

How and where we live: Zone 0

Your home, Zone 0, is the place where you spend most of your time, money and other resources. It is important that your home contributes to your health and wellbeing and is not a drain on environmental resources or your finances.

Permaculture is not only about living things; it is also about how we live and what we use. It is about our homes and the quality and cost of the lives we carry on in them. In permaculture we aim to design new houses or to retrofit old ones so they are comfortable living places that preserve and restore the Earth's resources.

Energy supplies from oil and gas are fast diminishing. In fact, we are considered to have entered an age of energy descent for oil, and with wars and natural disasters even the reserve supplies are diminished. No one can expect that the same amount of relatively cheap energy will be available in the future unless solar energy is harnessed to run transport and industry. (At present, solar energy units have a cradle-to-grave energy cost which makes them unsustainable; however, efficiency in this technology is improving rapidly and the costs are falling.) Water supplies are even more gravely threatened.

We need to practise the precautionary principle and change our buildings, lifestyle and consumer use to live comfortably and simply with less. When the resources become very scarce, the means may not be available to make the necessary changes. Anyone who does not alter their life to live better

and simply now, while resources are still relatively cheap and available, may not be able to later because of scarcity of materials or elevated prices.

In practice this means:

- reducing inputs into homes and constantly reducing waste
- ensuring that outputs can be contained on site, are non-polluting and enhance other functions
- living and working without waste
- increasing and replacing non-renewable resources.



Our ethical task is to:

- build new homes and retrofit old ones using renewable materials, low energy and minimum pollution
- live in our homes with simplicity.



Our design aims for homes are to:

- match space and function
- admit and store the sun's energy when needed, and remove and exclude heat when not required

- be simple, honest and economic with resources
- use living processes to recycle waste.



If we don't have design aims our homes:

- will cost us excessively to build, to live in and repair
- may be polluting and bad for our health
- will use and waste non-renewable resources
- will not be easy to live in
- may prove very expensive in the future.

Live differently, live well

For thousands of years there have been cultures that have enjoyed a high quality of life without compromising the needs of present and future generations by destroying or polluting life processes. Compare this with modern Western lifestyles which are characterised by:

- excessive consumerism
- alienation from nature
- over-processing of materials
- over-consumption and dissatisfaction
- embarrassing levels of waste of all resources
- overly busy and complicated lives.

In affluent countries most homes, offices and shops can be thought of as having one or a combination of the characteristics examined in Table 11.1.

All these houses take in clean good materials and spew out air, soil, water pollution, organic-putrile and foul materials (see Figure 11.1). So how can you live differently and still live well? You can build a new house or retrofit an old one. And you can make significant changes to your lifestyle and buildings that will reduce the destructive impact that our living has on the environment. Changes in your life are normally accompanied by improvement in the quality of your life; that is, in time, health and money.

Siting a new house

The difference between comfort or misery and great expense can depend on siting your house correctly. So consider the following factors before you select your land. Look at Figure 11.2 as we discuss the important factors.

Climate

- In hot climates choose a site with cooling breezes and shade.
- In cool climates choose a site with sunny aspects and protection from cold winds.

TABLE 11.1: HOUSE CHARACTERISTICS

House type	Characterised by
Consumer junkies	These houses devour huge amounts of finite resources and then release toxic or polluted air, water, or materials into the environment. In most Western countries the appetite to fuel this pollution stream seems insatiable with consumption of energy, water and materials increasing every year. This is increasingly copied by wealthy people in poor countries.
Sick houses	These homes have problems caused by artificial chemicals or processed materials that have been used in the construction and furnishings, such as asbestos, glues. In addition there is the problem of low-level electromagnetic radiation which emanates from the large number of electric items used in homes.
Vulnerable houses	These are the houses almost or completely dependent on vital resources such as water or energy from one source only. Most people do not have another water alternative. Also, many homes are totally dependent on one energy source which could be corrupted in some way, and Earth's energy resources are running out. In many homes the only source of food is a supermarket.

