

1. SUSTAINABLE DEVELOPMENT CONCEPTS

1.1. Definition and Principles of Sustainable Development

The concept of Sustainable Development

Sustainable development is a difficult concept to define; it is also continually evolving, which makes it doubly difficult to define. One of the original descriptions of sustainable development is credited to the Brundtland Commission: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987, p 43). Sustainable development is generally thought to have three components: environment, society, and economy. The well-being of these three areas is intertwined, not separate. For example, a healthy, prosperous society relies on a healthy environment to provide food and resources, safe drinking water, and clean air for its citizens. Thus, sustainability is about a future in which environmental, societal, and economic considerations are balanced in the pursuit of development and improved quality of life.

Principles of Sustainable Development

Many governments and individuals have pondered what sustainable development means beyond a simple one-sentence definition. The *Rio Declaration on Environment and Development* fleshes out the definition by listing 18 principles of sustainability.

- People are entitled to a healthy and productive life in harmony with nature.
- Development today must not undermine the development and environment needs of present and future generations.
- Nations have the sovereign right to exploit their own resources, but without causing environmental damage beyond their borders.
- Nations shall develop international laws to provide compensation for damage that activities under their control cause to areas beyond their borders.
- Nations shall use the precautionary approach to protect the environment. Where there are threats of serious or irreversible damage, scientific uncertainty shall not be used to postpone cost-effective measures to prevent environmental degradation.
- In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process, and cannot be considered in isolation from it. Eradicating poverty and reducing disparities in living standards in different parts of the world are essential to achieve sustainable development and meet the needs of the majority of people.
- Nations shall cooperate to conserve, protect and restore the health and integrity of the Earth’s ecosystem. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.
- Nations should reduce and eliminate unsustainable patterns of production and consumption, and promote appropriate demographic policies.

- Environmental issues are best handled with the participation of all concerned citizens. Nations shall facilitate and encourage public awareness and participation by making environmental information widely available.
- Nations shall enact effective environmental laws, and develop national law regarding liability for the victims of pollution and other environmental damage. Where they have authority, nations shall assess the environmental impact of proposed activities that are likely to have a significant adverse impact.
- Nations should cooperate to promote an open international economic system that will lead to economic growth and sustainable development in all countries. Environmental policies should not be used as an unjustifiable means of restricting international trade.
- The polluter should, in principle, bear the cost of pollution.
- Nations shall warn one another of natural disasters or activities that may have harmful transboundary impacts.
- Sustainable development requires better scientific understanding of the problems. Nations should share knowledge and innovative technologies to achieve the goal of sustainability.
- The full participation of women is essential to achieve sustainable development. The creativity, ideals and courage of youth and the knowledge of indigenous people are needed too. Nations should recognize and support the identity, culture and interests of indigenous people.
- Warfare is inherently destructive of sustainable development, and Nations shall respect international laws protecting the environment in times of armed conflict, and shall cooperate in their further establishment.
- Peace, development and environmental protection are interdependent and indivisible. The “Rio principles” give us parameters for envisioning locally relevant and culturally appropriate sustainable development for our own nations, regions, and communities. These principles help us to grasp the abstract concept of sustainable development and begin to implement it.

Guidelines for Sustainable Development

To identify a knowledge base that will support sustainability goals, citizens must first select goals. To help in this process, here is a list of statements, conditions, and guidelines for sustainability, which have been identified by prominent authors. Herman Daly, author of *For the Common Good: Redirecting the Economy toward Community, the Environment, and a Sustainable Future*, gives three conditions of a sustainable society:

- (1) Rates of use of renewable resources do not exceed their rates of regeneration.
- (2) Rates of use of nonrenewable resources do not exceed the rate at which sustainable renewable substitutes are developed.
- (3) Rates of pollution emission do not exceed the assimilative capacity of the environment.

Other authors consider peace, equity, and justice necessary for a sustainable society.

Donnella Meadows, author of *Limits to Growth*, outlined these general guidelines for restructuring world systems toward sustainability:

- (1) Minimize the use of nonrenewable resources.
- (2) Prevent erosion of renewable resources.
- (3) Use all resources with maximum efficiency.

- (4) Slow and eventually stop exponential growth of population and physical capital.
- (5) Monitor the condition of resources, the natural environment, and the welfare of humans.
- (6) Improve response time for environmental stress.

1.2. Sustainable Development Issues in the Pacific Region

Pacific island countries and territories are endowed with some unique natural resources and environmental attributes. The people and economies are heavily reliant on them, making sustainable use and management a high priority. According to the Pacific Island Forum Secretariat the development performance of Pacific Island Countries (PICs) over the past decade has been mixed. Modest growth and social progress have been evident for a few, but minimal progress has been made in many of the other countries and a measurable decline in key economic and social indicators has occurred in some. In most PICs development outcomes have been less than hoped for by governments, the people, and development partners. In general there is a shortfall in the capacity required to deal with an increasing diversity and complexity of emerging social, environmental and economic challenges. The smallest, most resource-poor PICs, and outer-island groups within many of these countries, have limited development options and marginal viability in the absence of significant external assistance.

Natural constraints contribute substantially to less than desired the rate of development. Small, highly dispersed land areas and populations are located a long way from major world markets. Natural resource bases are fragile and primary production options are narrow in most PICs, to an extreme degree in the atoll islands. PICs are also highly vulnerable to natural disasters, such as cyclones. These factors in turn combine with societal norms that prioritize communal sharing of resources as a safety net (risk-mitigation) strategy. The apparent end result is to substantially reduce incentives for individual entrepreneurship, labor, and wealth accumulation.

Pacific islanders are heavily reliant on fragile land and in-shore marine environments and, in most cases, a limited natural resource base. Increasing environmental challenges threaten to undermine sustainable development in the Pacific. Population growth, urbanization, and an increased demand for cash income contribute to the emergence of localized environmental and natural resource management concerns. Climate change is a significant Pacific concern of global origin. The Asian Development Bank (ADB) *Pacific Region Environmental Strategy* identifies eight critical environmental issues that challenge the ability of PICs to achieve sustainability:

- dwindling supply and quality of freshwater resources;
- degradation of the coastal and marine resources that form the ecological and economic foundation of many Pacific communities;
- depletion of forest resources and related habitat destruction, soil loss, reduced water quality, and the sedimentation of lagoon areas;
- pollution associated with rapid urbanization (e.g., ineffective waste management and contamination of scarce groundwater resources);

- increasing pressures on biodiversity, which underpins both formal and subsistence economies;
- sustainable and affordable supply of energy;
- adverse impact of climate change;
- weak environmental governance.

But the PICs also have significant development opportunities. Their natural endowments include extensive oceanic resources, including fisheries and untapped seabed minerals; fertile land and favorable climates for agricultural production; attractive sites for tourism development; and some natural resources (such as gold in Fiji and forests in the Solomon Islands). While these countries are often referred to as “small island developing states,” they could also be considered as “large ocean developing states.” In addition, widespread subsistence production along with strong social support systems has helped prevent the occurrence of absolute poverty in the PICs.

