

Forty Years of Auroville: Renewables and Environmental Developments

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Historical Context

The Stockholm conference on environment and development in 1972 paved the way for bringing environmental considerations into the mainstream of developmental efforts. Further, it led to the widening of the concern for sustainability to include all resources and not only money, as was the case earlier. Recently, the impact of 'Ozone hole' and evidence of global warming have set the agenda for renewable sources of energy in its imperative and non-polluting context.

Parallel to the efforts that led to these global initiatives, a bold experiment in international living, launched in 1968, was taking shape, centered around the ideals of spiritual, psychological and material harmony. A new township, christened Auroville, was created as a site of material and spiritual researches for a living embodiment of an actual human unity. It had to be sustainable by definition. Thus began an on-site, hands-on effort by dedicated team of seekers from many nations. They took up the challenges of developing appropriate technologies for low energy housing, water harvesting, renewable energy, afforestation, organic farming, waste water recycling and transportation- all within the context of a rural location in a developing country. Over the last forty years, reliable data and know-how have been generated for technical, financial, social and operational aspects of this 'hardware' of community sustainability. On the result of this effort would depend the birth of properly conceived sustainable Ecocommunities, unconstrained by rigidities of utility grids and myth of the rural/urban divide.

The first three steps to give scientific support to sustainability efforts were (1) the setting up of a top grade climate station with a sunshine recorder, a bimetallic pyranograph and a clock driven anemograph, (2) Nursery to record the growth patterns of indigenous shrubs and trees, and (3) Development of renewables as dictated by the priorities of the community and availability of talents within it. This article highlights and celebrates 40 years of efforts at Auroville.

Renewable Energy

Wind pumps

The very first focus of attention was on developing and acquiring wind pumps, since power from the grid was either not available or unreliable, and open wells were the main source of water for drinking and agriculture. A sail-type wind mill was developed, which lifted about 2.5 kilolitres(kl) of water per day, given an average wind speed of 132 kph, from a depth of 10 to 15 meters. Later, with experience gained by the use of excellent multi blade rotors developed by National Aerospace Laboratory and the setting up of its own workshop, the Auroville windmill came to be developed. The Auroville wind pump lifts 50 kilo litres of water perday under the same conditions as the first. Both models are still in use at Auroville, but it is the latter that the government schemes have made available to the public. Newest model uses the-state-of-the –art load matching devices and lifts double the amount of water without increasing cost.

Solar Water Heating and Drying

The next requirement was hot water, through solar energy naturally. The earliest living huts in Auroville, built as pentagonal capsules on stilts, were made out of thatch material and had no running water. The solar water heaters made for these homes were portable and shaped like a bread box. A bucket was used to feed water into it. The solar heaters provided 60 litres of hot water in the evenings for each square metre of single-glazed collector. They were all hand built and cost U.S.\$15.00 each. Some of these are still working, though these days, natural circulation water heaters are bought from commercial manufacturers in India. Lately ETC tube collectors from China, which has revolutionized solar water heating, have taken over and Auroville is an OEM/importer and installer of these systems.

Solar drying was also needed for the community mainly for processing food, and this need was met. Free convection air drying systems were designed and fabricated on request, for various tasks such as melting of jaggery or drying spices and organic food stuffs, wood seasoning and for curing of ferro- cement components in a condensing mode.

Solar Cooking

Solar cooking was now an easy step away and the cookers made were in great demand. Box type cookers with a single mirror, to Indian Standard specifications are now manufactured for use within the community. A large system capable of delivering community meals is now operational. It has a large ferro-cement bowl with prefabricated reflector segments and a tracking boiler on a computer-controlled swinging boom. The bowl with a 15 metres diameter, has an accuracy of 15 minutes of arc. This can be improved to 3 minutes by positioning individual

mirror strips with laser alignment. This system delivers 500 kg of steam per day through heat transfer loop and works as a top up boiler to cook meals for 1,000 persons at a time. Its efficiency is 43 percent and it is the only concrete solar bowl in the world.