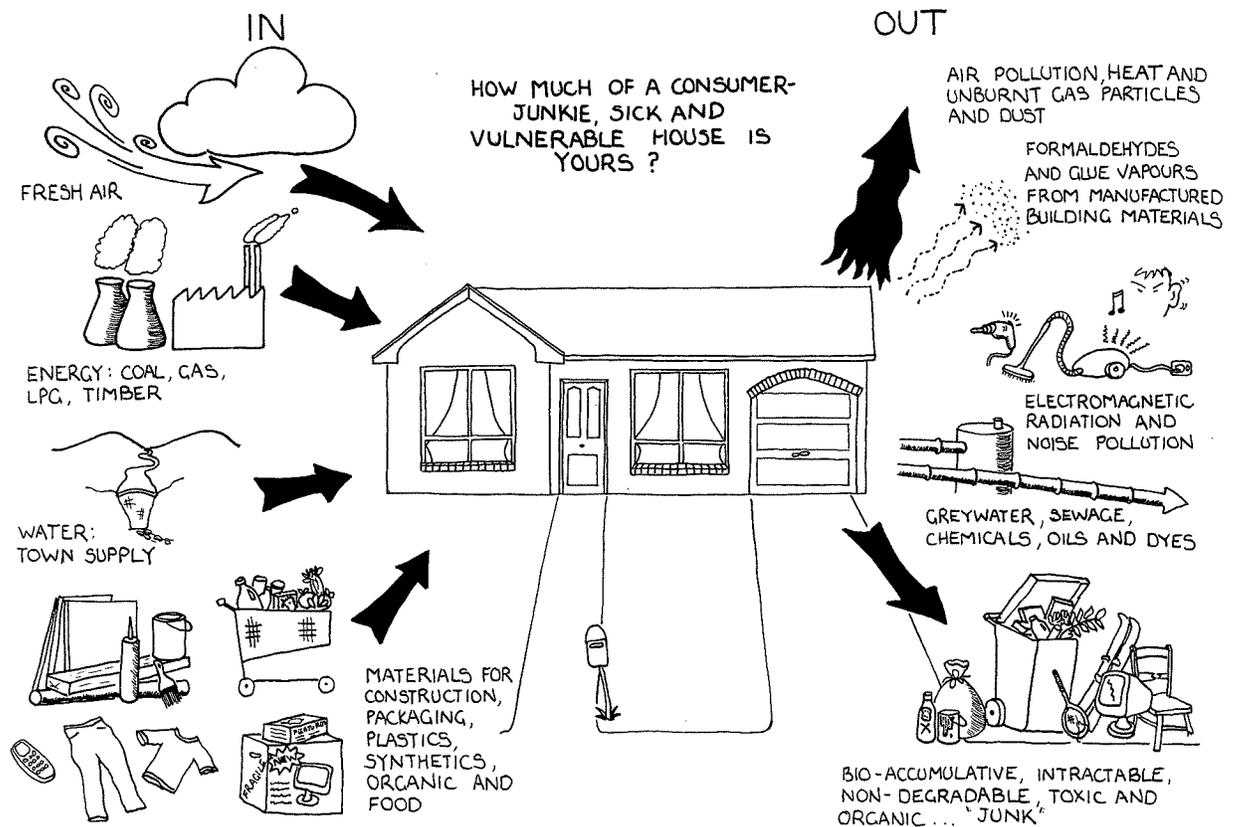


Figure 11.1 The sick, consumer-junkie house.

Topography

- You have greater control over soil and water on a site with a slope not greater than 15 degrees.
- Western slopes are often very hot and dry, and polar-facing slopes can receive freezing winds.
- Hills behind your site block severe winds and assist in capturing surface water.

Water

As you read in Chapter 4, water is a primary selection factor for land. When it's raining hard, observe where the water goes in order to decide how you could work with it or capture some for future use. Dams are expensive to build, but if you don't have other water sources, they are a priority.

In drier areas, your land potential will be determined by rainfall. As a crude guide, 80 centimetres (30 inches) can be considered minimal

to maintain a reasonable standard of living and support enterprises. However, consider rainfall distribution because 80 centimetres falling in three months also means nine months of drought. You will need to collect enough water in your rainy season for the dry months. Remember, try to live and farm within your rainfall budget and alter your storage capacity accordingly.

Practise Keyline Water Harvesting to place clean-water dams uphill and use gravity to distribute water downhill (see page 41). Grey-water and aquaculture dams are placed downhill where the water is cleaned before being released to local creeks.

Bore water, traditionally used to bolster water supplies in dry areas, is an increasingly unreliable water source. It is often saline, or alkaline, and increasingly polluted by excessive chemicals from farm run-off. Over-used and wasted in the past, bore water is likely to be metered and charged for highly in the future.