Recently Pacific Island leaders agreed that sustainable development should be one of the four goals in the *Pacific Plan*, with improved natural resource and environment management as a strategic objective. Identified actions include the development and implementation of enabling environments at the national level, principally national sustainable development strategies based decision-making processes; the development and implementation of national and regional policy on sectoral and cross sectoral issues, including fisheries, land, waste management, biodiversity conservation, energy, climate change, and disaster risk management; and facilitating access to appropriate financing for environmental initiatives including through the Global Environment Facility (GEF).

As reflected in the *Mauritius Strategy* and various regional policies and frameworks for action agreed to by the Forum Leaders, the region has acknowledged that integrated natural resource and environment management which promotes sustainable use and management requires policies, strategies, and actions underpinned by rigorous interdisciplinary analysis together with traditional knowledge. However, member countries have recognized under the Pacific Plan that because of limited human, technical and financial resources, they cannot achieve this without the assistance of development partners.

A strengthening of the national sustainable plans therefore involves embarking on a different way of thinking and a way of making decisions that reflects explicit and balanced considerations of the three pillars of sustainable development (economic, social and environment), good governance and other agreed principles.

Introduction to the Global Environment Facility (GEF)

The Global Environment Facility is a unique international entity. Its mission, governance, management and internal procedures constitute innovative responses to the spirit and mandate of the 1992 Earth Summit in Rio de Janeiro. The GEF's mission is the protection of the global environment. It was created to fulfill a particular purpose: the achievement of global environmental benefits through funding programs and projects in the following focal areas:

- biodiversity,
- climate change,
- international waters,
- land degradation, and
- persistent organic pollutants.

The GEF has been designated the financial mechanism for the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention to Combat Land Degradation (UNCLD), and the Stockholm Convention on Persistent Organic Pollutants: these Conventions provide the GEF with eligibility criteria, programme priorities and policy guidance. An important component of GEF's work is assisting participating countries in fulfilling their obligations under the conventions. The GEF project portfolio, particularly in terms of the priorities and policies of the Biodiversity and Climate Change Conventions, has followed operational strategies in each of its focal areas. For example, in biodiversity, the major objective is to develop projects in ecosystems of global significance aimed at securing biodiversity protection. In climate change, the strategy focuses on long-term mitigation measures by (a) removing the barriers to adoption of efficient renewable energy technologies and (b) reducing the cost of some of the more promising technologies that are not yet viable. In international waters, the GEF strategy promotes collaboration in resolving critical transboundary concerns.

The Implementing Agencies of the GEF are the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), and the World Bank. Governments may apply directly for funding from the regular GEF program; these GEF projects average US\$5.5 million and take several years to implement. GEF medium-sized projects (US\$1m) may be submitted by governments, non-governmental organizations (NGOs), academic institutions, national and international institutions, local communities, and private sector entities.

The GEF Small Grants Programme (GEF SGP) is a corporate programme of the GEF and is administered by the UNDP, and is currently offered in over 106 countries. While it is an integral part of the GEF Corporate Business Plan and the UNDP GEF unit, the implementation of the GEF SGP is decentralized and country driven. The SGP complements the regular and medium-sized GEF project funding by providing a window for the direct participation of NGOs, local communities, and other grassroots

organizations. The GEF SGP is rooted in the belief that global environmental problems can only be addressed adequately if local people are involved, and that with small amounts of funding (maximum US\$50,000 per project) local communities can undertake activities which will make a significant difference in their lives and their environment.

One of the funding mechanisms, established by the UNDP and World Bank, is the GEF program. In particular, to encourage and achieve Sustainable Development in the Pacific region we have the GEF/ PAS- Pacific Alliance for Sustainability initiative.

The GEF Pacific Alliance for Sustainability (GEF-PAS) has been designed to help the countries achieve their sustainable development goals while contributing to global environment benefits.

The **goal** of the Global Environment Facility Pacific Alliance for Sustainability (GEF-PAS) is to contribute to sustainable development in the Pacific Islands Region through improvements in natural resource and environmental management. In this respect the program will facilitate international financing for sustainable development, biodiversity and environmental protection, integrated water resources management and climate change responses in the Pacific.

The principal **objective** is to increase the efficiency and effectiveness of Global Environmental Facility (GEF) support to Pacific Island Countries (PICs), thereby enhancing achievement of *both* global environmental and national sustainable development goals. This will be accomplished by preparing and executing a comprehensive, regionally coordinated and nationally executed investment program for the Pacific region. It will reflect country priorities for achieving national sustainable development goals, while also delivering significant global environmental benefits in terms of conservation of biological diversity, prevention of land degradation, protection of international waters, sound management of chemicals and preventing and adapting to climate change.

The proposed Program provides the opportunity to address the main barriers preventing effective action by the PICs to safeguard their rich natural resource base. As a strategic partnership of all the GEF Agencies, the Program includes a common goal and implementation framework which will enable more efficient and effective use of GEF resources. GEF involvement will help to leverage co-financing from other donors, such as the bilateral agencies and other partners. This is necessary as the GEF contribution falls short of optimum investment levels. The Program will catalyze action to more effectively implement existing regional strategies, strengthen long term cross-focal area and cross-sectoral linkages, provide a framework for more effective stakeholder participation, and maximize the impact of the dollars invested by GEF.

1.3 Understanding the Major Environmental Threats

Endangered Biodiversity. While the PICs comprise a very small portion of the world's land area, they represent unique coastal and marine ecosystems with high species diversity and a significant degree of endemism – reportedly exceeding 80% for many islands. Their rich fisheries, forests, and other natural resources have long supported the livelihoods of human settlements and formed the basis of their economies. They are host to many endangered plants and animals. The small sizes of most of the islands also means the total world populations of many of these species are naturally very small, making them vulnerable to any disturbance. This is well illustrated by their bird population – the Pacific has 15% of the world's restricted range bird species in only 0.4% of global land area.

In contrast, the vast oceanic waters of the PICs include the Western Pacific large marine ecosystem, covering 38.5 million square kilometers. The Pacific region hosts the most extensive and diverse reefs in the world, the deepest oceanic trenches and relatively intact populations of many globally threatened species, including whales, sea turtles, dugongs and saltwater crocodiles. The mountainous islands of Melanesia support large tracts of intact rainforests that are host to unique communities of plants and animals, many of which have yet to be described scientifically. This globally significant biodiversity is critically threatened, with up to 50 percent of the region's total biodiversity at risk. Current threats are related to such factors as the over-exploitation of resources and destructive natural events. New and potential threats include those posed by living modified organisms and climate change. A recent analysis of global biodiversity hotspots indicates that the Polynesia–Micronesia hotspot is among those that can least afford additional habitat loss because of the existing fragility of ecosystems and species and also due to previous destruction. Bioprospecting is placing increasing pressure not only on the region's genetic resources, but also on the communities who view these as part of their heritage.

