

South Pacific Regional Environment Programme

Training Unit F1

THE HUMAN HABITAT: BASIC NEEDS

USE OF THIS UNIT

This unit introduces the human environment or habitat, focussing on people's most basic needs for food, water and shelter which must be met whether they live in a tiny village, a town or a large city. Emphasis is placed on the problems associated with water, since this is often the most critical environmental resource in villages and towns. If possible, the points made in the text should be illustrated with local examples, which are usually not too difficult to find. Someone familiar with the local water supply could be brought in to speak on the local problems in obtaining adequate pure water and distributing to users. A local architect interested in appropriate types of housing could also be invited to discuss that subject with the group.

EXERCISES

A field trip could be arranged to see one or more local water supply systems, if possible following them from the origin of the water catchment to some of the final points of distribution. Examples of local types of housing, including traditional houses, low-cost housing, and squatter settlements could also be visited.

The participants can make a plan or drawing of where the water comes from in their own village or town, starting from the rain falling from the sky, and ending with someone drinking the water at home. Then they should note on their plan all the places where there is a chance that the water might be dirtied or polluted. Finally they should think about what might need to be done to keep the water clean.

If time permits, each participant can draw or make a plan of his or her own ideal house, and then explain to the group why it has been designed the way it is.

TEXT

THE HUMAN HABITAT: BASIC NEEDS

The place where something lives is called its habitat. The places where people live are therefore called the human habitat, and this includes the environment where they sleep and eat, and often where they work. Man does not usually live wild in nature, he makes his own environment adapted to his needs, and he therefore can control whether that is a good or bad environment. Most people live together with other people, whether as an isolated family in a rural area, in a village or tribe, or a larger town or city. A human habitat can range in size from a farm with a family of four to a city of ten million or more, but whatever its size, the fact that people are living together creates special environmental problems. Often these problems get worse as the community gets larger.

The human environment or habitat is managed differently from the natural environment, because man built it himself and can change it as he wishes. However, he still depends on natural resources to provide what he needs in that environment.

All people have certain basic needs that must be met if they are to survive or even start to have a decent life. The most important are the physical needs of the body for food, water and shelter. No matter where people live, their first priority is to meet these basic needs. In the smallest communities, the materials to meet these needs may come directly from the surrounding environment: food from nearby gardens, water from an adjacent stream or well, and wood and materials from the forest to build huts. As a community gets larger, supplying these materials can get more complicated, and it takes a larger area to meet the needs of all the people. In a large town or city, large quantities of food and water must be transported to and stored in the town, to be distributed to the inhabitants. The wastes produced by all those people can no longer be left to disappear naturally, but must be collected, removed from the town and disposed of. If these things are not done carefully, serious environmental problems and risks to human health can result.

Food

Supplying food to people who no longer produce their own because they live in a town involves a series of steps, each of which may have environmental effects. Agricultural areas must be developed on rural land to produce the food. The food may need to be processed or preserved in some way so that it can be transported and stored until needed, requiring canneries, refineries, slaughterhouses, freezers, cold stores and other food processing plants. Most of these produce wastes that must be disposed of, often creating pollution problems. The processed food is often packaged in cans, bottles, plastic or paper containers which must also be gotten rid of when the food is eaten, producing more wastes that may be difficult to dispose of. There is also usually some wastage of food that has spoiled during transport or storage.

If care is not taken in handling the food, there is always the risk that diseases may be spread with the food, or that the food will spoil and people will be food poisoned. Government inspection and quality control are usually necessary to protect the public from these dangers, but small island countries may not have the means to maintain the same standards as larger or wealthier countries.

Any country with developing towns or urban areas will find that the need for controls and regulations increases as the communities get larger. Even in small villages, the dangers from food may be present, but the solutions are usually simpler. Everyone has to be careful how they prepare and eat food to avoid creating health problems.

Water

Water is essential for drinking, preparing food, and cleaning ourselves, our dishes, our clothes and our surroundings. In a small village you may be able to walk to a natural source of water. In a town that is seldom possible, and the chances are that any water near the town will be polluted. Safe water usually has to be collected in some rural area, piped to the town, filtered or treated, and then distributed through a complicated system of pipes to the inhabitants. The more people there are, the more water is required, and good water is often the most important limit on development.

Sometimes there is just not enough water. There may be a little rain, or the land may be poor at catching and holding water. However, much of the time the problem is that the water is not clean, and then it can be as dangerous as it is useful.