Solar Lighting

The problems of getting electricity in the late eighties prompted Aurovillians to go in for Solar PV lighting. The supply of power from the rural feeding grid was uncertain and distance from the grid, as well as the long wait for connection added to the odds. The decision for solar lighting was made simpler by the on-site-availability of an electronic unit, which made the charge controllers and procured CFC lamps. The prospect of having PV modules at half the price clinched the issue. Standard fittings in the Auroville lighting system used to be one 35 wp module, a 12 volts DC system with 2 CFC lamps and 2 motor cycle head lamps in bowl reflectors and a 12 volt 45 Ah deep discharge lead acid battery. At present there are some hundred houses lit by this system and many more use the hybrid system. Solar lanterns with 5 watt and 3 watt lamps have also been designed. The lighting of the Matrimandir complex, the heart of the town has been completed. The inner chamber of Matrimandir is lit during the day by optically directed sunlight from the computer controlled heliostats mounted on the roof of the building. The stand-alone 36 kW system for night time lighting has a bank of 240 batteries, each of 2 volt cells of 600 Ah, charged during the day by 484 modules of 75 wp each. High efficiency CEC lamps, with electronic ballast and metal halide flood lighting, are fed through a 15 kW inverter. Water pumped by solar cells, is used in homes for drinking, in kitchen gardens and for power through battery storage to run domestic appliances. Water for irrigation is used by high efficiency delivery systems such as drip, sprinklers and LDPE lined channels.

Solar PV Pumps

Auroville has the largest number of clustered solar PV pumps in a single cluster among the many such users in India. The common configuration here is the 960wp module directly linked to the 1hp centrifugal surface pump. The entire work of installation, including foundations, module supports, electronics and wiring is done in-house. Bulk purchases and investment allowances have made it possible for the Aurovillians to get the pumps at less than half the market price, thanks to a World Bank subsidy of 50 percent. Auroville has installed one thousand solar pumps in many states of India and won the prestigious Ashden Award for this enterprise.

Biogas

Auroville kitchens use mainly biogas for cooking, after the successful design was pioneered in the eighties. The earliest biogas systems was cow dung based

units of a floating drum linked to toilets. The drums were in fact used oil barrels, which corroded fast in the coastal climate. A three piece prefabricated floating drum system in ferro-cement was then designed to replace the old in situ models. Toilet systems were transferred to plant based aerobic bio-filtering systems, with a water recovery capability that is useful for the farming of non-edible trees. The peculiar egg shaped dome system has been achieved by constraining the width to the flat bed bullock cart used for transportation. The process of prefabrication has eliminated corrosion and ingress of vegetation, reducing the commissioning time to two days instead of fifteen days and ensured that quality is maintained under supervision.

Visitors to Auroville have gained confidence in renewables from this vibrant and living laboratory which the community is famed to be. Two video documents Auroville's experience and the city that earth needs tells amazing story of the alternative life style that is evolving here. For the wider society, the enterprises generated in Auroville hold great promise, specially those that can generate incomes in rural areas. Prominent examples are the making of prefabricated biogas plants, shutters, roofing panels and ready – to-install toilet blocks. The renewable systems are field tested, guaranteed and issued with handbooks for users. A number of renewable systems developed elsewhere in the country are also field tested at Auroville. Among these are BHEL's aerogenerators and cross flow microhydel turbines.

Ecodevelopments

- While trying to correlate discharge rates with intensity of rain fall, the autographic level meter anchored by Tim in the canyon of Forecomers was swept off by the fury of flash floods and it was a great lesson. So the work began on soil and water conservation and afforestation initially at Pitchandikulam and Forecomers.
- Johnny had already started work on organic agriculture and this also took off with greater speed. Now there is an active program on organic vegetables by Stefan.
- Work at Nursery of documenting plants and their growth by Narad was supplemented by seeds exchange and documentation of trees by Walter at Shakti and others.
- Research in mud housing by Poppo resulted in a widely acclaimed publication and now Auroville is a world leader in Compressed Earth Block through work of Satprem Maini and others.

Pointers for Eco development work in a spiritual organization

- If harmony

Search for fire proof roofing material began after a devastating fire at Tojour – Mieux workshop and this led to Ferro cement in which Udar was very interested. Auroville is the most successful promoter of this technology in India and has successfully made airtight biogas gas holders and the ribs of first concrete Solar Bowl in the world. Gas holders are even shipped to Andaman & Nicobar Islands and insured by Mother's blessings packets.

Green Buildings

With the development of stabilized mud bricks for walls and Ferro cement elements for roofing, two very low energy buildings came into being namely Visitors' Centre and Solar Kitchen, which has solar bowl integrated within. These were conceived and designed by Suhasini and Gilles with support from technology teams. They are passive buildings and have been widely acclaimed as green buildings because they use day lighting, low energy materials and employ waste recycling and rainfall harvesting.