

## Water in the Auroville bioregion

**Auroville Water Harvest** is an organization which was created on August 15, 1996, to fight against salt water intrusion and to promote appropriate management of water with the participation of all the people concerned. The goal of Harvest is to develop effective and sustainable utilization techniques based on precise knowledge of the underground and surface water resources.

### Surface water

Tamil Nadu has a long and rich history in regard to the use of its surface water resources. Each village has in theory three water bodies, all supplied with rainwater: for irrigation (*eri*), for cattle and for drinking water a *kulam* or *oorani*.

Majority of the irrigation tanks (*eri*) were built from the 6<sup>th</sup> to the 10<sup>th</sup> century of our era during the dynasty of the Pallavas. One will understand the importance of these systems of irrigation by noting that about a third of the surface area of the state is actually irrigated by these omnipresent tanks (about 40,000 such tanks), the two thirds of water needs comes from the exploitation of ground water.

The big tank of Bahour, in the south of Puducherry, existed before the Chola period (1<sup>st</sup> century). As for the famous Lake Estate, the broadest in the area, more known today under the name of Ousterie or Oussoudou, in the south-west of Auroville, was built by the Vijayanagar Dynasty around 1110.

It was observed that the land irrigated by these tanks (*ayacut - wetland*) have an increase in their fertility due to the water rich in nutrients. In addition, the beds of the tanks were cleaned regularly and mud was utilised in the fields, bringing better fertility. This practice continued until the beginning of the 20<sup>th</sup> century.

### ***Eri or the long history of water in Tamil Nadu***

The irrigation tanks played a decisive role to guarantee the food production but also to maintain a good ecological balance, to control the floods, to prevent erosion, to recharge the water table and to limit the valuable water loss during the large rains. The presence of the *eri* allows generating a favorable microclimate at local level. Moreover, without the *eri*, the development of rice cultivation, which is the staple diet of the people, would not have been possible.

Originally, the area was largely covered with forests, as the Maharajah of Mysore's hunt reports testify, driving out the tiger in the neighborhood of Auroville at the end of 19<sup>th</sup> century. From the beginning of the 16<sup>th</sup> century, rivers were partially diverted to fill these tanks quickly, thus offering a greater guarantee to the food production.

A little later, the irrigation tanks were connected between them at watershed scale in complex tank systems, and the first irrigation wells, then operated by man or animal energy, made their appearance. Auroville is located in a catchment area representative of this system, with chains of irrigation tanks connected along feeding channels extending over the entire length and width of the watershed and finally ending in Kaluvelli wetland, ensuring the life of the whole of the local population and beyond.

These systems of irrigation being the pillar of the life of the population, simple mechanisms of management and decision, anchored in the **country structure** of the population, made it possible to maintain these tanks. The filling of the tanks was measured precisely, and then the villagers met in order to define the area to cultivate as well as the choice of the species

and the irrigation plan, thus allowing to ensure an adequate and optimized use of land and water. A person, or more generally a family, “ *Neerkatti* ”, was in charge of managing the opening of the gates (sluices) to aid the distribution of water to the fields. The sharing of seeds, of work for the fields and maintenance of the irrigation equipment, coupled with an equitable division of the production, ensured a great equality and sustainability, and contributed largely to reinforce social fabric.

Scientific knowledge and traditional wisdom implemented to develop such processes, which ensured and still ensure to a large extent the sustainability of rural life of south India, can only inspire the deepest respect. History proves to us that it is the innovation and the local genius which produced these systems as well as the social and political organization responsible to maintain them. These extraordinary indigenous systems could again play a crucial part in the wellbeing of the populations and the life of the country.

The maintenance of the systems of irrigations (*eri*, control structures, feeding and irrigation channels) was formerly with the responsibility of a local body. This maintenance was ensured by participation through work or financial.

The great famines which devastated India made their appearance only with the British Raj (1857). Indeed, India was known since antiquity for its opulence, its amazing richness and the plenitude of its people. India knew 25 major famines in the second part of 19<sup>E</sup> century and 35 to 40 million people died of hunger during the same period. The British government reacted by developing irrigation canals and by improving the degraded structures. Due to these decisions and to the distribution of rice at the most critical periods, there was no more major famine until 1943. Nevertheless, the last great famine took place in 1967.