According to the World Health Organization, more than 70 percent of all hospitalized people got sick from drinking bad or polluted water. In 1981, more than 86,000 people were hospitalized in the Pacific Island countries from drinking bad water. Many more suffered from skin problems, sick stomachs and diarrhoea (runny stools). Nobody knows how many island people get poisoned with things like lead, weed killers, or pesticides in the water we drink. Polluted water does not often kill people but it makes people feel tired, unhappy and sick.

Polluted water does the worst damage to little children. Babies and little children who get sick from bad water can die or can be hurt for life. Life is hard enough without getting sick. Becoming smart and strong should be every child's right, and it is up to the adults to make sure the children get good clean water to drink.

Water that makes you sick may not be a problem all the time. It is worse when there is very little water because of no rain. It is also very bad when there is too much rain. When there is not enough rain many animals like pigs and dogs use the same water as people. Sometimes they spoil the water with their wastes. Some sicknesses get into the water just by the pigs or dogs or cattle walking in it.

When there is very little water it can stand in ponds or mud holes and pollution is not washed away. It can be very dangerous to drink or wash in.

When there is too much rain, wastes from people and animals wash into the water supplies. Soil with pesticides and weed killers and trash with lead and other poisons can get into the water. Sometimes after a big storm there are dead animals in the water and if anybody drinks it they will get sick.

Just because water from some stream or well is good to drink most of the time, do not think it is always going to be good. Even when there is no big rain or drought, water which is usually good for drinking can become polluted if somebody in the village gets sick and goes into the water or puts wastes into the water. Suppose one person goes to visit somebody on another island and gets sick. When that person comes back the sickness can spread to many people if that sick person's wastes get into the water.

Many people think, "I've been drinking this water all my life so it must be alright." But sometimes people get sick and do not know they got sick from the water. And sometimes what was good water a few years ago can become worse and worse as more people use it and wash in it or if new pesticides are used or trash is put into it.

People who live in a city usually think the water from the tap is safe to drink. But sometimes even city water can get polluted, especially after heavy rains. A pipe can also break underground, letting dirt into the water. Even in places where there are systems to chlorinate the water and kill germs, the water is not always safe because sometimes the machines to do this are not taken care of or break down.

The other big problem with water is getting enough of it when there is too little rain. Wells can get polluted, become salty, or dry up entirely. Cisterns are empty. Streams stop flowing, especially if the land upstream has been developed or the forest cut or burned. Water for essential uses may have to be brought from far away. People cannot wash as much and they must live in dirty surroundings, so more of them get sick. Industries using water may have to shut down, putting people out of work.

Making water safe

If you know your water is dirty, or if people, especially children, are getting sick, it is not hard to make water safe to drink. In fact, it is very easy. Most of the problems with water can be solved if the water is boiled before people drink it.

Boiling water may seem like too much effort, and it will use fuel which may be expensive or hard to get, but it is easier to boil water than it is to be sick. It is also cheaper. Babies and children should always get boiled water if there is any doubt that the water is safe. Maybe older people can drink water without boiling it most of the time, especially if you take good care of the water supply to be sure no animals get into it and no people swim in it or use it for a toilet. If people start getting sick in the village or city, especially with diarrhoea or stomach trouble, boil the water until the sickness goes away.

Another simple thing to do to make water safe is put one teaspoon of chlorine (hypochlorite) bleach into every fifty litres of water (about 10 gallons). A steel drum would need 4 small spoonfuls of bleach. After a while the chlorine will kill any germs in the water.

Keeping water clean

Polluted water can be made safe by boiling or adding bleach, but it is much better to prevent water from getting dirty.

Look at where the water comes from in your area. If it is from a stream, do people or animals go along the stream above the water intake? If so, something should be done to keep them away from the stream.

If well water is used, the well should be covered or protected by a wall so that dirt cannot get into it. Spilled water and rainwater should drain away from the well. Never drink from or wash in the bucket used to take water from the well; always pour the water into another container first, and keep the bucket in a clean place. Do not even set the bucket on the ground where it might get dirt on its bottom. A pump is a safer way to draw water from a well. If the well is less than 100 metres from possible sources of pollution like latrines, pig pens, or the village itself, then a new well may be needed in a safer place, or the polluting activities should be moved farther away.