The ever accelerating rate of biotic invasion in the Pacific is a major element of human-induced global change. Invasive organisms, pests and diseases threaten food and agricultural systems, as well as critical terrestrial, freshwater and marine ecosystems and environmental services. Alien plant species, in particular, pose a well-confirmed and increasing danger to ecosystem integrity. After habitat destruction or modification, invasive species are responsible for more species extinctions than any other cause. Further, the rate of extinction of native species has been higher on islands than anywhere else in the world. Invasive species have also degraded native ecosystems. By way of ship ballast water, international maritime traffic has resulted in the introduction of economically debilitating species into otherwise natural ecosystems. This is the main vector for the transfer of aquatic (fresh and marine) invasive species to both the coastal and riverine waters of PICs.

Climate Change and Sea-level Rise. Many Pacific islands are extremely vulnerable to climate change and sea-level rise. This is forcing island populations to adapt and may lead to abandonment or relocation of populations. Not only are the low-lying atolls at risk. The higher islands also have coastal features and characteristics that also make them particularly vulnerable to variability and change in both climate and sea level. In addition to such significant coastal impacts, climate change will also affect the unique biodiversity, soils and water supplies of these islands. There is growing community and government concern about the need to reduce the vulnerability of the PICs and manage the risks posed by extreme events and long-term change. However, for a variety of reasons PICs find it extremely difficult to adapt to these changing conditions. Importantly, failure to adapt now to climate change can result in high social and economic costs in the near future.

Petroleum consumption is largely responsible for the greenhouse gas (GHG) emissions of PICs. These countries are currently heavily dependent on fossil fuels, with petroleum accounting for an estimated 90% of commercial energy consumption. The share of renewable energy in the power generation mix ranges from 0% in most PICs to more than 50% in a few. Petroleum import is equivalent to about 20% of the total exports of a few countries, to more than 40% in most. The transport sector utilizes almost 100% fossil fuel. Currently there are many technical, market, finance, policy, institutional and awareness barriers to renewable energy systems operating sustainably and being price competitive relative to fossil fuel-based systems. Many of the past renewable energy projects have been designed to demonstrate the adaptability of the technologies to the PIC environment and for rural development purposes. However, development of renewable energy in the PICs is now driven from two perspectives: (i) sustainable development; and (ii) sustainable environment, locally, nationally and globally. The present approach is considered more participatory and holistic, and has an improved chance of success.

Land Degradation. For most Pacific societies land resources are the basis for the majority of subsistence and commercial production activities. However, these are being affected by such pressures as high population growth rates and/or density, displacement of traditional land and resource management systems including introduced agricultural systems, land shortage and land tenure conflicts, mining, deforestation and poor development practices. The consequences include: (i) loss of vegetation and other habitats, with associated impacts on island biodiversity; (ii) extension of agriculture into marginal lands; (iii) excessive use of chemicals; (iv) overgrazing; (v) erosion of watersheds and downstream sedimentation impacts, including damage to lagoons and coral reefs; and (vi) introduction of invasive species. Many of these land degradation issues are closely related to forest exploitation on Pacific islands. While forest cover is highly variable across the Pacific, from virtually non-existent on some low islands to over 80% in Papua New Guinea, logging has been an important part of many national and community economies, especially in Melanesia.

Threatened International Waters. Healthy marine and coastal environments are fundamental to the long-term sustainability of Pacific island societies. As well as providing a basis for subsistence livelihoods they underpin commercial fisheries and tourism development, mainstays of many island economies. The Pacific is the world's most significant tuna fishing area, valued at up to \$US2 billion and supplying a third of world tuna production. The largest tuna fishery occurs in the Pacific region, with nearly 70% of the world's annual tuna harvest. Major spatial shifts in the skipjack tuna population, for example, can be linked to large zonal displacements of the warm pool that occur during El Niño-Southern Oscillation (ENSO) events. The close association between skipjack tuna catch and ENSO is evidence that climate variability profoundly affects the distribution of tuna and resulting fishing opportunities. It is unclear how future changes in climate may affect the size and location of the warm pool in the western and central Pacific, but if more El Niño-like conditions occur, as is projected, an easterly shift of the centre of tuna abundance may become more persistent.

The sustainability of the fishing industries of some countries in the Pacific depends on the increasing use, and flexibility, of bilateral and multilateral fishing agreements, coupled with international stock assessments and management plans. Other threats to coastal and marine resources result from such factors as the discharge of nutrients derived from sewage, soil erosion, and agricultural fertilizers, improper solid waste disposal, over-exploitation of fisheries, and accelerated sediment discharge, as a result of land clearance and construction, for example.

Persistent Organic Pollutants. Due to their bio-accumulative nature, persistent organic pollutants (POPs) are especially problematic for PICs, in part due to their relatively small agricultural land base and relative dependence in the primary sector. Hazardous and persistent chemicals, including those currently listed under the Stockholm Convention on Persistent Organic Pollutants, have been identified as needing special attention, as they are unable to be treated in-country. They include polychlorinated biphenyls (PCBs) which are mainly found in transformer oils, and several pesticides that are very persistent in, and toxic to, the environment. Eradication of POPs, as well as intractable pesticides, is important for both local communities and for human health and the environment, nationally and globally. There is also a need to remove all the metal casings of the transformers and other equipment that has contained PCB-contaminated oils and other toxic substances. Several PICs are also affected by POPs that represent the residual effects of nuclear testing. There are also contaminated World War 2 shipwrecks in the team cooperating?

2. Role and Function of an Environmental Ranger

2.1. Leadership Attributes

A Good Team Leader/Project Manager

Most projects need many different people to make them work. The Team Leader is a very important position. The Team Leader organizes and coordinates all the people in the team. In a Fijian village this may be in line with the traditional protocol of inherited duties, such as spokesmen (Matanivanua) who have some sort of talent for maneuvering, controlling, looking after things that have the majority consensus and support. Someone who has a duty of care that is mature enough to use common sense and learned skills to motivate people in the village. He has a good sense of direction and responsibility that can incorporate most of the existing leadership structure and make good of what's new.

A good team leader helps people gain new skills, and helps the community and other stakeholders to work together as a team.

A Good Team Leader Must Do Many Jobs:

Explain the purpose of all activities	- Explain things clearly and fully to team members/ community. - Good communication skills are vital.
Identify important issues and/or problems	- Point out issues/problems before starting. - Look out for problems as they arise.
Seek contributions and commitments from all team members	- Make the most of each team member's skills and knowledge. - Encourage respect and trust amongst the team.
Decide on what actions to Take after getting team member contributions	- Assign tasks clearly so team members know: -what the tasks are -why they are doing them, -how their tasks fits in with the work of others.
Assign jobs	- Makes sure that the job suits the person. - Makes sure that the person is able to do the job.
Monitor progress:	- Are you on schedule? - Is the team cooperating?