Soil

Clay soils can shrink when dry and swell when wet, causing houses to crack. However, some clay is useful if you want to use mudbricks, cob, pise or rammed earth. Very sandy or shale soils won't hold water well in dams.

Surrounding land use

Check with your local council for their environmental plans. It is not much fun to build the house of your dreams only to find that a powerhouse, major highway or chemical plant will be built next door.

Access

Access can be very expensive if the council tells you that you must build the access road. You may need to consider owning a four-wheel-drive vehicle if you wish to avoid swimming across rivers. Bridges may

also need to be replaced. Access roads built along contours act as swales and require less maintenance.

Vegetation

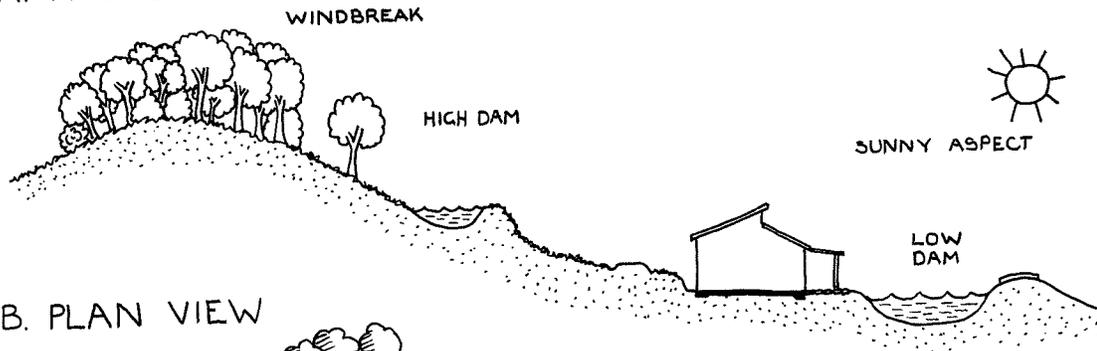
Leave all remaining native vegetation and work around it. Don't remove any vegetation until you are ready to replace it. Soils hate to be left naked.

House orientation

How you orient your house on the land is a big factor in influencing the type and quantity of inputs needed to make your house comfortable all year round. In general, in temperate areas orient the long axis east-west, with the main daily living areas sited on the sunny side so as to benefit from winter sunlight.

House orientation changes with latitude and climate. So, for example, in high latitudes (in places