If you get water from a spring, put a fence around it and build a stone or cement wall at least 50 cm high around the spring with a pipe from from the wall. Only take water from the pipe.

Do children play in or near the water supply, or do you swim or wash in it? Is rubbish dumped in or near the water supply? Such activities should be separated, or moved downstream from the source of drinking water.

If you use rainwater, the roofs and gutters should be kept clean. After a long period without rain, you should let a little rainwater run off the roof and clean it before starting to fill the tank. People often forget about their water storage tanks and cisterns. They too can be polluted or get dirt on the bottom, and should be cleaned out each year during the rainy season when it is easy to fill them again. Tanks should also be covered and screened to keep out dirt, rats and mosquitos. It is better to draw water from a tank or cistern with a pump or drain tap (faucet); if you scoop water out with a bucket or can, you can easily put dirt in at the same time, especially if the bucket is set on the ground or used for other things like washing.

Water conservation

The weather can sometimes be very strange, and some years many islands may not have enough rain. Wells can be low, rivers may dry up, and water can be very hard to get. Even in normal years there is often a long dry season. So it is important to think about ways to store water and use it carefully. Water is a precious resource.

The water flow in streams and rivers depends on the land that catches the rain. If the land is covered by forest, the forest holds the rainwater like a sponge for drier periods, but if the forest has been replaced by gardens, grassland or scrub, the rain runs off faster and there is less left for the dry season. Replanting trees takes a long time, but it may help to bring water back to a dry stream. It is much easier to protect the forest in important watersheds.

People who put in holding systems or pipes or pumps should keep thinking about the need to conserve water. It seems like a good idea to put in a big tap and a big pipe so that when you turn it on lots of water comes out, but this can waste water. Suppose a pipe gets a small leak or a tap leaks a little; over a few days hundreds of litres can escape from a little leak. If there is no rain for a long time those hundreds of litres can be very hard to replace.

Check cisterns, storage tanks and pipes for leaks during the rainy season, when it is easy to repair them and fill them up again. A leak during the dry season could be a disaster. Storage tanks can lose water to the air if their tops are open. It is best to have them covered. This will also help to keep them clean.

Shelter

No one wants to live all the time outside in the hot sun, the cool nights, the wind and the rain. We therefore build shelters, houses or buildings to protect us. These can be as simple as a few leaves on some sticks, or a tall concrete and steel building, but the purpose is the same.

Each island culture has its own traditional type of house appropriate to local environmental conditions. The Samoan fale, for instance, has a high thatched roof to protect against sun and rain, but no walls so that the breezes could keep it cool. On the other hand, the Kanak case in New Caledonia has thick walls and no windows, with a fireplace inside to keep it warm on cold nights and for smoke to keep out the mosquitoes. A sturdily constructed traditional house was not only comfortable but remarkably resistant to cyclone damage. Unfortunately such houses have been criticized, not always with good reason, as being unsanitary.

More modern buildings in most islands have tended to be European houses or simple constructions in European style made of wood and corrugated sheet metal. A solid European house may provide good protection, but it is often of a style adapted to temperate conditions, and it may be hot and humid because of inadequate ventilation. The simpler constructions tend to be too hot during the day and too cold at night, and thus often much less comfortable than traditional houses of local materials. They also tend to be extremely dangerous during cyclones. An attempt in New Caledonia to build high-rise apartment towers for low-cost housing was a complete failure; no one wants to live there, and some are still empty more than 10 years after they were built.

A common problem is the failure to consider cultural factors and life-styles in housing design. It is difficult for people to change their patterns of living to adapt to new surroundings, and new types of housing tend to be more successful if they have been designed by the people themselves, or at least have taken local cultural factors into account. Many European-designed houses have several small rooms (which are cheaper and easier to heat in winter - in Europe) while most island societies require a large space in which the whole extended family can gather. A typical island family just cannot feel comfortable in such a house.

Much work still needs to be done to create new kinds of housing in appropriate materials suited to each island environment and to the modern life of island people.

QUESTIONS

Are there any problems on your island in producing food for urban areas?

What are some of the local environmental problems created by food production and distribution?

How much of your food is now imported?

Where does your local water come from?

Are there ever any signs that it may be polluted?

What can you do to make the water supply where you live safer?

Do you have problems of water shortage? Has the problem gotten worse? Why?

What are the advantages of your traditional type of house?