Review the situation

- Is the plan still working well?
- What if something goes wrong?
- Are you supporting the team and the community?
- Review the team's work at the end of each activity
- Give constructive feedback on lessons learned.
- Give direction for the future.

Team Leaders should try to avoid:

Getting too involved in the action

Feeling that you have the only answer

Ignoring social and cultural issues

Not seeing a problem from the team/community point of view

Being the technical expert

Being indecisive

Sticking to one point of view

2.2. Environmental Ranger Job Specification

The Environmental Ranger will be expected to undertake the following duties:

1. Understand the major Environmental Threats to the Pacific Region and how these will impact on local villages. (Section 1.3)
2. Understand the GEF funding mechanism and how to link the local village into GEF projects and programs. (Section 1.2)
3. Organise, Co-ordinate and deliver village conservation programs (Section 3) to raise awareness about the Environmental threats and to teach local village people how they can deal with such threats.
4. Network with NGO's and Government Departments to assist in these programs, seek sponsorship through the private sector. (Section 4)
5. Monitor, evaluate review and police the Village Environmental Conservation Program.(Section 5)
6. Implement Waste Management Programs. (Section 2.4)
7. Assist with the implementation of (NBSAP) Programs in local village Communities. (Section 4.1)

2.3. Working with Local Communities

An Environmental Awareness Program should be introduced by the Environmental ranger. What is important is that all members of the village community have meaningful and informed participation in the Environmental Awareness Program.

This can be achieved through the use of familiar demonstrations and displays using adaptable examples to carry message through. Some daily utilities can be used for easy interpretation by the community where they are comfortable.

How To work effectively with communities - A Step by Step checklist

- Find out about the community before you begin working with them. Identify the stakeholders within the community (e.g. different clans or church groups) as well as those who are external (e.g. NGO's, government departments).
- Work with the community leaders and organizations that are already established to build stronger community organizations. Work within established structures rather than create or duplicate new ones.
- Establish a team (committee/working group) and work with this team. Bring other community members together at every step of project planning and implementation.
- Listen to ideas of all community members and respect everyone's ideas.
- Share your personal skills. Train community members to manage their own projects.
- People working with a community (or with any other group of people or team) will find that trust and honesty in the relationship they develop is one of their most valuable assets.

Some Handy Hints!

- Successful enterprise development in a community needs to be built on a strong foundation. One building block is a 'healthy community'. Some features of a 'healthy community' include:
 - a sense of shared identity;
 - the presence of established processes for resolving conflicts within the community;
 - a strong leadership and established institutions;
 - a willingness from community members to voluntarily contribute time for community projects.
- Are you building an enterprise on a healthy and strong foundation, or does some community development work need to be undertaken in conjunction with enterprise development?
- Any environmental program requires a strong leader (either a strong individual or team) to lead it. No program will succeed without someone who is committed to it, who will lead and manage it, through good times and bad, and who will do so

- for reasons apart from their own personal benefit. Who will take the leadership role for your environmental program?
- It is vital that community stakeholder goals and objectives are identified at the outset.
 - Take your time and be patient. New things can take time to succeed. Work at the community's pace.

Some Do's and Don'ts!

- DO** Help the community understand and gain awareness about Environmental Conservation and how it works. Run an Environmental Awareness Programme if required.
- DO** Promote participatory planning. Involve all stakeholders in planning and decision making.
- DO** Consider what, if any, community development work needs to be undertaken to strengthen the foundations for the community's enterprise plans.
- DO NOT** Let community expectations about the benefits they might receive too high or unrealistic.
- DO NOT** Try to do everything your self. Work with the community at their pace, and take time to develop their skills and experience. Let the community drive the project.

Hands-on Exercise: Drain or Sustain?

This hands-on exercise puts participants in the middle of an easy-to-understand sustainability dilemma. A product of the Center for Geography and Environmental Education, University of Tennessee, Knoxville, Tennessee, USA.

Purpose: To introduce participants to the concept of sustainable development.

Group size: 4 to 36 participants.

Time Needed: 30 minutes.

Materials:

- A large number of small pebbles.
- Paper and pencils for keeping score.
- Extension: A chalkboard and chalk.

Directions:

1. Divide the group into communities of four.
2. Place 16 pebbles in a communal pile for each community.
3. Explain the rules of the game:

- The pebble pile represents a **valuable** renewable resource. The resource is replenished after each round of play.
 - Each community member may take freely from the resource pile each round.
 - Each community member must take at least one pebble in each round to survive.
4. One person in each community must record the number of pieces taken by each community member in each round.
 5. After each round, count how many pebbles each community has remaining in the pile, and add an equivalent number of pebbles to the pile.
 6. Play three or four rounds, pausing after each round to find out if any community members did not survive.
 7. Play one final round, then have community members share what happened in their communities:
 - In which communities did everyone survive?
 - Which community had the most pebbles in the resource pile at the end of the game?
 - Which communities are confident they will always have enough pebbles for everyone as long as the pile is renewed? How did these communities arrive at that point? What strategies were used?
 - Was there a leader in these communities? If so, why did the community listen to that person?
 - Could these communities have reached “pebble sustainability” without communication?
 8. Compare per capita pebble ownership around the room.
 - Out of the whole room, who had amassed the most pebbles? How did he or she accomplish this?
 - Did this keep others from surviving?
 - Where do we see this type of greed in the real world?
 9. Start a discussion of the following:
 - What information is necessary to know how to manage a resource sustainably (e.g., community size, resource renewal rate, environmental carrying capacity, etc.)?
 - What is needed to actually put information into practice (e.g. leadership, communication, trust, legislation, understanding of consequences, examples of failure ?)
- Extension:**
10. Propose that all communities are taking pebbles from one communal pile. Some communities are at war with one another, and some are unaware of the others.
 - Would the pebbles still need management? How would these factors affect the management of the pebbles?
 - Would these situations change how community members felt about adhering to their sustainable usage?
 - How might global pebble usage be managed? Write suggestions on the chalkboard.
 11. Now explain that this scenario represents the current state of our common resource, the atmosphere. Automobile and factory carbon dioxide emissions are heating up the atmosphere, causing the “greenhouse effect” and changing the ecology of the planet. Each pebble taken represents one “share” of carbon dioxide emissions generated by that person.
 - How do the communities that reached sustained usage feel about the “greedy” communities’ usage?

- How can the atmosphere be managed? Would the suggestions listed on the chalkboard be useful in this situation? What are other “real life” examples of shared resource issues?

Note: The pebbles represent a valuable renewable resource. In the United States, this game is often played with individually wrapped candies. The participants are told they can keep and eat the candies they have at the end of the game. Using candies or coins rather than pebbles helps participants understand the temptation and greed associated with this game and how it applies to the real world.