A. PROFILE



B. PLAN VIEW

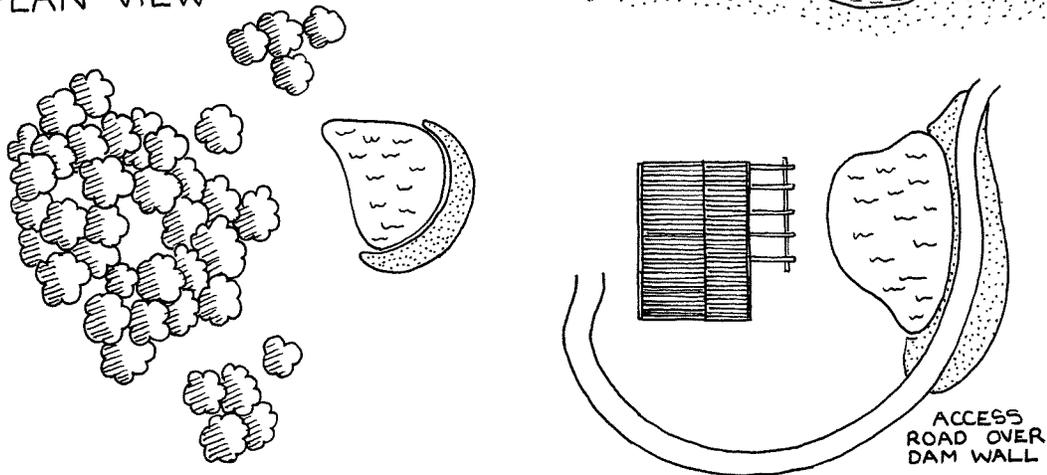
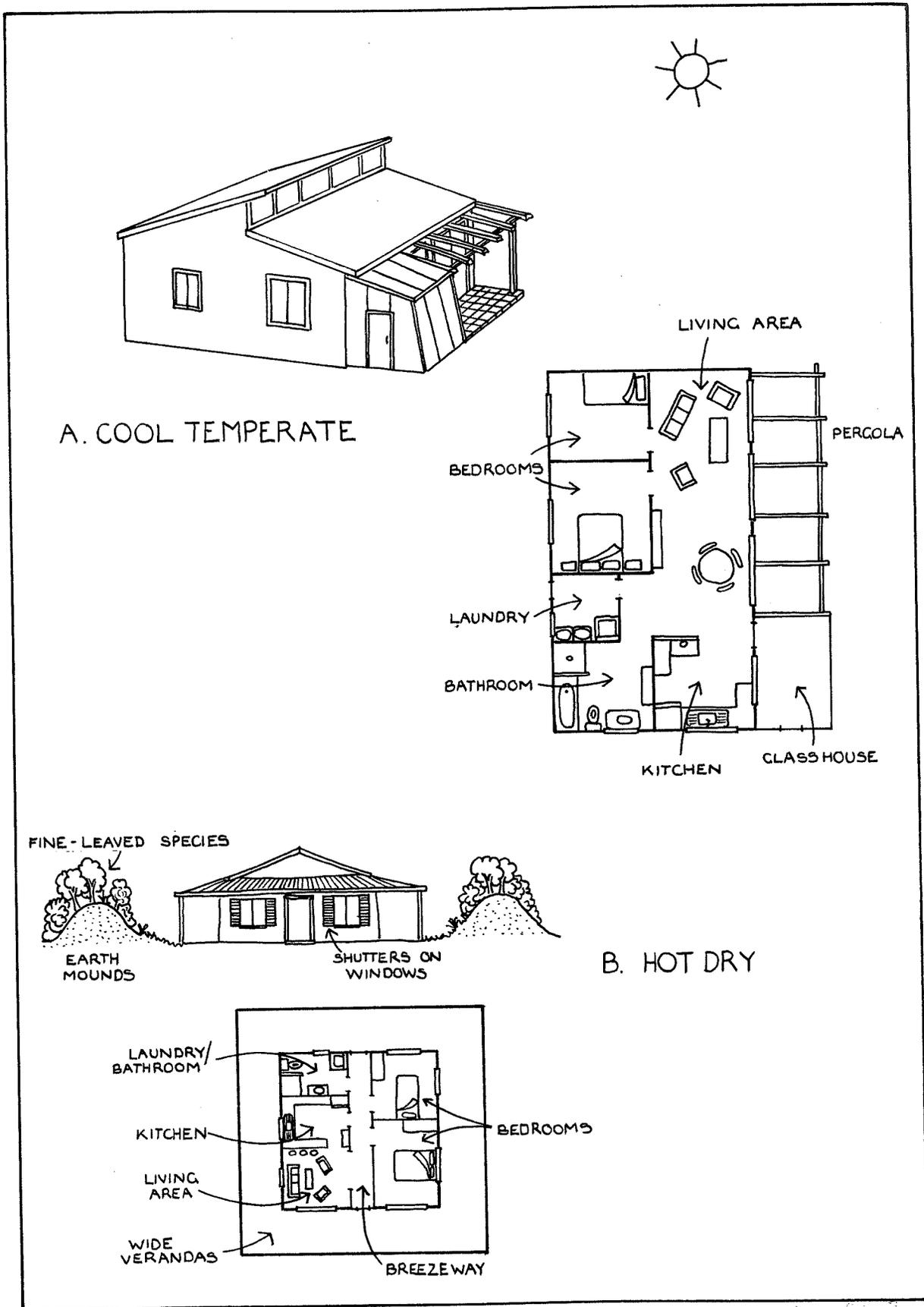


Figure 11.2 Site selection. This diagram shows the ideal profile for a site in a temperate climate. The trees on the ridge act as a windbreak and a recharge area for ground water; water can be gravity fed from the high dam to the house; the house is placed on the lower slope to receive maximum radiation; and the low dam reflects light to the house and modifies surrounding temperatures.



closer to the magnetic poles), orient buildings to receive more westerly sun. In desert areas and in lower latitudes, orient houses to minimise westerly sun. There are many books available that provide this information and an environmentally conscious architect can give you advice.