Do you prefer a traditional or European house? Why?

Can you think of houses you would not want to live in? What is wrong with them?

South Pacific Regional Environment Programme

Training Unit F2

HYGIENE AND SANITATION

USE OF THIS UNIT

One of the most important environmental effects of pollution is on human health. This unit describes the environmental effects of the disposal of solid and liquid wastes, and gives the principles of hygiene and sanitation necessary to identify serious health risks and to take action to avoid problems.

A review of the general principles in the text by the group should be followed by practical exercises in identifying problems of hygiene and sanitation. As a class exercise, each participant could describe from memory the situation in his own community, using the checklist provided. An exercise in the field as described below would be even more effective. A local environmental health officer could be invited to assist with this unit.

EXERCISES

The participants should visit whatever local waste disposal facilities are available, such as the rubbish dump and possibly a local waste treatment plant. If there have been any local studies of pollution, these can be used to illustrate the results of inadequate waste treatment. Coliform counts (a measure of pollution by intestinal bacteria and thus by human wastes and pathogens) can be particularly useful as pollution indicators. Counts of over 100 per 100 ml indicate water unfit for domestic use, and over 2,000 coliforms shows water that is dangerous for swimming.

The checklist can also be used in a field exercise to evaluate local environmental health hazards.

SUPPLEMENTARY MATERIALS

The environmental checklist is based on one originated by UNICEF and described in the following publication, which can provide additional material on this topic:

Rural Sanitation: Planning and Appraisal by Arnold Pacey, London, Intermediate Technology Publications Ltd., 1980.

TEXT

HYGIENE AND SANITATION

Any community produces wastes. A traditional community produces wastes that come from the local environment and that can usually be absorbed and disposed of by that environment. A more modern community imports many things which are usually thrown away locally after they are used or worn out. Often these things do not decay rapidly and thus they stay in the environment for a long time. Any time many people are living together, they also produce more human waste than the local environment can absorb. All these wastes can be a threat to human health.

In order to control the spread of diseases, everyone must learn and follow the principles of good hygiene, including personal cleanliness, safe disposal of human wastes (faeces or excreta), hygienic food preparation in clean surroundings, careful disposal of garbage, and a pure water supply. The sanitary and environmentally safe disposal of wastes is often a particular problem on small islands where the land area is limited, the coastal waters are important for fishing, and it is not easy to find any place the islanders can afford to set aside for wastes.

Solid waste disposal

The solid wastes produced in any modern community are of several kinds. There are organic wastes such as paper, kitchen garbage, and garden cuttings which will decay with time and may even enrich the soil. They may, however, be contaminated with disease organisms. There is metal in various forms, including steel and aluminum cans, old automobiles and appliances, and metals used in construction. Some like steel will slowly rust away or oxidize, while others may remain almost indefinitely. A few, like the heavy metals lead and mercury, may be poisonous if they contaminate the environment. Glass is usually in the form of bottles, which may break but not rot, and which frequently cause serious cuts and accumulate water in which mosquitoes can breed. There are now plastic wastes in many forms, including plastic bags, bottles and packaging, old ropes and nets, synthetic clothing, and many household objects.

If solid wastes are just dumped or used as fill, they can become a breeding place for flies, rats and mosquitoes. Since some of the wastes may be contaminated with poisons or diseases, it is dangerous to allow people to sort through and remove things from the dump. Four people died recently in Vanuatu after eating food found at the dump. Wastes can also be a source of significant water pollution, either in water running off from the dump site or in ground water contaminated by seepage from the wastes. If the wastes are burned, the smoke can be a significant source of local air pollution, and may contain toxic gases.

There are sophisticated techniques for destroying solid wastes like high temperature incinerators, but these are beyond the means of island countries. The most widely used disposal method is the sanitary land fill. A site should be chosen where there is no risk of contaminating important water supplies or coastal waters. The wastes are dumped, compacted, and immediately covered with a layer of dirt or other fill. The method is simple and relatively cheap; availability of fill material is sometimes the biggest constraint.

Liquid waste disposal

Water pollution, usually by liquid wastes, is the most widespread environmental problem in the Pacific Islands. Some of these wastes come from industries, but most are the result of people's use of water for washing, cleaning and in water-flush toilets. Some water pollution also results from heavy rain flooding pit toilets or latrines. Liquid wastes from areas where people live are thus usually highly contaminated with microbes including disease germs, viruses and parasites.

