“A great tailor cuts little” **Lao Tsu**

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On the Coromandel Coast between Chennai, the capital of Tamil Nadu, and the former French town of Pondicherry, lies Auroville - an international township experiment which was inaugurated on 28th February 1968. Over the years support for the project has come from the Government of India, UNESCO and a host of other international organisations and foundations.

Can a community of nearly 2000 inhabitants, comprising 37 nationalities, be a manifestation site for a sustainable future?
Auroville keeps confounding conventional wisdom and is indeed very much awake.
Auroville’s uniqueness lies not only in its dedication to establish ‘a living human unity’, but also in its “mission statement”, a charter composed of four themes, which forms the basis of its overall progress and development.
That document mentions that Auroville **belongs to humanity as a whole**, that there will be **unending education** and **a youth that never ages**. It speaks about taking advantage of **all discoveries from without and within** and being **a site of material and spiritual researches.**

After 37 years of countless trials and experiments with the aim of continuous searching to integrate appropriate technology into the built form, this endeavor is exemplified in numerous Auroville buildings.

Eco-House, 1977

In the mid seventies a residential building was constructed called **‘Eco-house’**. It was one of the very first attempts in India to build a climatically appropriate house which integrated solar cooking and water heating with rooftop rainfall harvesting and a biogas plant. Even a roof mounted wind generator was contemplated.

The experiment was too far ahead of its time to succeed, as the technologies had not matured then. However, it provided the first data on costs and technology integration. One clear conclusion was that for ecological and economic sustainability, group housing rather than single housing is necessary.

ECO HOUSE	TECHNOLOGIES
1975 - 1977	Rainwater harvesting with underground cistern
	Roof integrated solar water heater
Area: 140 m2	Window mounted retractable solar cooker
	Multifeed biogas plant, usable as septic tank, if required
Total Cost: Rs. 60,000.00	Three different types of experimental roofs (Hollow concrete tiles, Prefab brick jack arches, Madras terrace roof)
	Design for Ventura ventilation via inner courtyard

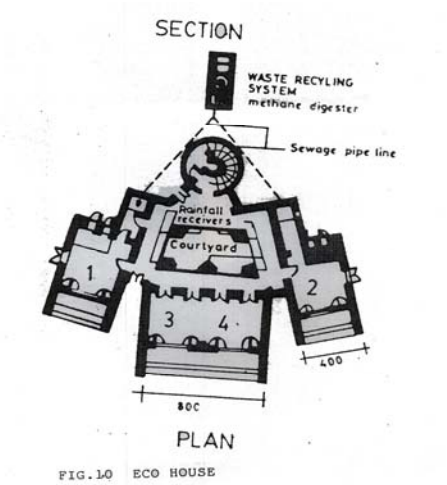

FIG.10 ECO HOUSE

Auroville Visitors Centre, 1991

The Visitors Centre is situated at one of the major entrance roads to Auroville and serves as an entry point for the numerous daily visitors. The building comprises exhibition and conference space, with a boutique and cafeteria.

The aim of the whole complex was to demonstrate the use of 'sustainable technologies', including low energy building materials, renewable energy and on site waste water recycling. Several cost-effective and alternative technologies had matured by the mid eighties. Attempts to integrate everything in a functional and pleasing environment were rewarded by the first Hassan Fathy International award handed out in 1992.

The most significant learning experience came from the manufacturing and use of 160,000 stabilized earth blocks. They were made on site with local soil mixed with 5% cement and compressed in a manual press. Cost-effectiveness was achieved by having these unfired compressed earth blocks used in combination with locally prefabricated ferrocement roof channels, sunshades, doors and water tanks. All these building technologies, machines and design procedures had been evolved in-house. An Auroville researched and manufactured wind pump was installed for pumping water, and has been functioning very satisfactorily for the last 15 years.

The unreliability of the rural electricity grid, and the existence of an electronic unit which made charge controllers and procured CFL lamps, made us decide to employ solar PV systems for electricity generation. However, there were problems with the use of "end of shelf life" submarine batteries, each cell of 2V and 20.000 Amph for a 24V-output supply. The solar PV array proved insufficient to maintain the submarine batteries because of their high self-discharge rate and a diesel back up was needed to keep the system operational. The limit of solar PV systems was thus experienced.

Further hybridization was tried with the installation of 2 prototype wind generators of 4 kW peak capacity each. The average wind speed of 3 m/s at a height of 25 meters was sufficient for the multiblade wind pump, but insufficient to keep the rotors of the wind power generators turning regularly.