2.4. Implementing Waste Management Programs

GETTING STARTED

Before practical strategies for minimizing waste can be developed, you need to have some understanding of the raw material’s arrival and purpose before its disposal as waste. Auditing or roughly quantifying the materials entering the village or business operation and the manner and quantity of disposal is a good way to get an appreciation of where the priorities are and which strategies should be adopted. With a good knowledge of your types and quantities of waste then follow the waste management hierarchy:

RETHINK REDUCE REUSE RECYCLE

RETHINK

- Draw up an environmental purchasing policy. Consider whether single-serve packages and disposable goods are necessary.
- Carry out an audit of you central waste bin and identify the materials that can be avoided, reused or recycled
- Purchase good made of recycled materials in preference to virgin materials
- Adjust order quantities to prevent wastage

REDUCE

- Avoid over-packaged goods
- Purchase goods in bulk, preferably in refillable or returnable containers
- Avoid single-serving products, e.g. sugars, butters, condiments, cereals, biscuits, sweets, milk, salt, pepper, coffee/tea/drinking chocolate
- Avoid disposable items, e.g. plastic/Styrofoam/cardboard plates, cups, paper serviettes, table mats etc
- Avoid plastic cutlery and disposable utensils
- Minimise food wastage through portion control, self service, appropriate food storage
- Store food in reusable plastic containers to reduce use of plastic film
- Avoid wrapping items in plastic film
- In the office:
Photocopy on both sides of paper

Consolidate hotel business forms especially billing procedures
Use circulation slips for internal memos
Use reusable envelopes for internal mail
Use electronic mail to send information
Store information in electronic rather than paper form

REUSE

- Furniture by recovering or repairing damaged pieces
- Uniforms and aprons by repairing them – badly damaged uniforms could be repaired for use back of house or by other organizations
- Worn sheets as pillow cases or mattress covers
- Worn tablecloths as serviettes or coasters
- Unused food in the staff canteen
- Waste food for local community piggery
- Give worn towels, sheets, tablecloths, uniforms that cannot be repaired or reused to charity
- Badly damaged towels and sheets as cleaning rags and cloths
- Scrap paper as note pads/internal memos
- Coat-hangers from the laundry
- Use cloth bags for laundry and shoe shine which can be reused
- Use fabric rather than paper serviettes
- Use rechargeable batteries

RECYCLE

Recycling options in Pacific island countries are very limited by comparison with the more highly industrialized nations. Many Pacific island countries have no recycling services, several others have good recycling infrastructure only for beer and soft drink bottles. In a few countries office paper, newspaper, car batteries, motor oil and aluminum cans are recycled but these are usually restricted to large cities and may resort and hotel are too distant and with too small a volume for individual pick-ups. In these circumstances hotels and resorts in close proximity should consider cooperating and consolidating their materials to a volume large enough to be of interest to the recycling operators.

Garbage - How long does it take to break-down?

Source: Robin Aiello, consultant

A lot of people take garbage for granted - they just throw it out without a thought. However, a lot of the trash that is thrown away takes years and years to rot away.

Below is a list of how long different types of trash take to fully broken down.

TRASH	APPROX. TIME TO DECAY
Aluminum can	200-500 years
Apple Core	2 months
Cigarette butts	40 years
Cotton rag	1-5 months
Dead Animal	Less than 1 year
Diapers (biodegradable)	200 years
Fishing Line	600 years
Glass bottle	1 million years
Milk cartons	5 years
Orange peel	6 months
Painted wood	13 years
Paper	1-5 months
Paper Towel	2 - 4 weeks
Parking ticket	2-4 weeks
Plastic bag	10 - 100 years
Plastic bottle	50 - 80 years
Plastic 6-pack rings	500 years
Plywood	1-3 years
Rope	3 - 24 months
Sand shoes	75 years
Styrofoam cup	500 years
Tin can	50 - 100 years
Woolen Sock	1 year

3. DEVELOPING A VILLAGE CONSERVATION PROGRAM

Many local village communities are already suffering from the effects of poor environmental management techniques and lack of good conservation practices. The major environmental threats outlined in Section 1 of this Manual will also impact on their quality of life today and well into the future. It therefore makes sense to begin to establish some environmental management guidelines and to develop Village Conservation Programs. Such programs should target the following three key challenges:

- Minimising Energy Use
- Minimising Water Use
- Developing Better Waste Management Techniques

The following guidelines, outlining the main issues and actions that can be undertaken, are recommended as teaching modules that could be utilized by Village Environmental Rangers to implement a Village Conservation Program. They are just as relevant for day to day village living as well as for the operation of local shops and businesses. Section 3.4 concentrates more specifically on environmental management guidelines for village based accommodation operators as this is a growing trend as community based ecotourism businesses are expanding as income generating, employment creation and poverty alleviation projects.

3.1. MINIMISING ENERGY USE

ISSUE: FUEL EFFICIENCY IN LAND TRANSPORT

Actions:

- **Encourage people to use fuel-efficient transport options** like car pooling, using public transport and/or riding bicycles.
- **Drive for fuel-efficiency.** Driver training courses can help improve fuel efficiency and safety. Driving at 80 km/h instead of 100km/h on the open road consumes 20 per cent less fuel for most vehicles.
- **Maintain optimum vehicle performance.** Regular servicing saves fuel. Fuel efficiency can be maintained by keeping an engine in tune, wheels aligned, tyres properly inflated etc. Monitoring fuel consumption helps identify when a vehicle needs tuning. When servicing, ensure that used oil is recycled. Reduce fuel consumption by keeping tyre pressures at the recommended levels.
- **Setup and operate vehicles for fuel-efficiency.** Air resistance caused by pack racks and large trailers can increase fuel consumption by 10 per cent or more. A normal car engine consumes more than 1.5 litres of petrol per hour of idling. Larger engines consume much more. Switch engines off instead of leaving them idling. Total weight makes a difference. An extra 50 kilograms can add 2 percent to fuel consumption in urban conditions or off-road work.

- **Minimise the environmental impact of used tyres.** Using retreaded tyres where possible gets the most out of each tyre carcass. Tyres which are too worn for road use may still be suitable for on-site use trailers or other vehicles. Many tyre retailers will take old tyres for recycling. These tyres are recycled into useful products such as rubber matting, soaker hoses etc. Never burn old tyres as they are a toxic air pollutant.

ISSUE: FUEL EFFICIENCY IN WATER TRANSPORT

Actions:

- **Select fuel-efficient water transport.** Sailing is much more fuel-efficient than motorized water travel. Use sailboats in preference to motorboats, when feasible. Standard fuel consumption data for boats are not available because of the variety of hull/fitout/engine combinations. Record fuel consumption data and swap information with fellow operators to identify fuel-efficient options. Diesel engines are more fuel-efficient than petrol ones, and diesel fuel has a lower fire risk. Four stroke engines are generally quieter and more fuel-efficient than conventional two-stroke engines.
- **Operate boats more efficiently.** Fuel consumption of most boats increases dramatically at high speed. Reduce speed by a few kilometers per hour and save fuel. Ensure engines and drives are properly maintained, and that hulls are kept clean to minimise drag. Leaving an engine idling for long periods wastes fuel. Switch it off. Minimise and eliminate oils leaks from motors and drives by good inspection and maintenance practices.
- **Avoid dumping sewage.** More harbours are providing sewage pump-out facilities for boats, to reduce the dumping of nutrient-rich wastes in often-sensitive marine environments. Use facilities if they exist, and seek their provision if they do not.