While the natural environment has some capacity to purify such wastes, it is quickly overloaded by the concentration of people in large villages or towns. This creates serious health risks if safe ways are not found to collect and treat these wastes.

Liquid wastes follow the drainage patterns of the land, often going into streams, swamps or ground water before finally emptying into the coastal waters. Thus each watershed in a town area may have different liquid waste problems. The amount of waste will depend on the number and concentration of people living in the watershed.

The appropriate techniques for treating human wastes depend largely on the density of the population, and to some extent on the nature of the soil and the risk of polluting water supplies. A well-designed closed or water-seal latrine may be adequate for an isolated family in a rural area. A low density community will usually require septic tanks in which the wastes are partly purified before being spread through the soil in a drain field for final treatment. Septic tanks need to be properly designed and emptied regularly; otherwise they will not do their job and cause pollution. Very few septic tanks in the Pacific are properly maintained. People usually wait until they are completely stopped up before having them emptied.

In larger towns and cities, septic tanks are no longer adequate, and liquid wastes will need to be collected in sewers for central treatment. There are many treatment methods, including oxidation ponds and various kinds of waste treatment plants. Experience has shown that the more complicated systems are difficult to maintain in the Pacific Islands, so simple treatment methods should be chosen whenever possible. The use of the output of these systems to water flower gardens or golf courses can help to complete treatment, but this is not recommended for food gardens as there is a slight risk of contaminating the food. Treated waste water can also be drained into coastal waters where the circulation is good, preferably into the ocean beyond the coral reef if one is present.

Toxic wastes

The increasing numbers of poisons and toxic chemicals being imported into the Pacific Islands is creating special problems with waste disposal. Anything brought into an island is eventually released into the environment, either when it is used or when it is finally thrown away, unless it is exported again as the most dangerous wastes should be. Some of these poisons such as pesticides are applied in small amounts over large areas, but there are always residues left in the containers, contaminated or spilled materials, and poisons that were bought and then not used.

Most people simply pour unwanted poisons down the drain, or throw them out with the rubbish, and they thus end up in the liquid or solid wastes, where they add to the risks both to people and to the environment. There have already been serious accidents with such wastes in the Pacific, and it is best to assume that any poison used in your community will eventually turn up in the wastes, and take precautions accordingly. The developed countries are discovering too late that many old rubbish dumps are time bombs of poisonous chemicals that are now starting to leak into the environment as their containers disintegrate. While there is less chemical waste in the islands, all imported materials should be looked at with care for their eventual effects when they are thrown away.

Evaluating hygiene and sanitation

The following check lists (based on ones developed by UNICEF and modified by Pacey, 1980), can be used to evaluate the state of hygiene and sanitation in a town, village or household. If the answer to any question is NO, then there is a possible health hazard which probably requires some action.

Environmental Checklist Part I: The village

(A NO answer shows a danger)

1. Do people defecate so that their waste is kept away from places where other people may walk, and where flies cannot reach it (such as by using a latrine or burying it)?
2. If children leave faeces near their homes, are they immediately removed?
3. Do people defecate far away from the source of drinking water?
4. Is the drinking water source different from the place where people and animals bathe, and women wash clothes?
5. Does the village have a protected water source, such as a protected spring, a well with a pump, or a piped water supply?
6. Do people use water from the protected source?
7. If there is a protected water source, is it conveniently placed for everybody? If there are wells, are there enough of them? If there is a piped supply, are there enough taps?
8. Is the area around the wells or the public taps dry?
9. Do people try to ensure that stagnant water is drained away, so that rain does not leave big puddles in the village?
10. Are there any waste burial pits or rubbish bins in the village?

Environmental Checklist Part II: The home and family
(A NO answer shows a danger)

1. If the household has a latrine, is it clean, and is there a cover or other means of keeping flies out?
2. Is the house clean and free from flies?
3. Does the family have clean drinking water?
4. Are there containers or cisterns for storing water, and are they covered and clean?
5. Is there a bowl and soap for washing hands?
6. Do people regularly wash hands after defecating and before eating?
7. Are the preferred materials for anal cleaning (such as paper) always available? Or if water is used, is it available near the latrine or defecation site?
8. Is there a way for young children to defecate hygienically in or near the house (such as a pot)?
9. If the household has pigs or other animals, are they confined in a pen? Is the pen clean?
10. Is there a waste pit or bin where animal droppings can be safely placed, and where children's faeces can be put?
11. Does the housewife throw rubbish into a waste pit or bin?
12. Is it possible to prepare food in a clean place, and if there is a kitchen, is it convenient for the housewife?

