Olive's Place: Reflections on a Housing Project
Seven years On.

Hannah Hueneke, Alyson Wright

2004
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The report provides an evaluation of CAT Arrilhjere Housing Project seven years after completion. The primary objective of this project was to construct a house, using local Indigenous labour, that was appropriate to Australia’s arid zone.
The Centre for Appropriate Technology is a resource for Indigenous people, offering:

- Technical advice and support
- Accredited technical training
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- Research
- Community planning
- Building project management (shelters, community facilities, etc)
- Infrastructure development (power sources, water systems, airstrips, etc)
- Product design and development
- ATWORK training
- BUSHLIGHT project
- HEAVY METAL bush-hardy equipment
- BUSH TECH info sheets
- Our Place radio segments
- Our Place magazine
- Training videos
Executive Summary

In 1997, CAT participated in the Arrilhjere Housing Project on Iwupataka Land Trust land, situated to the west of Alice Springs. The Arrilhjere house project had 3 major goals:

1. To provide a low environmental impact house for the owner, Olive Peltharre Veverbrants.
2. To be the centre for an environmental learning centre for Indigenous people and others.
3. To enrich the local community by offering meaningful training and employment opportunities for local Indigenous workers.

In the terms of these goals the project has been extremely successful. The house design and technology is extremely appropriate for arid zone Australia and has worked efficiently over the past 7 years. The Centre receives many visitors each year, including many Indigenous people. Olive provides a thorough explanation of her property, explaining the importance of renewable energy, conserving water, caring for country, using resources cautiously and the lessons she has learnt over the 7 years of living at Arrilhjere. The project also used local Indigenous workers, who have since benefited from the training experience that the project offered.

However, this evaluation found that despite all the success of the project; the technology, Olive’s advocacy and showcasing skills, there are very few similar houses in other remote Indigenous communities. There are a number of complex reasons for this. Design conservatism, higher construction costs, policy barriers and availability of cheap energy supplies provide some answers as to why the development of similar houses has not occurred. In addition, this report questions why more housing are not built by local people in remote areas. It suggests the effects of fragmented and disjointed service delivery in Indigenous communities, the difficulties in achieving participatory approaches and the policy barriers all present challenges to increasing the use of local Indigenous people in service and maintenance projects.

The Arrilhjere Housing project proved the effectiveness and efficiency of solar passive design and technology, but it alone cannot be a catalyst for change. Better outcomes in housing will be achieved by understanding people’s wants, people being able to express these aspirations, government providing supportive policies for the desires and through increased understanding of living in arid zone environments. Housing on Indigenous communities is not only a human right issue or a health issue; it offers real opportunities in livelihood development, self-determination and empowerment for Indigenous people.
1.0 Introduction

Desert Australia can be a challenging place to live. It is very hot during the summer and cool at night during the winter. Seven years ago CAT participated in an ambitious housing project with a Western Arrernte woman, Olive Petharre Veverbrants, on Iwupataka Land Trust land west of Alice Springs. Every organisation can benefit from looking back on a past project and reassessing its successes and failures. A recent visit to Olive’s place was an opportunity to reflect on the achievements and challenges of the project.

This report has a number of sections. Firstly, it evaluates the technological design. Secondly, it looks at the achievements of the Arrillhjere project, including assessing the housing design and technology and also some other key elements of the project. Thirdly, it reflects on the uptake of similar projects in other remote communities. In this section, it questions why more Indigenous houses don’t follow similar designs and why local Indigenous labour isn’t used more often in service delivery. Finally, the conclusion provides a summary of the main points.

2.0 Assessing Achievements of Arrillhjere Project

There are many important lessons and ideas that have come out of the work at Olive’s place. The Arrillhjere house project had 3 major goals:

1. To provide a low environmental impact house for Olive.
2. To be the centre for an environmental learning centre for Indigenous people
3. To enrich the local community by offering meaningful training and employment opportunities for local Indigenous workers.

The house features include mud brick construction, solar energy supply, rainwater utilisation, composting toilet, correct orientation and insulation. The house was officially opened in June 1997 as a showcase example of appropriate design and local Indigenous construction that could be applied in remote communities. In those terms, it has been a real success. The house functions well and is a popular demonstration site.