ISSUE: MINIMISE ENERGY SUPPLY

Actions:

- **Minimise supply needs.** The key to minimizing supply need is to select energy-efficient equipment in the first place and use it efficiently. Interrogate the retailers more thoroughly and read the appliance labels more carefully.
- **Maximise the efficiency of energy supply.** Producing electricity by burning fuels is less efficient than burning fuels at the place where heat is needed, as in gas cooking and solid fuel heating. By using energy sources other than electricity for heating, hot water and cooking, the cost of electricity connection and wiring may be reduced.

- **Investigate non-grid electricity supply options.** Non-grid energy supply options include renewable energy sources such as photovoltaic cells, wind and micro-hydroelectricity, and non-renewable diesel or petrol generators. The quietness and environmental benefits of renewable energy sources make them preferable to fossil fuel-fired generators. Generator capacity should be carefully matched to the electrical load. For small, variable loads, batteries can be charged by a generator which doesn't have to run when loads are very low.
- **Choosing energy options on tour.** For lighting, fluorescent lamps powered by rechargeable batteries are most efficient, and mantle-type LPG or kerosene lamps are next best. Rechargeable batteries charged by vehicle alternators and/or renewable energy sources such as photovoltaic cells can provide energy for lighting and refrigeration. If wood is used for energy, care should be taken to determine that its source is ecologically sustainable. It is desirable to establish a fuelwood lot to satisfy long-term wood requirements.
- **Choosing dry cell batteries.;** For a small number of low-power portable items (such as calculators and radios) non-battery options using built-in solar panels are available. Despite using hazardous cadmium, rechargeable NiCad batteries are assessed as being environmentally-preferable to single-use batteries as they can be re-used many hundreds of times. Mercury-free, single-use dry cell batteries (including alkaline cells) can be disposed of, however, for each recyclable NiCad battery, a bucketful of single-use batteries may be used.

ISSUE: DEVELOP ENERGY EFFICIENT BUILDINGS

Actions:

- **Limit heat flows through ceilings and walls.** Insulation reduces the heat flow through walls and ceilings by up to 90 per cent. Installation of reflective foil is recommended in sunny areas or climates with cold, clear nights, as it improves comfort and acts as a vapour barrier. Reflective foil requires airspace next to the shiny surface to act as an insulator. Ensure that foil is not sandwiched between the ceiling lining and the roofing, as this negates its insulating properties. In hot humid climates or cold climates, a vapour barrier will minimise the risk of condensation in the insulation and possible damage to the building structure. Light-coloured, well-ventilated roofs are cooler than dark ones. Shading roofs and walls reduces heat gain. Trees, verandahs and pergolas can also be attractive.
- **Limit heat flows through windows.** Heat is lost through single-glazed windows ten times faster than through insulated walls. Double glazing or a tight-fitting curtain almost halves this loss; double glazing with 'lo-E' glass cuts heat loss by about 70 per cent. Curtains and blinds are most effective when they seal tightly around the window. Fitting a pelmet can double the effectiveness of a curtain. In

direct sun, a square metre of window allows in as much heat as that emitted by a single bar radiator. It is therefore important to shade windows from direct sun in hot weather. This cuts heat gain by 80 per cent. North-facing windows can collect large amounts solar energy in winter. However, windows that are too large can lead to summer overheating and large heat losses during winter nights.

- **Control ventilation and draughts.** Where heating or air conditioning is used, limit air leakage into a building and avoid running exhaust fans for long periods, as excess outside air increases energy consumption for heating and cooling. Controllable cross-ventilation, aided by ceiling fans and windows and louvers that seal tightly when closed, can avoid or limit the need for artificial cooling. The climate of an area must be understood before constructing a building so windows can be located to take advantage of breezes.
- **Designing for energy efficiency.** The size and shape of a building, and the sizes and zoning of areas within it, influence total energy consumption. Using rules of thumb to design for energy efficiency can be misleading. Heat flow calculations and computer analysis should be used to identify major areas of heat gain and loss. Building design contracts should provide calculations for energy consumption and estimates of capital and running costs for a range of design options. Intelligent application of energy-efficient design principles can often achieve large ongoing savings at little or no extra capital cost when savings in the cost of heating and cooling equipment are considered.
- **Select energy-efficient heating and cooling equipment.** Timer controls and thermostats are important components of heating and cooling equipment. Each zone of a building should be controlled separately. When a building has a number of spaces used at different times which are to be heated and/or cooled, use separate equipment in each area or ensure that a single heating/cooling system can be zoned and that distribution losses (including heat gains/loses through ducting and pipes, etc) are low under the full range of likely operating conditions. The most efficient equipment possible should be used to minimize ongoing operating costs and energy use. Energy labels rate the energy efficiency of domestic gas heaters and electric reverse-cycle air conditioners. For cooling in dry climates, evaporative cooling is far more energy efficient than refrigerative cooling, unless the building being cooled is designed and constructed to be very energy efficient. Running a ceiling fan when air conditioning is operating will save energy, as the fan provides comfort at a higher thermostat setting.
- **Select an environmentally-preferable fuel.** Solar powered or passive solar is the most environmentally preferred source followed by wood (from sustainable sources and used in an efficient, low-emission wood heater). High efficiency gas/LPG or electric heat pumps come third.
- **Operate heating and cooling for efficiency.** When an area is unoccupied, heating and cooling should be switched off (or, in extreme climates, set to a minimum

level). The use of key tag switches in accommodation units ensures that heating and cooling are used only when the unit is occupied. Filters (if fitted) can restrict airflow and reduce efficiency if they are not cleaned regularly.

ISSUE: HEATING WATER MORE EFFICIENTLY

Actions:

- **Encourage conservation of hot water.** Supplying hot water generates around one-fifth of total greenhouse gas emissions from the services sector and can generate half of the greenhouse gas emissions from accommodation services. Hints for conserving hot water can be provided, such as:
 - fill electric jug from cold tap; and
 - don't rinse dishes under running hot water.
- **Prevent hot water leaks and drips.** Enormous amounts of hot water can be wasted owing to leaky tap washers. Check for drips regularly. Pressure temperature relief valves on hot water services can dump many litres of hot water per day. A way to check for leaks is to connect a hose to the hot water pipe from the pressure-temperature valve and put it in a 4 litre container. If the container overflows in a day it indicates that a lot of hot water has been used or the valve should be replaced.
- **Selecting a hot water service.** Heating of water with solar energy (and gas/LPG boosting rather than electricity) is preferred on environmental grounds, followed by heating with wood (from sustainable sources), with gas/LPG (with higher energy rating preferred), then with fossil fuel-generated electricity. If roofs are shaded, electric heat pump hot water units could be a solution. If finances are tight, install solar hot water for communal facilities. Where a large refrigeration or air conditioning plant is installed, it may be possible to use waste heat from those systems to provide hot water for nearby buildings.