South Pacific Regional Environment Programme

Training Unit F3

HUMAN HABITAT PLANNING

USE OF THIS UNIT

This unit reviews a few of the general principles of urban environmental planning applicable to the villages and small towns of the Pacific Islands. It can be used to start a discussion of the particular town planning problems of whatever cities or towns are known to the participants. More detailed aspects of local environmental planning are covered in Unit G4 Planning.

EXERCISES

Many island towns have been the subject of town plans or planning studies. If copies of these can be obtained for a local urban area, they could be reviewed by the group, perhaps in conjunction with a tour of the urban area. This could be followed by a discussion of the reasons for success or failure in implementing the plan.

TEXT

HUMAN HABITAT PLANNING

Most villages or towns have developed slowly without much thought as to how they should be laid out or how they should grow. In one city, for instance, the main streets follow the cow paths that once crossed the pastures where the city was built. An unplanned community may find itself with many environmental problems and risks to the inhabitants, such as people living next to dangerous industries, neighborhoods without effective means of waste disposal, poor traffic flows, inadequate provision for schools and recreation near populated areas, etc. A little advanced planning is much cheaper and easier than trying to correct mistakes after the town has already grown up.

The following are a few of the principles of environmental planning in town areas that may be helpful in avoiding or solving the problems of growing villages and towns.

Future growth. Most towns and villages are growing, either because more children are born, or because new families are moving in from rural areas. Using either government census information or more general observations, it should be possible to make some estimate of how many new people are added to the population each year. It can also help to calculate how many can be expected to be children, young adults, or older people.

Sometimes a new development is planned, like the opening of a new industry, hotel, school or other facility that will attract more people to the community. Knowing the number of jobs to be created, the size of the average worker's family, and the number of new workers to be attracted from outside the town, the additional growth from this development can also be estimated.

From the number of new people of different ages that are expected over perhaps the next 5 years, the need for new housing areas, roads, schools, water, electricity and other facilities can be projected. It takes time to plan and construct such facilities, but it is much easier to make provision for this growth early before the land is occupied and development patterns are fixed. If the need is already pressing, meeting it will cost more and often will be less satisfactory.

Town planning. The way in which a village or town is laid out can make a big difference in whether it is an agreeable or unpleasant place to live. There is no reason why communities in the Pacific Islands need to lose a comfortable human scale and become large and impersonal like the big cities of developed countries.

Neighborhoods can be organized so that primary schools and small stores are within walking distance of the homes. Such residential areas can be planned in advance with adequate basic facilities such as roads, water, electricity and waste disposal. Industry and large-scale commercial activities should be separated from housing areas, providing that convenient transport is arranged for the workers. Any particularly noisy or dangerous activities

should also be kept away from residential neighborhoods. This can be done through zoning or through health or other regulations.

Patterns of traffic flow should be carefully thought out, and adequate street widths provided for before the area is too built up. Just thinking about how many people will have to go where at what hours will help to avoid serious mistakes. Main roads in particular should be planned to accommodate long-term growth in the town.

Beautification. There is no reason why human surroundings have to be ugly. It is not hard to take a little care in architectural styles, the choice of building materials, and the planting of trees and garden areas, but this can make a big difference in the appearance of a village or town. Works of art and sculpture and other cultural elements can be used to decorate buildings and public places, and can help people to identify with and feel pride in their own community. Parks that are readily accessible to the people both help to beautify a town and provide places for recreation. With the importance of tourism in the region, urban beautification is not a luxury, but can have a significant economic impact as part of the overall tourist image of a country.

Another important aspect of beautification is to avoid ugly or damaging activities like littering streets and public places with cans, bottles and rubbish. Such litter can also be a significant health hazard. Making available adequate rubbish bins in public places, together with public education, can help to control this problem. Can or bottle control laws that put a monetary value on containers returned for reuse or disposal can also reduce the amount of litter. Bottles can often be reused locally, while aluminium cans are generally worth exporting as scrap.

