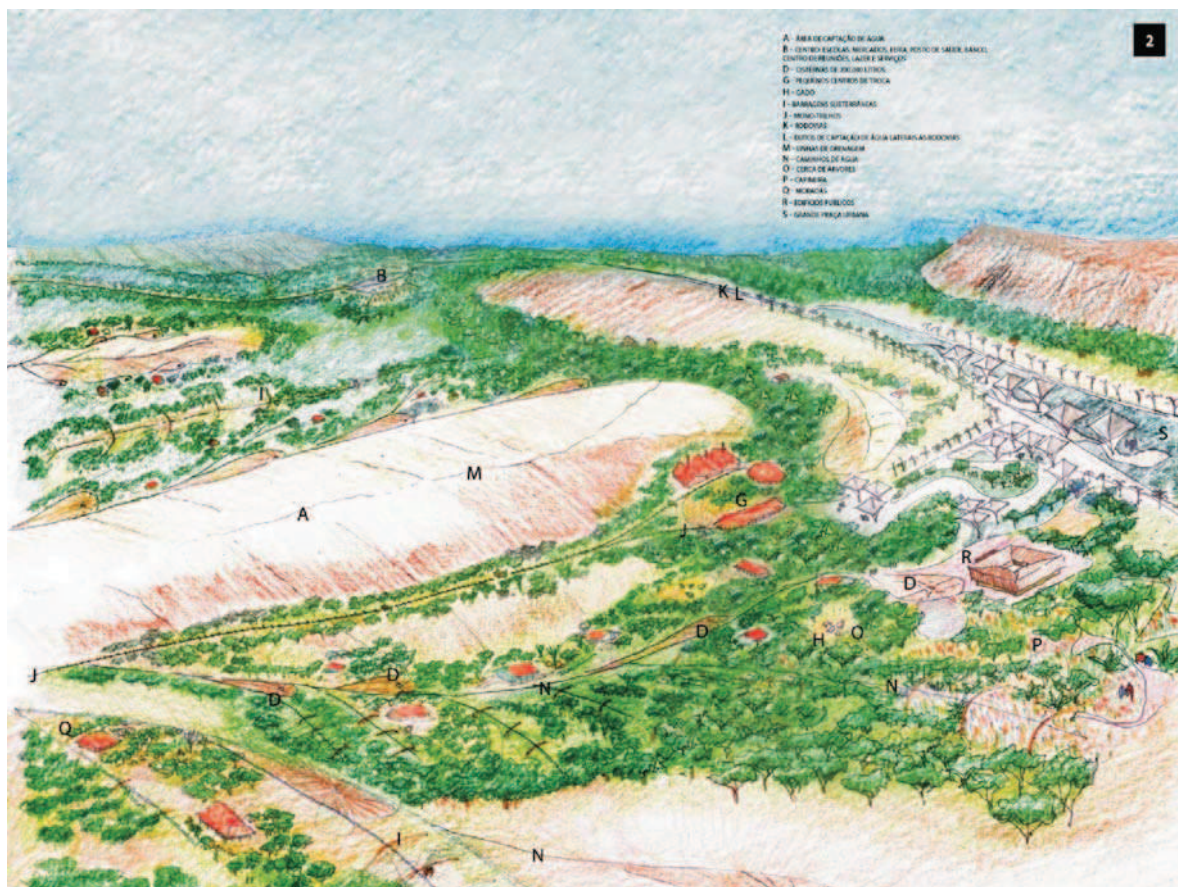
Let's assume that only Nature is the maximum possible expression of what we used to seek as the perpetual motion machine.

There are different cycles of lethargy and apex in each biome. They exist and permeate us. Let's recognize that goods such as gravity, rains, wind, and sunshine are the only capitals that are distributed on surfaces – if not equally distributed, at least without any privileges.

The main aspect of this network is to design of paths on plane surfaces, on ample fields, on small protuberances of landscape. The design of the territory. A network of paths and permanence that collects and conducts the greatest amount of rain and storm waters, and its storage, free from the fury of the



Underground reservoirs in shallow soils. 2014. Drawing by the article's author.



Proposal made by the article author. 2014.

winds and the intense heat of the sun – this light that gives us everything, and which has no reason to take it away so quickly. A network of new conductions and permanence that nurtures the crop by osmosis.

A plant and animal reserve, in a place that used to be the promise of a desert, is already some achievement²⁴.

This project is to be carried out by people and through political will. Decisions that include education, appreciation of local culture, promotion of low cost, easy-to-handle, low-impact technologies, the adoption of knowledge in sciences already developed by agricultural research companies such as Northeast EMBRAPA.

It is necessary to continue with the policies of social aids which have leveraged entire populations from the line of extreme poverty, through education and committed work. To reach the next level, which will come after this first assistance: the development of a viable project for the Nation and Territory, and to be accountable for the evolution of the project through the work of all those involved. Education is urgent, and there is work in all its latency, to propose possible life alternatives.

What the dryness of the São Francisco River makes explicit without any margin for ambiguity is that it is time to correct the course set out ten years ago for the semi-arid region.

Let's leave "Old Chico" flow in peace.

The transposition canal of the São Francisco River can be incorporated as macro-vector of water. It is a large-size-temporary river which, due to its large size, consists in an exception in the reforestation system of the Semi-arid. Let's just throw out the bathwater – which had happened when we saw those two transposition canals as continuous flows, perennial rivers, open veins to the sun and the wind. Let's not throw out the baby with it, though.

The appeal continues and this text expounds our plight so we don't have to keep making the same mistake regarding the following lessons: storing water in large surfaces exposed to the wind and evaporation; consider that just by having water, without dosing it, the Semi-arid is fertile; disregard its salinity; disregard the vocation of each of its soils; remove its plant coverage; conduct land reform on sands²⁵; adopt monoculture, even less in frail lands; treat the semi-arid as one single ecosystem.

As a conclusion, we get back to the question:

For whom the rivers dry?

And the answer echoes:

They dry for us.

NOTES

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