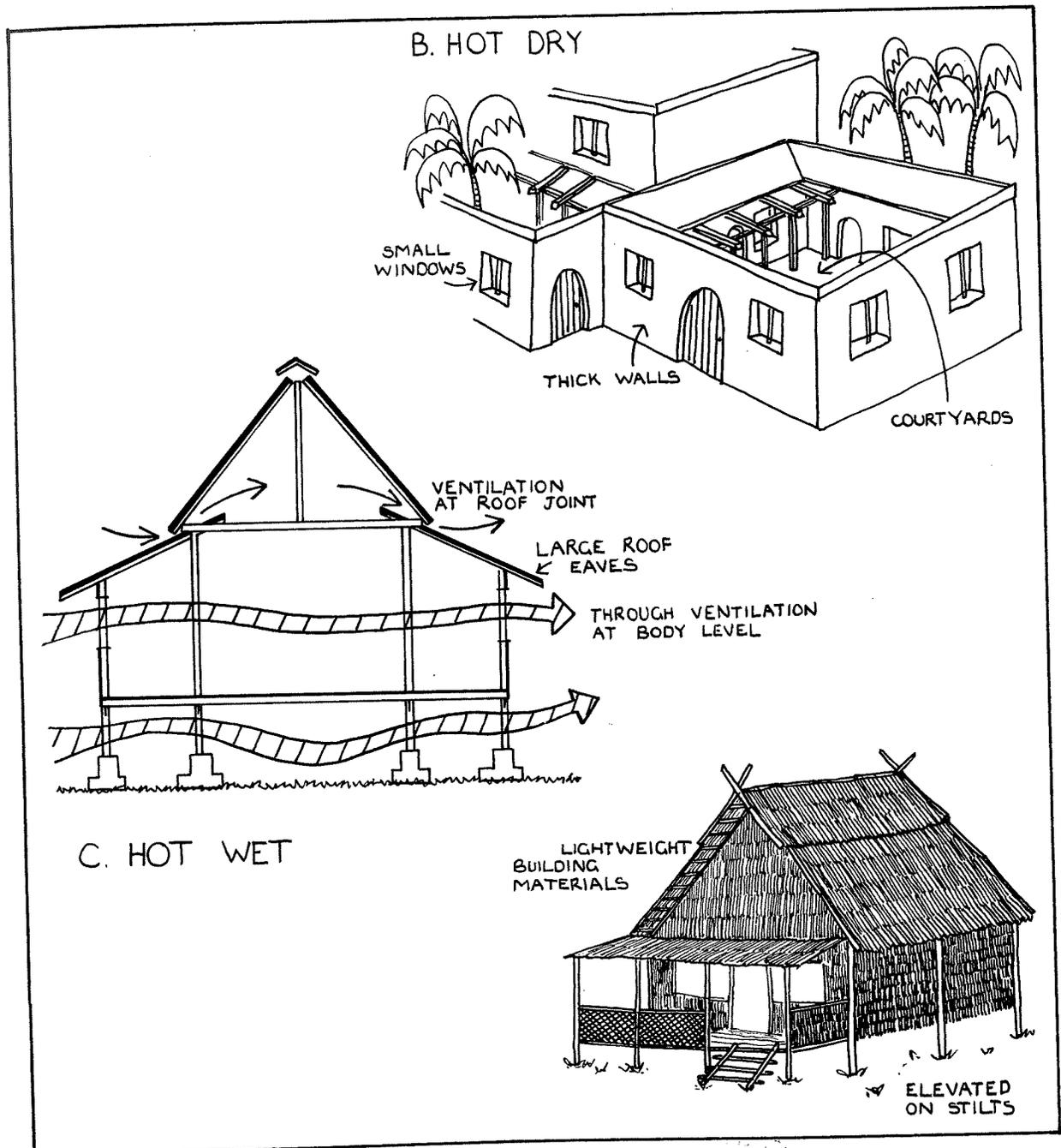
House design

Once the right site is selected for your house, there are several factors to consider in its design.

Climate

Figure 11.3 demonstrates how you can design your house layout according to the climate and your requirements.

Figure 11.3 Examples of house designs suited to different climates.



- In deserts and hot climates, buildings need wide shady verandahs with plenty of cross-ventilation.
- In cold climates, houses need exposed (sun-facing) glazing to heat and light the home.
- In hot wet climates, houses are better built on stilts to maximise evaporative breezes.

Building technology

Whether you are building a new home or retrofitting one, materials and technology in buildings can be assessed for their ecological footprint, or their cradle-to-grave cost. Materials are great consumers of non-renewable resources, so use design criteria to test them.