**BOX 1: What is it like living in the eco-house?**

Living in the arid zone is a considerable challenge. Whilst the passive design features function extremely well (keeping the house 10 degrees cooler than the outside temperatures), Olive does experience a few days of uncomfortable warm temperatures during the peak of summer, when outside conditions soar to 45 degrees or above. A wood stove heats the living areas during winter. Electricity is supplied by solar panels on the roof, and water from rainwater tanks, once supplemented during prolonged drought by water supplied from town. Grey water supports a small garden and windbreaks around the house, and the toilet is a composting system that uses no water.

**BOX 2: What is a demonstration project?**

A demonstration project aims to trial and demonstrate the benefits of an idea or technology to encourage others adopting it. It often involves partnership between different groups with a shared aim. The Arrillhjere Demonstration Project was a partnership between an Indigenous client, an architect, CAT, Tangentyere Council, and Arrernte Council. It aimed to encourage the adoption of participatory construction processes and passive design in Indigenous housing.
2.1 Appropriate Technology: Evaluating Housing Design and Technology

Table 1 provides an overview of the technical design features of Arrilljhjere house. The points within this table are then discussed within the text.

Table 1: Evaluating the technical and design aspects of the Arrilljhjere Project

<table>
<thead>
<tr>
<th>Technology or Design</th>
<th>Evaluation</th>
<th>Olive’s Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Panels –</td>
<td>Extra power required (3.5 KW to 8.8 KW).</td>
<td>* Overcast days use limited power – not for washing or TV</td>
</tr>
<tr>
<td>8 Neste 120 W crystalline panels</td>
<td></td>
<td>* Caution – Turn off lights, fans and other electrical appliances when not being used</td>
</tr>
<tr>
<td>4x4 Volt Century lead acid batteries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C60 regulator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selectronic 2.2kW sine wave inverter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar Hot Water</td>
<td>Works well, with no additional changes</td>
<td>* 3 minute showers</td>
</tr>
<tr>
<td>Solahart 180J</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas Stove</td>
<td>Only power costs $350-400 per year LPG</td>
<td></td>
</tr>
<tr>
<td>Refrigeration –</td>
<td>Changes:</td>
<td></td>
</tr>
<tr>
<td>Eskie/Ice</td>
<td>Gas Refrigerator</td>
<td></td>
</tr>
<tr>
<td>Changes:</td>
<td>Scandiluxe Refrigerator and Freezer</td>
<td></td>
</tr>
<tr>
<td>Rainwater Tanks –</td>
<td>Works Well – only once ran out of water, had to rely on mains supply</td>
<td>* Use water conservatively</td>
</tr>
<tr>
<td>Settling tank 2 X 22,500 litre tanks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey Water Reuse</td>
<td>Provided a reliable source to native and vegetable garden.</td>
<td>* Used on gardens</td>
</tr>
<tr>
<td>Composting Toilet</td>
<td>Works well – Recommend change to chamber system, so you don’t have to get inside</td>
<td>* Only water at dusk or morning</td>
</tr>
<tr>
<td>Mud Brick House &amp; Solar Passive Design</td>
<td>Very good condition, all help to keep the house cool in summer</td>
<td>* Using windows, open top and bottom. Warm air goes out top and cool air replaces it through the bottom.</td>
</tr>
<tr>
<td>Roof Area: floor area of 135m²</td>
<td>Additional ceiling fans and pot belly stoved are used.</td>
<td>* Shuts curtains depending on sun orientation</td>
</tr>
<tr>
<td>roof area of 252m², 1.86 times the floor area</td>
<td></td>
<td></td>
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<tr>
<td>House orientation</td>
<td></td>
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<tr>
<td>Window design</td>
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<td></td>
</tr>
<tr>
<td>Insulation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.1.1 Passive design

Olive requested a house that could be built by Aboriginal people on remote communities, and that was suited to the long hot summers, freezing winter nights, and arid landscape of Central Australia. The architect, Brendan Meney, designed the home along passive design principles, which means it requires minimal or no mechanical heating or cooling. The house includes a self supporting steel framed umbrella roof to create shaded outdoor spaces and to shade the external walls of the building. The house has an enclosed floor area of 135m² and an overall roof area of 252m², 1.86 times the floor area. In addition to large veranda, other solar passive designs include house orientation, window design and insulation. There are no openings; windows or doors, on the west side of the house. The success of this passive design was recognised by the 1997 Ecologically Sustainable Building and Architectural Award.
2.1.2 Using Renewable Energy

In Olive’s own words, “I am living with the weather everyday”. She harnesses solar energy to provide the house with power (see Picture 1). A thermometer and her solar gauges, help her to make decisions on the daily operations. If it is overcast or cloudy, Olive doesn’t put the washing machine on or watch the TV because she knows she won’t have enough power to see it through the day.