Instantaneous gas/LPG hot water units do not have pilot lights, so they use gas only when supplying hot water. They save many dollars per annum compared with standard natural gas units and much more if LPG is used. Some instantaneous hot water units require quite large gas supply pipes, which can be expensive to install over long distances.
- **Limit losses from hot water services and fittings.** Losses of heat from storage tanks and pipes can be equivalent to the energy in the hot water delivered. For example, daily losses from electric hot water units are from 2 to 5 KWh, equal to the energy used to heat 40 supplying 80 to 120 litres of hot water. Extra insulation (for example, foil-backed fiberglass blanket) can be installed around tanks and pipes, although this is difficult with externally-mounted units and many

gas units unless a weatherproof shelter is built around them. Losses from electric hot water tanks and gas pilot lights can cost many dollars a week per unit. Tanks and pilot lights which are not likely to be used for more than a week should be switched off. Where hot water pipes are exposed to the environment they should be insulated, especially in cold climates. If hot water service thermostats are set higher than necessary, tanks lose more heat. Check the temperature of hot water by lowering the thermostat setting. A lower thermostat setting not only reduces the risk of scalding, but also increases the chance of running out of hot water, so a balance must be sought.

ISSUE: MORE EFFICIENT USE OF LIGHTING

Actions:

- **Switch off lights manually when they are not required.** Lighting generates around one-quarter of the greenhouse gas emissions from the services sector, and involves high costs for operators. Providing training and information can encourage people to switch off lights and can explain why controls operate the way they do. Many people believe that it is more energy efficient to leave fluorescent lights on when they are not needed. This is not the case. While switching fluorescent lights on and off more frequently reduces their life slightly, it is cheaper and environmentally preferable to switch fluorescent lights off when they are not required.
- **Use key-tag switches and automatic controls to switch off lights when they are not required.** Key-tag switches ensure lights are not left on in unoccupied rooms, as all equipment linked to the key-tag switch is turned off when the key tag is removed (which happens whenever the occupant leaves the room). Using key tags for appliances such as air conditioners, as well as lighting, improves energy efficiency. Automatic controls (timers, movement and light sensors) can switch or dim lights. Care should be taken in setting up automatic controls and performance must be monitored (for example, moving branches can keep lights on).
- **Make use of natural light.** Compact light-tubes with reflective lining (for example Skytube or Solatube) provide much more daylight than conventional skylights of the same size, so they cause fewer heating and cooling problems. Large areas of glass for daylighting can cause glare and discomfort, as well as increase heating/cooling costs. Good design is essential. One square metre of roof glazing can allow up to a kilowatt of summer heat to enter-as much heat as a single bar radiator produces. Reflective glazing will only reduce this to 200 watts per square metre, which is 20 times the heat that would enter through the same area of an insulated ceiling. Small areas of roof glazing can provide a lot of light. For example, one square metre of clear roof glazing in direct sun provides light equivalent to that supplied by about 30 fluorescent tubes.

- **Make the most of the available light.** Dark, textured walls can absorb up to 90 per cent of light, while light-coloured walls reflect up to 90 per cent of light. Overhanging trees and verandahs can block out a lot of natural light. Where it is aesthetically and environmentally appealing, trim back vegetation (good for fire prevention, too) and use adjustable shading instead of wide verandahs. Where verandahs are used, paint surfaces light colours to reflect more light, and insert small transparent sections in the roofing to allow light to enter.
- **Reduce excessive lighting levels.** A light meter can be used to check that light levels comply with the relevant standards. Removing a proportion of fluorescent tubes or light globes, or replacing them with lower wattage ones lowers light levels.
- **Select energy-efficient lighting.** The most basic feature of an energy-efficient lighting system is conveniently-located and labeled switches. Desk lights, along with lower background lighting, can provide plenty of light where it is needed, while saving energy. Fluorescent lights are the most efficient practical option for most applications apart from some outdoor uses such as street lighting, for which specialist advice should be sought because of the design issues involved. Fluorescent lights are at least three times as efficient as low voltage lights and five times as efficient as incandescent lights. Low voltage lighting is not low energy lighting. If used, it should be restricted to critical display applications. Lower wattage globes (for example 20 or 35 watt) are preferable to the more widely used 50 watt low voltage globes. Efficient reflectors may increase light output by up to 30 per cent. Opal coverings may reduce it by 25 per cent, and dark tinted covers can reduce it much more. For portable lighting, battery-powered fluorescent lamps are much more efficient than conventional torches. Quartz globes have become available as alternatives to traditional globes. These provide more light for the same power consumption, but are still much less efficient than fluorescent alternatives.
- **Dispose of old lamps and ballasts in an appropriate way.** Fluorescent and other types of discharge lamps contain small amounts of Hazardous chemicals such as mercury or sodium, which should be recovered. Their glass and metal content can also be recovered for recycling.

ISSUE: ENERGY EFFICIENT COOKING

Actions:

- **Select environmentally-preferable fuels.** Conventional electric cooking, using electricity generated from fossil fuels, usually has a greater environmental impact than cooking with gas/LPG, but microwave and other new electric technologies (such as induction cooking) are more efficient than conventional electric hotplates and, in some cases, gas. Extra electrical wiring required to handle electric cooking loads can be expensive. Total system costs, including tariff penalties for high electricity demand associated with cooking, should be considered.
- **Select efficient cooking equipment.** In commercial kitchens, a large proportion of cooking energy may be wasted as equipment is held on stand-by in case it is needed. Equipment that can reach operational condition quickly and be turned off when it is not needed should be selected. Keeping food warm consumes a lot of energy. Minimise the time food is kept hot. Where food must be kept hot, keep it in insulated, closed containers rather than open stainless steel trays.
- **Use cooking equipment efficiently.** It takes less energy to reheat equipment than to leave it on in case it is needed. Switch equipment off when it is not needed. Allowing large exhaust fans to operate unnecessarily consumes excessive electricity, and can remove heated or cooled air from a building unless a separate air supply is provided. Good cooking practices include using lids on pots, using efficient cooking appliances (such as pressure cookers and microwave ovens) in preference to less efficient options such as conventional ovens, and using the lowest suitable cooking settings. It takes seven times as much energy to turn water into steam as it does to heat water to its boiling point from room temperature.
- **Use other kitchen equipment efficiently.** Urns, coffee percolators and toasters use large amounts of electricity if they operate for long periods. When purchasing these appliances select well insulated, efficient equipment that can reach operating temperature quickly and is easily operated. As no standard tests exist for the energy efficiency of these appliances, check the thickness of insulation. Ensure thermostats are fitted where appropriate, ask for energy-efficiency data and, if necessary, test-run equipment to see how quickly it heats up.
- **Plan meals to minimise cooking energy requirements.** Offering salads and quick-to-prepare meals can minimise cooking energy requirements. Carefully selecting items on a menu can limit the variety of cooking equipment used for

a given meal. Bulk preparation and storage, and efficient reheating equipment, can minimise wastage of food and energy.