The British government declared that the common resources belonged to the State and would be managed by the Taxes Service. Later, it imposed a tax on the lands and a right on water for those who used the tanks. The local population was not involved any more in the maintenance of the irrigation systems. The enormous expropriation of the resources of the villages by the government led to the disintegration of the traditional society, its economy and its control. Taxes to maintain the *eri* could not be supported by the population. This extraordinary system of water collection, of centuries of concerted collective labor, this unique example of social participation fell gradually in disuse.

At the end of 19<sup>th</sup> century and during first half of the 20th century the situation became disastrous: famines, impoverishment of the population, but also of the local government, are the rule. The independence so much desired did not bring a reform of the Indian administration. The degradation of the *eri* continued, as well as the growing problems faced by the population, which then turned as one of the engines of the exodus towards the large cities.

## **Today**

Majority of the structures of irrigation today are in bad condition and are largely silted, having lost their original storage capacity because of the absence of regular maintenance such as it was practiced in the past. Drainage and feeder canals, control structures, as well as know-how related to their usage are on the edge of collapse. The traditional knowledge of the people is being lost.

Becoming aware of the importance of these structures for the life of our area, large efforts are being carried out by **Auroville Water Harvest** for the last twelve years to not only rehabilitate these structures, but also to recreate the necessary institutions in the villages with the participation of all the beneficiaries. **Auroville Water Harvest** is a very present and recognized actor in this field, as a project carrier but as much as partner and adviser to the government and international agencies.

At the same time as the impoverishment of which we speak, the rural population had grown exponentially, bringing an increased pressure on the already decreasing resources. To

ensure their survival, the populations sought other resources, and started to deforest to sell wood for the cities which developed, for construction, ships but also for cooking purpose. Swiftly, in this climate of torrential rains, the ground cover disappearing, erosion took its toll, washing away the arable soil and the remaining vegetation, filling the *eri* and channels even more quickly, opening broad scars like canyons in the ground, and letting lost to the sea what had made the richness of this country.

### ***Kulam and oorani***

Apart from these broad irrigation tanks of a few tens to a few hundreds of hectares, the villages all are equipped with small ponds or *kulam*, often masonry made, present for many within the village, close to a temple. *Oorani* and *kulam* are Tamil words which indicate these small village ponds. They have multiple vocations: for domestic use, drinking water, the cattle, and personal hygiene. When this pond is close to a temple, its use is strictly reserved for the ablutions or other usages considered as “pure”, which makes it possible to ensure relatively clean water. In other cases, the basin is separate into two, seldom by a physical barrier but by established practice, which makes it possible there still to guarantee a relative cleanliness, while exploiting on self-purification capacity of such ecosystem... and the natural resistance of the population!

Let us keep in mind that all the house works (including education, hygiene and thus the drudgeries of water) are allocated traditionally to the women and girls. Water, with the collection of wood for the kitchen, are so demanding activities under these conditions of environmental degradation, which they very often justify the school absenteeism, digging more deeply and to some extent legitimating the prevailing ditch of the sexes in the contemporary Tamil society.

To come back to our *kulam*, in the majority of the cases water was largely polluted, used as it is as well for common needs as for latrine and animals. Today the *kulam* are also used for providing water necessary for the pesticide pulverization, farm equipment and vehicles cleaning, etc In such cases, the population does not have other choices only to seek access to other drinking water resources, if that is however possible.

In Kuilappalayam for example, the village itself not having a well, the population had no other choice only to go down to the open well near the coastal road, and to bring back water home each day while passing through fields, the road towards the sea not existing at that time. This very day, in Kalupperumbakkam, village located along the southern edge of the marsh of Kaluvelli, a good half of the population draws water in holes arranged in the sandy banks of the village pond which until eight years ago, offered water of sufficient quality to the population. What has happen? This water became contaminated by drained waters of the always increasing quantities of chemical fertilizers and pesticides. This was added to the continual contamination, but up to that point naturally controlled, linked to the other already evoked uses. To address this acute water shortage, the service of the government in charge for water supply (TWAD), developed not less than five wells for the domestic needs of this village. Unfortunately, and as in many villages of the bioregion, all these wells have a high salinity, and their water is unsuitable for consumption. The women thus make the tail with the water hole, and collect water with bowls, heavy work which generates many tensions and moves away the girls from the places of education.

### **Ground water**

That now brings us toward the underground resources, the green revolution and the developments of these thirty last years.