Picture 1: Olive living with solar power

Solar Energy
Originally, the solar electric system consists of 8 Neste 120 W crystalline panels mounted on the north-facing roof at 24°. The system is connected to a bank of 4x4 Volt Century lead acid batteries, with a trace C60 regulator and a Selectronic 2.2kW sine wave inverter. The system produces up to 3.5 kW of power/day.
This system worked well but Olive wanted more power for her daily operations. In 2000, additional funding was sought that provided another 4 Sharp 175 W monocrystalline panels and additional 2x4 Volt Century batteries. The power obtained from this system now produces up to 8.8 kW of power/day which is plenty for Olive’s requirements. The only time she needs to be cautious is on overcast days, on these days she minimises her power usage by not putting on any washing or not watching the TV. Generally, there is more then enough power to run:

- 333 litre fridge SCANDILUXE
- 1000 litre tuckerbox freezer SCANDILUXE
- Lights: One in each room (energy efficient bulbs)
- Washing machine – front-end loader
- T.V.
- Ceiling fans
- Microwave
- Other kitchen appliances

Like many of us, Olive is also cautious not to waste power. She turns off lights, fans and other electrical appliances when they are not required. Yet, as she reminded me, she is constantly learning how best to use the system. When Olive first brought the fridge, she would turn it off when she wanted to use the microwave. However, this uses more energy to cool the fridge back down and can affect the operation of the fridge.

Solar Hot Water
The solar hot water system is a Solahart 180J system, adapted to manufacturer’s specifications to perform as a vented system so that the wood stove can be connected to provide boosting in winter. The solar hot water system is working well. Olive is cautious to only take 3 minute showers and reminds all of the guests staying with her of the rules!

Heating and Cooling the House
The house is designed around passive solar features, so that minimal heating and cooling is required. Additionally, overhead fans are used to circulate the air. Olive opens the windows in the middle. This means that warm air rising goes out the top and cool air comes in the bottom replacing it. She also shuts the curtains depending on the location of the sun.

A pot belly stove provides heating for the cold winter nights associated with desert environment. All the wood is sourced from on site. Olive also dries out citrus peel, to use as fire starters.
Power Requirements: Gas Stove
The house has minimal running costs in comparison to Australian remote area standards. The only energy purchased is bottled LPG for the stove. No monitoring of gas use has been carried out, but a review of the last gas bills showed that the running costs would be around $350-400 per year.

Refrigeration
During the first 2 years of living at Arrilhjere, Olive had no method of refrigeration, except for eskies and ice. One of the main changes to design of the house was refrigeration. Originally, a gas refrigerator was chosen because it was thought that there was not enough solar to provide refrigeration all day. The problem with the gas refrigeration occurred in the peak of summer when the gas refrigerator would stop working because of the summer heat.

A number of different refrigerators were recommended to replace the gas refrigerator. In the end Olive choose an electrical SCANDILUXE refrigerator and freezer. This was chosen on the recommendation that it uses 1/3 the power that Australian models use. The size was also important in Olive’s decision. She wanted something large enough to store the food, so she didn’t have to make so many trips into town. Olive has plenty of room in her SCANDILUXE freezer which has a capacity of 1,000 litres (see Picture 3) and her refrigerator is also approximately 330 litres.