Cultural factors. There are often cultural factors which should be included in planning a community. In some island cultures the orientation or arrangement of houses and other structures in a village had traditional significance. It may be possible to keep the essential features of such arrangements in a modern village or town lay-out. It is also necessary to provide spaces for important social and cultural activities or events such as traditional ceremonies and commemorations.

The goal in planning for human communities should be to create places where people can live comfortably and go about their business with a minimum of difficulty in agreeable surroundings in harmony with their cultural values and life-style.

QUESTIONS

What do you like most about the community where you live?

What do you like least in your community?

Is it easy to get from one place to another in your community?

Are there people who do not have access to clean water, electricity, or fuel for cooking?

Are there waste disposal problems resulting from poor planning?

What do you think could be done to make your community a better place to live?

South Pacific Regional Environment Programme

Training Unit F4

DISASTER PLANNING

USE OF THIS UNIT

One time when the environment has an extreme effect on man is during a natural disaster. In this unit, the principal types of natural disasters common in the Pacific are reviewed. The ways in which careful environmental planning can reduce the effects of such disasters on the human habitat are then discussed.

The best way to introduce this topic might be to describe some natural disasters (cyclones, earthquakes, tsunamis) that have occurred locally, perhaps with the participation of eye-witnesses to the damage caused. The text could then be reviewed with those examples in mind. A final discussion could then focus on steps that could be taken locally to reduce the risk to human life and damage to property in the event of future natural disasters.

Unit D2 on Weather also touches on natural disasters.

EXERCISES

If information exists on local areas damaged during a natural disaster, a visit to some of those areas could be arranged to give the participants a first-hand view of the kinds of sites where control measures should be developed.

TEXT

DISASTER PLANNING

The natural world is subject to occasional rare extreme events which can cause great damage both to the natural environment and to man and all that he constructs. In the Pacific, these natural disasters are most often caused by the following events.

Cyclones or cyclonic storms, also known as hurricanes or typhoons, may have high winds sometimes exceeding 200 kilometres per hour and heavy rains often accompanied by very high tides and large waves in coastal areas.

Floods and droughts produced by unusually heavy rainfall or the complete lack of rainfall. Even towns in the Pacific not noted for heavy rainfall have registered amounts up to 27 centimetres of rain in 8 hours, and a metre of rain in 4 days. There have also been times on some islands when it has not rained for months.

Earthquakes are possible in many parts of the Pacific where the sea floor is geologically active. The sudden release of pressures in the earth's crust sends a shock to the surface that can make buildings collapse and cause big changes on the islands. An earthquake in Vanuatu lifted parts of some islands about 6 metres out of the water.

Tsunamis, sometimes mis-named "tidal waves", are giant waves caused by earthquakes or underwater landslides that can sweep up on exposed shorelines. If they cross the Pacific from a faraway earthquake there may be some warning of their coming, but not if they are generated nearby.

Volcanic eruptions are always a danger on islands where the volcano is still active. Rocks and ash may be shot into the sky to fall to the ground over large areas, hot lava may pour from the volcano covering everything in its path, and certain types of volcanoes can even explode.

Most of these natural disasters are sufficiently rare that people forget about them. Something that only happens every 50, 100 or 200 years or more on the average does not seem like an immediate danger. However, sooner or later they do happen somewhere. Since most of them occur without any warning, there is no chance to prepare for them at the last minute. Therefore, for most governments, disaster preparedness means planning what you will do once the disaster has occurred.

While extreme natural events cannot be prevented, there is much that can be done to keep them from becoming human disasters. Disaster planning in this sense means taking reasonable precautions based on an understanding of the environment to reduce the vulnerability of people and property to such disasters as may occur. Just as preventive medicine means increasing a person's resistance to disease and reducing their chances of getting sick, so preventive disaster planning means increasing the resistance of the human habitat to natural forces and reducing the the risk of damage.

Construction standards

Much can be done to improve construction standards for houses and buildings so that they are less apt to collapse or blow away during a natural disaster. If earthquakes are a danger, concrete and masonry buildings need to be properly reinforced. Wooden buildings with adequate cross-bracing will suffer less damage in an earthquake. In cyclone areas, buildings must be strong enough to resist the force of the wind, and roofs must be correctly tied down internally or externally to the building structure and foundations. It is often the air pressure inside a building that lifts the roof off in a cyclone. In flood prone areas, building levels should be raised above known flood levels.