As mentioned earlier, the first wells with vocation of irrigation developed towards the 16<sup>th</sup> century. We must keep in mind that these were open wells, which did not allow to make them very deep, taking into account the nature of the grounds. One thus finds them only in the sectors where water is naturally close to surface at least during part of the year: on the

alluvial part, close to the beach, or on the argillaceous parts or with slow vertical infiltration. From these wells one often drew water by hand, or used animal haulage, or norias. In addition, in the sector of Puducherry which, because of the French presence, profited quickly from social and technical developments, wells were drilled and tubed rather early. It is necessary to keep in mind that in Puducherry town artesian wells were present (spouting out well) until the fifties. At the beginnings of Auroville and until the eighties, water was often close to surface, which made it possible to extract it with wind mills of the crétois type, with limited extraction capacity.

In the direct area of Auroville, the principal aquifer, called Vanur sandstone, was at 7m above main sea level 1975. Today, this same aquifer is 57m below sea level ! This implies that the subsoil waters circulate now from the sea towards inland, but also that this aquifer presents perfect conditions to be invaded by the sea in very little time. And the fact is that one observes a fast increase in his salinity (measured since 1994), this observation being besides the reason why **Auroville Harvest Toilets** was initially started.

In the same way, but to a lesser extend, the Cuddalore sandstones aquifer, that on which Auroville is located and which corresponds to our red soil, presents an alarming profile now, with water table levels sometimes descending to sea level as far as than 1.5kms inland. This same aquifer is besides already in the course of contamination by sea water more in the south, towards the town of Cuddalore.

What did it occur to reach such situation?

Undoubtedly, the demographic growth is one of the major sources of the problem. In 1950, India counted 357 million inhabitants. By 2006 it counts more than 1.1 billion people and the needs for the population, adding to those related to modernization, made only exponentially increase the exploitation, then the overexploitation, of natural resources.

Problems of food to which the population faced since the middle of 19<sup>th</sup> century and the most serious famines which struck the country during part of the 20<sup>th</sup> century generated a sharp reaction of the government as of the independence, which reached its full extend during the period 1967-1978 with the Green Revolution. The fact is that the population grew much more quickly than the food production.

The engines selected for the Green revolution were the extension of cultivated surfaces, the practice of double cropping and the use of high yield seeds, this combined with the modernization of husbandries, the facilitated access to water, the massive production of fertilisers and the pesticides necessary to these seeds. Double crops means "two monsoons", or the equivalent in the form of water drawn... from under ground! The food bet was won. India, of a country of famine (the last great famine in 1967 decimated 4 million people, that is to say more than one percent of the population), became food exporter in 1978. Multiple economic and social repercussions benefited the population and the country in the form of employment creation, industrial development for fertilizers and pesticides and agricultural machinery etc The Green revolution, practiced in all the developing countries, was regarded as particularly successful in India. On the other hand, the environment and especially surface and ground water, up to that point preserved, started to be largely overexploited but also massively polluted.

### ***The overexploitation and the risks of salinisation***

One of the means chosen by the government to accelerate the agricultural development was to give free (or highly subsidized) electricity to the farmers. The rich land owners were thus equipped gradually, drilled wells, installed submersible pumps ever deeper, and extracted ever more gigantic volumes of water, without any mechanism of regulation. This tendency did nothing but worsen thereafter. The absence of measures to limit this established practice, a total lack of public information on the limited resources, coupled with a welcomed political laxity in a country with strong rural population, gradually brought the situation to its roof. In

the bioregion of Auroville, in the early eighties, the groundwater water extraction from the main aquifer is about equal to the natural recharge. During the eighties, it doubled it. In the nineties, it is eight times the natural recharge which is extracted annually, and today it is proven that fifteen to twenty times the recharged volume is extracted from the principal aquifer! During the same period, Puducherry passed from one to three harvests of rice or sugar cane per year! With the collapse of the aquifer generated by this overexploitation - the principal aquifer broke down of 57 meters - the subsoil water movements were reversed, running now from sea towards inland and creating the ideal conditions for massive and flush like sea water intrusion. This depletion, accelerating with the ever growing extraction, gradually brought an increase in the salinity of the groundwater. This phenomenon present throughout the coast of India is found also far inland because of emptying of the main groundwater resources and thus of the upward leakage of deeper naturally salty (fossil) aquifers. Today, in Auroville' s bioregion, the water intended for domestic needs in the villages is of unsuitable quality almost everywhere. In certain zones, the rate of salinity is such that it affects the agricultural production. To that comes to be added the infiltration of often very dangerous pesticides, the overused fertilizers and other industrial and urban wastes which, for lack of adequate treatments, are found concentrated in the ground and the water.