Water supply, storage and use

In the previous chapters we have looked at collecting, storing and cleaning surface water. It makes good sense to be self-sufficient in water. Your water audit told you how much is available, how much you use and how much you can reduce, and which savings have the greatest impact.

Your water audit also allowed you to know how much profitable surplus you have to increase yields or productivity in other areas. For example, hot water can be channelled to tanks in a glasshouse to give extra warmth to plants, then siphoned off to a washing machine and finally to the garden. Eventually you will bring it back into the house as

an apple or cabbage, and no longer pollute rivers, lakes and oceans.

Energy usage

It is important to understand how you use energy in your home in order to see where you can make changes to achieve financial and resource economy. Hot water is obviously a major consumer of energy and so is heating in cool climates. To reduce heating costs, find out where heat is lost from your home. Figure 11.4 shows how energy is lost from a warm room. First you insulate your ceiling, then seal windows, walls and floors—in this order of priority.

It is vital that you also consider your method of heating. The Department of Minerals and Energy, or the equivalent government department where you live, puts out free annual information on the cost of useful heating. Use their information to achieve the greatest possible saving of money and resources.

The best technologies make use of almost infinitely renewable energy such as hydro, solar and wind. They can be used for heating, cooling, light and other useful work. Passive solar energy, which requires people to be active in controlling sunlight, is a very efficient form of heating. Essentially, light energy is stored in thermal mass as heat, which is radiated back after sunset.

As you make changes to reduce your energy consumption, keep monitoring your energy footprint. What are you costing our Earth?

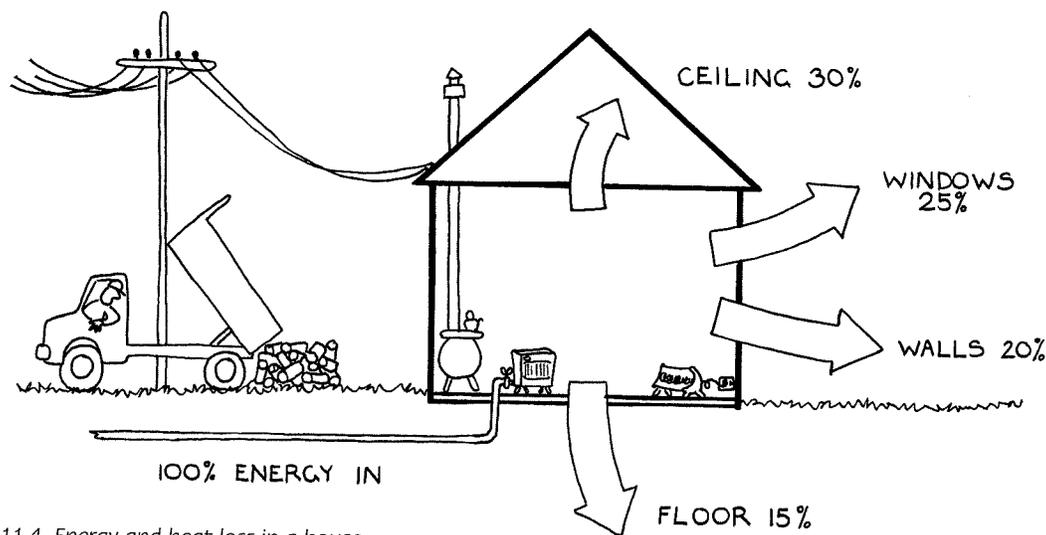


Figure 11.4 Energy and heat loss in a house.