2.1.3 Conserving Water
Olive was bought up never to waste anything. Olive’s commitment is visible from the moment you step foot on to her property. She explains that this stems from her background both as an Indigenous person and her childhood spent on remote mining fields during the Depression. This is where she learnt the lessons of conserving resources and never being wasteful. In her yard, she keeps 44 gallon drum, as a reminder of the amount of water that her family used (for washing, drinking, cooking, cleaning and bathing) on a weekly basis when she was younger (see Picture 4).
Rainwater Tanks
Olive is particularly concerned about water in desert Australia. Rainwater is collected in 2 – 22,500 litre tanks (see Picture 5), with a first flush tank as well. This supplies the entire house water usage, including cooking, showers, washing clothes, drinking water and cleaning. The house is also connected to mains water, through a tap on the outside of the house. Olive has only once run out of rainwater supply since she has been living in the house. In this case, the tanks were filled with mains supply to see her through the dry patch.

Picture 4: 220 litres used to supply Olive and her family with water in her childhood

Picture 5: Rainwater Settling and Supply Tank
Grey Water Reuse
Grey water is collected from the household use and supports a small garden and windbreaks around the house. The greywater reuse system has been operational since the building of the house and has not required any additional maintenance. The garden has mostly native species and a few citrus trees: oranges, lemons and pink grapefruit.

Composting Toilet
The composting toilet is a 2 chamber system that does not have water requirements (see Picture 6). Since Olive has been using the toilet the chambers have only required emptying once. Each chamber takes 3 years to fill up. The toilet is a batch composting toilet. This means that one chamber is used until it is full. This chamber is sealed off and allowed to compost while the second chamber is being used. Emptying the chambers involves getting inside with shovel and digging out the composted waste.

Picture 6: Composting Toilet Chambers

Olive can not do maintain the toilets on her own and must get a helper (volunteer) to assist her in emptying them. If the toilets filled up more quickly, this would be seen as a laborious task but given how infrequently this occurs it is less of a concern. One design feature that would improve the toilet is to make the chambers more user friendly, so that cleaning them doesn't involve getting inside them. The waste from the toilet is used to fertilise the garden.

2.2 Project Outcomes: Other Successes of the Project

2.2.1 Caring for Country
Olive’s place doesn’t stop at the edge of the wide shady verandahs. She has planted a garden and trees, which are watered through the grey water reuse system. These have been chosen to provide food, shade, windbreak, soil stability and dust suppression. Due to the scarcity of water, each plant is expected to perform several of these functions.
Olive garden has bush tucker langwe and quandong, as well as an olive tree, Valencia orange trees, a pink grapefruit tree, mulberry trees and grapevines (see Picture 7). She has also had pumpkins and rockmelons in the garden, which have a long shelf life. Olive encourages growing your own food in remote areas because of the difficulties in accessing store based produce in these areas.

Picture 7: Growing orange trees for shade, food, shelter and wind break

Around her house, ironwoods, river gums and other eucalypts have been planted with the help of Tangentyere Council. They provided support to fence the area and propagate the trees from the seeds collected off the property. Olive also works to remove weeds and foster self-seeding native plants by protecting with old tyres (see Picture 9). This encourages revegetation and protects the plant from cars, humans and animals trampling on it. “Whenever you see something like these ironwood seedlings coming up, you’re got to look after it. That’s looking after country”, Olive explains.

Picture 9: Revegetation work: protecting iron barks using old tyres

Waste Not Want Not
Olive’s place also aims to provide the message of re-using and reducing waste. The food scraps are not given to the dogs, are composted and added to gardens. Olive also sorts all her waste
into different bins, including tins, glass, plastic and paper (see Picture 10). She tries to reuse as much material as possible and that which is taken to landfill is compacted so to reduce the amount, i.e. she squashes the cans, tins and plastics down. Olive also has a very creative side for reusing products around her land. As mentioned before, old tyres are used protect young seedlings from being trampled. Olive uses glass bottles to make garden edges and she also makes mosaic art pieces for broken china and crockery.

Picture 10: Sorting waste: cans and plastic

2.2.2 Training and employment

The construction process was used as a training project for trainees from the Tangentyere and Anerrnte Councils, who handmade and laid thousands of mud bricks, as well as carrying out other work such as painting, welding roof trusses, and constructing floors. Many of the trainees later went on to full time work, as a direct result of the experience gained on the project. This type of construction process offers a flexible and culturally appropriate way for communities to obtain housing as well as training and employment for young people living on country.