A structure does not have to be modern to be resistant to disasters. Many traditional types of construction also provide good protection, particularly where structural members are tied together to provide some flexibility and to resist forces in all directions. However, even small changes in traditional techniques may make a big difference in building resistance. A poorly nailed joint may pull apart more easily than one tied with traditional rope, and wood salvaged from a packing case may not be as strong as the forest pole it replaces.

If there is not enough information available locally on correct building standards, it should not be too difficult to obtain this from countries with more experience. It may be necessary to provide for the inspection of homes and buildings to ensure that the occupants are not at risk, and to make recommendations to strengthen substandard structures.

Flood control

It is not too difficult to calculate from historical rainfall records what could be the heaviest rainfall to be expected in an area or community. From that figure and the area and shape of each watershed, it is possible to determine what volume of water will need to be drained off the area, and where it may collect. This information can be used to plan the size of drains needed for storm runoff in order to avoid flooding.

Often it is not possible or economically feasible to build drainage works big enough for the rare very heavy rains, but it is usually possible to plan for certain low-lying areas where the water can collect without great danger to lives or property. Such areas could be made into parks, playgrounds, gardens or other open spaces where temporary flooding will not do great damage.

Avoiding vulnerable areas

A careful study of the local environment can help to identify those areas that would be the most vulnerable to damage in the event of a natural disaster. The information can come from several sources. Descriptions of the damage caused in previous disasters can often indicate flood levels, wave heights, and wind directions in the case of cyclones, or unstable soils on which buildings move more in earthquakes. There may also be signs in the environment itself, such as ridges of rubble thrown up on the shore, or channels cut through islands by storm waves. Many bent coconut palms, or broken or fallen trees can suggest the extent and even the direction of wind

damage. Previous volcanic eruptions may leave scars or deposits from heavy ash falls or lava flows. Calculations using maps or based on the topography of the land and the position of protective features such as reefs or ridges could also show which areas are most exposed or most liable to flooding.

Development should be restricted in areas identified as particularly vulnerable. Housing should not be permitted in such areas if there is a risk of loss of life. Building standards should be adapted to the nature of the risk, such as better resistance to wind in areas known to be affected by cyclone winds, or construction on stilts in low-lying areas subject to flooding.

Natural environmental defences

There are many things in the natural environment that provide defences against the effects of extreme conditions. A healthy coral reef is a natural breakwater that helps to protect the shore against storm waves and tsunamis. The natural shoreline usually has rocks or beaches that also absorb the energy of breaking waves. Coasts subject to heavy storm waves often have a raised ridge or rampart of sand and rubble that shelters the land behind which is usually occupied by houses and gardens.

Plants are also an important protection against wind damage and erosion by waves and flood waters. The important strip of trees and shrubs along the shore both break the force of the wind and help to hold the soil with their roots. Mangrove forests also provide valuable coastal protection. The plants along river and stream banks slow the flow of the water and help hold the banks against erosion. Swamps and flood plains also trap flood waters and allow them to drain off more slowly. The forest or even a row of trees can protect crops and buildings against the full force of the wind.

It is essential to preserve the protective value of these defences as much as possible. Too often passes are blasted in the reef, mangroves are filled in, beaches are mined of their sand, protective rubble ramparts are leveled to make lots with a sea view, coastal and stream bank vegetation is cleared, and trees are cut without thinking about the consequences in the event of a cyclone, tsunami or flood. People are then surprised when areas are affected that had never been damaged previously.

Where natural defences have already been removed, it may be possible to restore them. Mangroves, coastal and stream bank vegetation can be replanted. Gaps in coastal ridges can be filled in. Rows of trees can be planted as windbreaks to protect fields and crops.

There is nothing new about improving defences against disasters. On one island in Tonga, rows of trees were planted long ago crossing the island in different directions so that at least some of the crops would survive in the event of a cyclone.

With careful environmental planning and a bit of common sense, extreme natural events like cyclones and earthquakes need not become human disasters.

QUESTIONS

What are **some** of the natural disasters that have occurred in your country?

Were they **made** worse because of changes people made in the environment?

Do you think your home is a safe place to be when a cyclone or earthquake happens?

What can be **done** to make houses and buildings more resistant to the effects of such **disasters**?

Can you think of places on your island where people should not build houses?

Why are **these** places dangerous?

Are there **signs** on your island of previous natural disasters?

What can be **done** to make your island a safer place to live?