APPLIANCE	WATTS	DAY 1 MON 12/10	DAY 2 TUE 13/10	DAY 3 WED 14/10	DAY 4 THUR 15/10	DAY 5 FRI 16/10	DAY 6 SAT 17/10	DAY 7 SUN 18/10	AVERAGE DAILY USE	WATT HOURS
REFRIGERATOR	300	6 hrs	6 hrs	6 hrs	6 hrs	6 hrs	6 hrs	6 hrs	6 hrs	1800
ELECTRIC KETTLE	1800	/// (15 mins)	/// (15 mins)	/ (5 mins)	// (10 mins)	/// (15 mins)	//// (25 mins)	//// (20 mins)	15 mins	450
STOVE/OVEN	2,400	30 mins	—	60 mins	45 mins	—	30 mins	45 mins	30 mins	1200
HOT WATER SYSTEM	4,800	1 hr	1 hr	1 hr	1 hr	1 hr	1 hr	1 hr	1 hr	4800
TELEVISION	150	—	30 mins	—	—	2 hrs	2 hrs	2.5 hrs	1 hr	150
STEREO/RADIO	100	30 mins	1 hr	30 mins	1 hr	30 mins	4 hrs	3 hrs	1½ hrs	150
VACUUM CLEANER	500	—	—	—	—	—	35 mins	—	5 mins	42
WASHING MACHINE	485	—	—	—	—	1½ hrs	—	—	13 mins	120
POWER TOOLS	SAW 310 DRILL 430	—	—	—	—	—	15 mins 5 mins	—	3 mins	37
LIGHTS										
KITCHEN FLUORO	40	1½ hrs	2 hrs	1 hr	1 hr	2¾ hrs	2 hrs	1½ hrs	1½ hrs	60
LIVING ROOM	75	2 hrs	1 hr	1 hr	2 hrs	3 hrs	2 hrs	3 hrs	2 hrs	150
BEDROOM	75	30 mins	15 mins	15 mins	30 mins	15 mins	20 mins	15 mins	20 mins	25
BATHROOM/TOILET	60	15 mins	15 mins	20 mins	10 mins	20 mins	15 mins	15 mins	15 mins	15

Figure 11.5 An energy audit example, of Rob's place.

Figure 11.5 shows how Rob did his calculations so he could see where to make economies to achieve the greatest gains. People still switch off 40-watt light globes (which is a good thing to do) believing they are saving substantial energy, whereas they would achieve greater economy and comfort by investing in insulation and their money would be returned within two years.

Storing heat

After choosing the most efficient and least polluting heating system, you want to save the heat you have generated. This can be achieved by installing insulation and draught-proofing your home.

- Insulating your *ceiling* is the best method of retaining heat and conserving energy. (The best roof insulation is a sod roof with 10 centimetres of dirt, but sod is not very practical in a suburban home.) Early insulating materials are suspected of emitting toxic gases or dangerous particles, such as

glass particles and polystyrene fibres, so choose insulating materials that are as near as possible to natural materials and, if possible, are by-products of other industries; for example, cellulose, coconut fibre and wool.

- *Floors* can be insulated with carpet and underlay or from below with ceiling insulation held in with chicken wire. Cement slabs need to be insulated 60 centimetres inwards from the outside edge.
- *Walls* are naturally insulating if made of stone, mud brick, straw bale or adobe. These materials absorb heat and radiate it back later.
- *Window edges* should be lined to prevent winter draughts. Heavy lined curtains with pelmets assist considerably with keeping the warmth in. Double glazing is most effective on south-facing (north-facing in the northern hemisphere) windows. Other places to draught-proof are doors and the edges of ceilings.

TABLE 11.2: USING GADGETS

Item	Risk	Change to
Colour TV	*	Sit more than 2 metres from screen
Black and white TV		Go to the theatre
Video	*	Play-reading at home
Microwave oven	*	Open door away from you; cook outside with family
Computer	*	Take frequent breaks
Radio		Sing or play instruments
Electric blankets	*	Preheat bed, switch off at wall; hot water bottle; flannel sheets; one dog
Hair dryer	*	Use towel or sun
Clothes dryer	**	Use the sun; air clothes
Power tools	**	Change to hand tools and get fit
Vacuum cleaner	**	Straw broom

Cooking

Cooking is expensive and air polluting. Gases can build up to unhealthy levels in tightly closed kitchens, so ventilation is a priority for most kitchens. Alternatively, outdoor cooking is pleasant and desirable. Remember that takeaway food outlets contribute substantially to air pollution compared with home cooking.

In recent years several appropriate technology centres have designed very efficient wood-heater cooking and water-heating units. Efficient wood-fired stoves are conscionable if you plant trees to replace those you burn; that is, if you design and plant a woodlot. If you are not already planting so that future generations will have the equivalent tree resources then it is time to start. Any fossil fuel is environmentally expensive with coal and coke costing more than the others.

Maximum energy efficiency is achieved by using one energy source to serve several functions. For example, I use a closed combustion stove to heat my water for washing, washing up and cooking, and of course it heats my house in winter. The incongruous part is that my electricity bills go down in winter when I use the stove and go up in summer when the stove is not alight.