A waste water treatment plant for the recycling of the guest bathroom facilities was also constructed. It is constructed on the site were the soil for the compressed earth bricks had been extracted. The sewage is collected in septic tanks constructed next to the different buildings, all waste water flows towards a distribution tank, and is directed into a vertical planted filter from where is flows into a storage tank for pumping out by a solar PV pump for irrigation of the surrounding gardens.

The building proved a useful learning process and test ground for applied technologies. It also became a catalyst for further applications of appropriate building technologies within the community and outside. The difficulties encountered with integrating renewable energy devices demonstrated that further experience had to be gained in this area.

VISITORS CENTRE	TECHNOLOGIES
1989 - 1991	Compressed earth blocks
	Ferrocement roof channels and building elements
Area: 1200 m2	Solar chimneys
	Wind pump
Total Cost: Rs. 40 lacs	Water solar PV pump
	Wind generators
	Decentralized waste water system (Dewats)

Solar Kitchen, 1997

The most recent integration attempt is demonstrated in the **'Solar Kitchen',** a community kitchen for preparing 2000 meals a day. The concept for developing a larger scale common kitchen facility started during 1994. The idea was to explore the use of solar energy as a means for cooking. Since solar energy is abundant in southern India, using steam as the heat transfer medium for preparing the meals was the obvious choice.

The innovative decision to integrate in the building a fixed spherical solar bowl concentrator of 15 meter diameter determined, to a large extent, the design and technology applications used within the building itself.

Renewable energy features

The solar bowl is positioned at the western end of the first floor. Composite granite blocks were used for the foundations. Walls in compressed earth blocks support the whole structure. A total of 96 prefabricated ferrocement elements were cast and hoisted in place to form a perfect fixed spherical bowl. Research led to the optimum size (15x15 cm) for the 11.000 hand cut flat facets with ordinary 3mm mirror glass. Each single mirror piece had to be hand placed with an accuracy of 5 to 10 arc minutes, achieved with a simple laser pointer placed at the centre of the sphere.

A tilted fixed mast supports a moving receiver which can rotate in all directions around a double-axis articulation placed at the centre of the sphere and balanced by a counterweight. A computer programme ensures the automatic tracking of the whole system with scope for seasonal changes.

The solar bowl had also to be hybridized with a conventional diesel fired boiler back-up system for cooking on an off-on basis. At present low pressure steam is used for cooking nearly 1500 meals a day.

Dewats (Decentralised waste water treatment system)

The Dewats system was started during 1998, with an Imhoff tank and a baffled tank reactor. Inaccurate flow estimates and financial constraints resulted in odour problems
Modifications started in 2002 with the changing of the Imhoff tank into a storage settler, the enlargement of the baffled tank reactor with the additional construction of two extra chambers.
The major work and upgrading consisted of adding a planted filter, implementing an innovative technique of constructing the holding structure with locally available laterite soil mixed with 1.5% bentonite (clay used for drilling bore wells). The technique proved to work and offers exciting possibilities for constructing above and underground planted filters. Major work was also undertaken with the reshaping of the open polishing pond which functions also as an infiltration place for the treated water.
The planted filter has a variety of flowers and bushes, which add to the overall appeal and beautification. The odour problem has fully disappeared with the adding of the planted filter.

Climatically appropriate design features

With the necessary reforestation on the Auroville plateau already established, a comfortable micro-climate is taking shape. Further improvements of comfort levels in a warm humid zone can be achieved by integrating solar passive systems in buildings.

The long façade of the building was oriented north - south at a 45 degree angle to the prevailing wind direction. This helped to increase indoor air velocity while giving a minimal sun load.

Adequate roof insulation, through the use of broken bricks mixed with lime and sand on top of the 10 meter free span ferrocement roof channels, is another cost effective way to reduce inside temperature and save overall energy. Within the building air circulation is increased through ventilation chimneys, which serve also as light wells. A small water body on the east side of the building, in the direct path of the wind direction, is provided for.

SOLAR KITCHEN	TECHNOLOGIES
1994-1997	Compressed earth blocks
	10 meter long ferrocement roof channels
Area: 2000 m2	Decentralized waste water system (Dewats)consisting of settling tank, baffled reactor, planted filter, polishing pond
Total Cost: Rs. 1.5 crores	Solar bowl concentrator of 15 meter diameter
	Scheffler community cooker concentrator, solar cookers, solar dryers
	Wind generators (2 of 5 kW), Solar PV System (3 kW) generating power for a cold storage room

The on-going learning curve of the Auroville experience, "taking advantage from all discoveries from without and from within", is propelled by multidisciplinary research projects which involve cooperation and creativity between Auroville residents and the scientific community at large.

A continuing commitment towards perfection in all spheres, without and within, is the hidden key to the dynamism of the Auroville experiment.

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