Fortunately, this increasing salinity is not yet the fact of the intrusion of sea water, at least in the close vicinity of Auroville. On the other hand, 20 kilometers south, the disaster is on going. We seat on a time bomb: the current scenario of overexploitation of the groundwater resources, if not massively and very quickly corrected, guarantees a major catastrophe for the 1,2 million people living in the bioregion of Auroville. Let us keep in mind that a sea water intrusion as massive as that which could occur under the conditions which prevail today is a catastrophe that Nature would spend fifteen thousand years to repair...

But the threat of salt does not stop there: to this situation at the very least alarming, the tsunami of December 2004 came to add its misdeeds.

## **The tsunami**

In addition to the destruction and the losses of which so many people suffered, another phenomenon, less noticed but however alarming, occurred. Into the few minutes during which the sea came to cover the grounds, a phenomenal volume of salty water intruded into the ground, carrying with it the dejections strewing the beaches, privileged place of public defecation since immemorial times. The immediate result was that the fresh water presents in the dunes, which fed the large population living along the coasts, was found in a few minutes completely unsuitable for consumption. Everywhere along the coast, the government and NGOs had to ensure in emergency the needs for freshwater. But also, and that was the very first time, to address the sanitary requirement.

The importance of these factors on public health emerged only further with time, and a vast segment of the public health hazards and lack sanitary arrangements, largely occulted until that point of time, emerged to light to disappear no more. The emergency and temporary camps are transformed into a multitude of new settlements with high population density, in zones without access to water, speaking about sewer or purification, elements completely absent from the rural and coastal Indian landscape.

Where to find water? How to avoid the dramatic problems which can emerge from the deplorable hygienic conditions? Which are the existing techniques and are they adapted to the conditions, the population needs, and the local capacities? The water tables are everywhere within a few tens of centimeters from the ground, often salty and very sensitive to pollution, when the rebuilt areas are not quite simply flooded during monsoon. An enormous headache and a vast challenge to be solved at all levels. The solutions used initially, including by the international agencies specialized in public health and water sector, were catastrophic and completely misfit. Of this hard lesson, gradually, the government and

the whole of the local actors turned to reliable and really adapted solutions. Only now complete and appropriate solutions are in for some villages, with a growing interest for duplication.

The urbanization and industrialization, the absence of medical facilities, system of distribution of water suitable and the lack of regulation, generate today enormous pressures on the environment and public health.

**Auroville Water Harvest** plays a foreground part in the field of water, its protection and its regeneration, a role recognized and appreciated by the highest Indian and international authorities. Proof is the visit of the President of India, Dr. Abdul Kalam, who visited Auroville in November 2004 in order to better understand the water situation (which affects the whole India), the solutions suggested and implemented by Auroville. The expertise acquired in these fields and others related ones is well known and appreciated by the authorities, which see in Auroville a fair and privileged partner, capable to give answers and to develop practical solutions for the complex problems faced by Tamil Nadu.

Groundwater, surface water, pollution, drinking water, cleansing, distribution, recycling, coastal area, urbanization, rural life, industry, agriculture: such are some of the fields where the expertise of **Auroville Water Harvest** blossom and find gradually its full radiation. We face an emergency situation, and like topicality for the human activities everywhere on our dear planet, it is centrally about an urgency for conscience, to be able to answer in creative ways to an on-going catastrophe. With the dash and the inspiration characteristic to Auroville, solutions emerge, by the very force of the aspiration for a change.

The area of Auroville is rich of a long history as regards development of the activities around water. The complexity of the actual problems calls for in-depth answers, based on a solid comprehension of the water mechanisms and the socio-economic dynamism of our area, articulated around a systematic transfer of knowledge and of the methods suitable for sustainable and integrated development. Auroville is in total interdependence of the bioregion as regards water resources. **Auroville Water Harvest** plays already a headlight part by setting up scientifically grounded solutions, also environmentally, socially, organizationally and economically viable, with the local population and actors.

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