2.2.3 Engaging with Indigenous design conservatism

The Arrillhjere house also played an important role in addressing design conservatism in Indigenous communities. Design conservatism involves a perception that non-standard (including ‘appropriate’) housing designs are sub-standard and low-status. Design conservatism has its roots in Indigenous people’s historical struggle to have their rights and status recognised. The phenomenon calls for housing designs which incorporate culturally appropriate and passive design features, but which retain a conventional appearance. The Arrillhjere house fits the bill.

2.2.4 Improving living conditions

Olive’s place is also an example of how passive design can improve living conditions for Indigenous people - not just help the environment. Passive design elements lower energy costs and provide better comfort all year round. More importantly, this is achieved without depending on power supplies, which in remote areas are often unreliable. Elements that could be incorporated into every new house, at little or no extra cost, include house orientation, roof and window design, and insulation to reduce the need for heating and cooling.
2.2.5 Responding to Indigenous aspirations

The Arrilljhere project offered a unique opportunity to fulfil the housing aspirations of an Indigenous person. Throughout, the design Olive had control over the choice of technology, housing design and project outcomes. This has been influential in sustainability and effectiveness of the technology. Olive has also been vigilant in learning as much as she can about her house and continues to introduce environmental sustainability principles throughout.

Olive’s commitment has been extremely important to success of the project and to creating a learning and education centre in arid Australia. She is passionate about the appropriateness of the house and sharing the story of the project. By visiting the Arrilljhere house, Indigenous visitors from all over Central and Northern Australia have been able to access new ideas about the potential of housing design. Visitors have come from places as far flung as the Granites, Ti Tree, Yuendumu, Weipa, Pulya, Katherine, Ulpanyali Kings Canyon, Kimirrkura, Old Mapoon, Kintore, Ceduna, Little Sisters Camp, Mt Leibig, Ernabella, Galiwinku, Elcho Island, Larapinta Valley Camp, Attijere, Hermannsburg, Kununurra, Wadeye, Derby, and Badu Island in the Torres Strait.

3.0 The Future: Indigenous Housing

At the time of implementing this design and installing the technology, much thought went into choosing sturdy and good quality components. Seven years on the appropriateness and effectiveness of this choice of technology and design can be seen through its success; the technology is still working effectively and efficiently. Only small changes have included additions to solar panels and using refrigeration. The accomplishments of the project can also be measured through Olive’s own convictions, “I wouldn’t live anywhere else. I love my country and my home. Most people, who come out here, also fall in the love with the place.”

It is important to note the effort and conviction of Olive. Olive was driven by values instilled in her as child; these included the importance of conserving resources and looking after the environment. Much effort, on Olive’s behalf, has gone into learning and maintaining her home. Olive has also sort advice from CAT when her system was not operating efficiently. Being able to rely on advice at CAT has given her assistance in choosing the alterations she has made at Arrilljhere. Olive’s commitment to understanding the technology and house design is not only important because she is living with technology everyday, but also because she acts as an interpreter of her house to the hundreds of visitors she receives to property each year. The learning point in all of this is that the appropriate housing technology is available and does work, but effort must be applied to learning and understanding the technology.

Despite the project’s success, the example of locally built, passive design, energy and water efficient has not been widely adopted on Indigenous communities or supported by policy makers. Given the success of the Arrilljhere project, any evaluation must look at why similar initiatives have not been undertaken. “Why aren’t more houses on remote communities built of passive design?” and “Why aren’t more houses built by local people?” Such questions require lengthy analysis; the section below provides a starting point.

3.1 Why aren’t more houses on remote communities built along principles of passive design and environmental sustainability?

There is no easy answer. However, many of the explanations behind low take-up of passive design are the same for remote communities as they are for the urban communities. The reasons include design conservatism, higher initial construction costs and availability of relatively cheap energy supplies to counter the effects of poor design. It should be noted that higher initial construction costs might be reduced over time as building contractors become more familiar with the ‘non-standard’ designs.
Housing in Indigenous communities is already a difficult issue, with many examples of failed policies. Therefore, policy makers may be wary of complicating the problem further by using new designs that might fail or be more expensive. Furthermore, their priorities are usually driven by need to build adequate houses within budget and timeframes constraints which can mean that residents miss out on the long term and holistic benefits that passive designs offers. As passive design and environmental sustainability becomes more widely accepted, this barrier can be expected to diminish.