Using gadgets

There is clear evidence that low-level radiation leaking from electrical items in the home is damaging to health. In particular, as with chemicals, children are most at risk because they are growing and their bodies absorb more toxins and radiation than adults. Table 11.2 is a list of risks associated with common household goods. For the sake of your health, the fewer you have the better and, in particular, those marked with an asterisk are believed to leak or be more damaging than the others. Those with two asterisks draw large amounts of electricity.

Materials

These are all the food, medicines, cosmetics, clothes, toys and packaging we bring into our homes. Before you buy them ask yourself the following questions:

- Is it biodegradable? If not would I be happy to bury it in my backyard?
- Can it be recycled when I've finished using it?
- Am I happy to eat it, drink it or have it close to my skin?
- How long will it last and what repairs will it need?
- Can I repair it, reuse it or recycle it?

If the answers are 'no', then do not buy it.

TABLE 11.3: HOUSE CHECKLIST

HOUSE PROBLEM	WHAT TO DO	FIX: WHEN AND WHO AND WHERE
Too hot in summer	Insulate ceiling Pergola and vines Deciduous trees Shady verandahs Breezeways/corridors Solar fans Cool air tunnels Deciduous creepers Shade house with plants	
Too cold in winter	Insulation Double glazing on coolest side Thermal mass in doors/walls Lined curtains and pelmets 70% glass wall on sunny side Compact house Gap sealing Glasshouse to sunny side	
Too humid (fungi, moulds)	Cross-ventilation Solar fans Exhaust fans Fix window open Let more sunlight in	
Too dry	Indoor plants Indoor ponds Duct air from glasshouse Dense planting	
Artificial light during day	Work in better-lit room Skylights Paint walls a light colour Light furnishings Replace verandah with pergola Insert wall or glass door	
Severe winds	Build mounds Plant windbreaks Insulation Trellises Suntraps	
Pollutants: Exterior Interior	Dense fine-leaf plants Change to natural materials Improve ventilation Reduce electric gadgets Cook own food Prepare own cosmetics and medicines	
Other house problems: Noise	Fences Insulation Double glazing Complain to responsible body	

HOUSE PROBLEM	WHAT TO DO	FIX: WHEN AND WHO AND WHERE
Poor work/leisure areas	Retrofit Change use of area	
Sensory deprivation (smell, sound and sight)	Put in windows and doors Skylights, pergolas Attach glasshouse	
Chemicals: Furnishings Building materials Paints	Change to natural fibres and dyes Mud brick, adobe, stone, wood Whitewash and tints	
Cleaning agents	Natural glues, waxes, sealants Pure soap Borax Methylated spirits Bicarbonate of soda Vinegar	
Machines: Photocopier Computer	Provide excellent air circulation Frequent rests	

Ideally, we would never bring home anything we can't dispose of within our own boundaries. In reality, this is difficult; for example, what do you do with old toothbrushes? I try to replace as much plastic as I can with biodegradable materials. I use glass containers, cotton carrybags, belong to a food co-op and take all my own containers. I buy nail- and toothbrushes with natural fibres. Since I found that tins are very slow to break down buried in holes in the ground I resist most tinned food and, of course, anything packaged in plastic. It means that my shopping is smaller, lighter and cheaper. I put rubbish out about three or four times a year. My medicines and cosmetics are few and simple, and my clothes are of natural fibres and can be mulched. And I like organic chocolate.

Transport

This is the worrying one because it is the really big monster resource junkie. Everyone feels their own car or motorcycle is absolutely indispensable. If your home is quite energy hungry it will cost you about 14,000 kilowatt hours per year in a cool climate. A two-car family will consume 40,000

kilowatt hours per year. However, it is very easy to make considerable savings for your health and the environment by walking, cycling, or taking a bus, train or taxi instead of your own car. It is also often more leisurely and enjoyable. Try it and see.



Try these:

1. Make a list in your journal of ways you can reduce household waste. Count how many times you put out rubbish in a month and then reduce it.
2. Design a new home for your family which is clean passive solar, and will cost almost nothing in maintenance in the future. Now furnish it.
3. Take your place, or another, and retrofit it to become a sustainable clean green home.
4. Do your own energy audit, like Rob's (see Figure 11.5).
5. Reduce your car use and start with one day a week 'car free'.
6. Use Table 11.3 to shift to a more Earth-friendly household. In the third column, mark items by your priorities and write the dates the work will be started and completed.