3.2 Why aren’t more houses on remote communities built by local people?

3.2.1 Fragmented service delivery

The Arrillhjere project faced a common challenge to people in remote areas; the compartmentalised nature of Indigenous service delivery. By and large, service organisations are set up to address one specific issue - housing, training, health, or business. However, community needs are often complex, spanning a range of areas. It can be very difficult for a community, attempting to achieve multiple goals in different areas, to access funds or coordinate support from the different sources for one project. This CAT project drew on support from agencies including: ATSIC, Northern Territory Employment and Training Authority, Training Network NT, Aboriginal Development Unit, Community Development Employment Program, ABSTUDY, Tangentyere Council and among others.

It was a difficult and often frustrating task that exposed a lot of space for improvement in the way government agencies work together to provide more holistic, coordinated support to communities. Agencies must continue to work to better match their services to the needs of communities. Such ways could include: funding applications could be coordinated between agencies, made more straightforward and funding conditions could be made more appropriate to participatory housing projects. This isn’t to say that governments are making no progress - programs such as the IHANT Central Remote Regional Council Training and Employment Program are addressing these challenges – but emphasises the need for continued improvement.

3.2.2 Indigenous housing crisis

The urgency of need for Indigenous housing also presents a barrier to participatory approaches. Many Indigenous communities suffer from a severe housing shortage, as well as a failure of existing houses to provide adequate ‘health hardware’ facilities (Northern Territory Department of Community Development, Sport and Cultural Affairs 2004). These problems are only expected to increase as the Indigenous population grows. Understandably, policy-makers place a high priority on getting new houses on the ground as quickly and efficiently as possible. Commercial building contractors can construct a house on a remote community in around ten to twelve weeks. A participatory building process using inexperienced trainees and working in cooperation with Indigenous cultural structures could be expected to take several times longer.

3.2.3 Longer time frame of participatory construction projects

The Arrillhjere house was built over 78 weeks, comprising 52 weeks of actual on-site work and 26 weeks down time due to funding difficulties, cultural business, arid zone weather conditions, and experimental building techniques. In the context of overcrowding, a huge backlog in housing need and housing-related health problems, it is easy to understand the reluctance of housing agencies to prioritise participatory approaches. However, the potential wider long term benefits of participatory construction must be considered. It offers a real livelihoods opportunity on communities and scope for capacity-building and empowerment.
4.0 Conclusion

Housing is not about bricks (mud or otherwise) and mortar, it’s about homes for people. The Arrilljhore project offered a unique opportunity to fulfill the housing aspirations of an Indigenous person, Olive Veverbrants. The commitment, ownership, responsibility and pride she has for the house and surrounding country have been key elements in regards to the maintenance and sustainability of the house. The message in this is therefore simple; better outcomes in housing are achieved when effort is applied to understanding what homes people want to live in remote Australian communities.

Demonstration projects can be a catalyst for change in housing design and construction, but alone they are not sufficient. For passive design and local construction to be more widely adopted, governments must integrate principles of triple-bottom line sustainability: ecological, economic, and social. Furthermore, government departments and agencies must work cooperatively to enable projects with multiple goals to access funding from multiple sources. The unique value of a participatory construction project is the opportunity to work on a range of different fronts, in a way that provides direct and immediate benefits to participants, as well as longer term and conceptual gains.

Whilst the success of the Arrilljhore Demonstration House project hasn’t signalled a new wave of solar passive, participatory Indigenous housing projects, it did demonstrate some useful principles. Passive design can improve living conditions by maintaining comfortable temperatures, without air conditioning, even in the arid zone. Whilst there are significant hurdles to achieving success in participatory construction of Indigenous housing, it is an approach that offers communities significant rewards in terms of training, employment, ownership of technology, and capacity-building. We must cease thinking of housing on Indigenous communities only as a human rights issue, or a health issue, but begin to acknowledge and grasp the livelihoods and self-determination opportunities it offers Indigenous people. Olive (personal communication, January 2004) describes her satisfaction with the opportunities offered by house: “I am proud of seven years of living with stand-alone solar power and hot water, rainwater harvesting and conservation, a mud brick (adobe) house, composting toilet, grey water reuse, own refuse disposal/recycling, worm farming and food-shade trees and plants”.

Olive’s Place
Centre for Appropriate Technology