ISSUE: ENERGY EFFICIENT REFRIGERATION

Actions:

- **Switch off equipment when is not needed.** Refrigerators do not have to run if no perishable items are left in them and should therefore be switched off. Refrigerators with non-perishable drinks in them can be switched off overnight, achieving savings of up to 30 per cent. Time switches could be used to do this automatically.
- **Switch off lights.** Continuously operating internal lights in glass-fronted refrigerators and coldrooms use power directly and add to the cooling load, making the compressor work harder. A 40-watt fluorescent tube and its ballast create a total load of around 80 watts. Unless the lights are really needed, they should be disconnected or switched off. Lighting up display signage on a drink vending machine can cost hundreds of dollars a year to run, and generates a tonne of greenhouse gas. Unless the lights are really needed, they should be shut off.
- **Manage refrigeration equipment and supplies.** Running refrigeration equipment too cold by 1 degree can increase running costs by 5 per cent. Maintain correct internal temperatures of all refrigerators. Regularly check to ensure that doors are shut properly and clean door seals to reduce running costs and slow build-up of frost. Non-perishable goods such as soft drinks do not need to be stored in refrigerators until a few hours before they are served but should be kept in a cool place to minimise energy required to chill them.
- **Ensure refrigerator operation is not impaired by installation.** Good ventilation around coils on the backs of refrigerators is essential. Refrigeration units should not be placed in direct sun. The running costs for a glass-doored refrigerator can be doubled and the fridge's contents warmed if the fridge is in direct sun. Refrigerators should not be located near hot equipment or in hot rooms. A 5 degree centigrade increase in room temperature can increase running costs for refrigerators by 30 per cent.
- **Select suitable size and type of refrigeration equipment.** Larger refrigeration units usually use more energy although many cheap bar fridges can consume large amounts of energy. Many commercial refrigeration units are much less efficient than domestic models of comparable capacity and cost more to buy. cannot provide such information, request them to measure energy consumption before you will consider buying, or advise the supplier in writing that you will return the appliance if its running cost is too high.

- **Avoid energy-guzzling equipment.** Running a drink vending machine can cost \$300 or more annually and generate more than two tonnes of greenhouse gas. Running a glass-fronted fridge may cost \$200 to \$600 more annually. Try to minimise the number of refrigerators used. Avoid using open refrigerated cabinets, as they are very inefficient. Where they are required, fit them with insulating blinds that can be pulled down overnight or plastic strips that trap cold air but allow access to the produce in the cabinet.
- **Use waste heat from refrigeration equipment.** Use the waste heat generated by large refrigeration systems to heat water, provide space heating or to dry clothes and linen.

3.2. MINIMISING WATER USE

ISSUE: MORE EFFICIENT CLOTHES WASHING AND DRYING

Washing and drying clothes may consume large amounts of energy. One load of washing may use up to 200 litres of water (of which a third may be heated), and up to a kilowatt-hour of electricity (costing 12 to 20 cents) may be used to dry each kilogram of washing.

Actions

- **Minimise hot water usage for clothes and linen washing.** Try to reduce the number of washing loads to be done. Encourage clients to use towels and linen for more than one day. Use signs to explain procedures and how they help the environment by reducing energy, water and detergent use. A partially-filled washing machine wastes energy and water. Fully load washing machines according to manufacturers' instructions. Cold water washing is most energy-efficient. Use the lowest washing temperature that cleans satisfactorily. Front-loading washing machines, which use much less water and detergent, and are gentler on clothes, are preferable to top-loading machines.
- **Check your detergents.** The phosphorus compounds in many detergents contribute to environmental problems' such as algal blooms. Many detergents now carry 'NP' (No Phosphorus) and 'P' (reduced Phosphorus) labels. Given that N is the chemical symbol for nitrogen and P stands for phosphorus, these may cause confusion among some consumers.
- **Remove as much water as possible.** Some modern washing machines have high spin speeds which extract far more water than other slower models. When next buying a washing machine look for one with a spin speed of 1000 rpm or more. This high water extraction rate makes open-air drying quicker and reduces the energy consumption of clothes dryers by up to half.

- **Use clothes lines.** Clothes lines use good old-fashioned solar/wind technology. In rainy climates, clothes lines can be under cover, but wind movement should not be cut off as it is important for drying. Even if clothes are not fully-dried on a clothes line and are placed in clothes dryer to complete the task, energy consumption by the dryer will be reduced.
- **Consider natural gas/LPG dryers.** Natural gas/LPG dryers are commonly available in sizes that suit various commercial requirements, but domestic units are also available.

ISSUE: MORE EFFICIENT DISHWASHING

Actions:

- **Minimise hot water usage for dishwashing.** Dishwashing consumes water, energy (in the form of hot water) and chemicals (in the form of detergent) and generates water which requires treatment. Scrape excess food off dishes rather than rinsing it off with water. If rinsing dishes as well, put the plug in the sink. Rinsing dishes under running hot water can waste several litres of water per minute. Inefficient stacking of dishwashers is very common. Fully load dishwashers and pack efficiently to use their capacity effectively.
- **Select an energy and water-efficient dishwasher.** Different dishwashers and wash programs use very different amounts of water and energy. Choose the most water-efficient dishwasher and use a water-efficient cycle. For domestic models, refer to energy labels. For commercial models, ask the manufacturer about energy and water consumption. Washing up in a domestic sink uses around 15 litres of water. Larger commercial sinks may require 40 litres per fill. In comparison, water-efficient domestic dishwashers use as little as 15 litres on economy cycles (generally to wash more dishes than can be washed in a sink).
- **Select low-environmental impact detergents.** The phosphorus compounds in many dishwashing detergents may contribute to environmental problems such as algal blooms. Many detergents now carry 'NP' (No Phosphorus) and 'P' (reduced Phosphorus) labels. Given that N is the chemical symbol for nitrogen and P stands for phosphorus, these may cause confusion among some consumers. Reputable manufacturers of detergents for commercial use now provide detailed Material Safety Data Sheets on request. Always ask for these and compare them. As some cleaning products are not compatible with some waste treatment systems, it is wise to check.

ISSUE: MORE EFFICIENT HANDWASHING, SHOWERING AND BATHING

Actions:

- **Install water-efficient showerheads.** Water-efficient showerheads vary greatly in cost and the quality of shower delivered (some of the cheaper ones are among the best while the more expensive ones are not as good). To gain an AAA water efficiency rating showerheads only have to meet a standard of 9 litres per minute. User satisfaction with water-efficient showers is much lower if there is excessive air movement in a bathroom (from an exhaust fan or draughts), as the moving air evaporatively cools the person's body. Install an exhaust fan away from the shower, and do not wire the exhaust fan into the bathroom light switch.
- **Fit tap aerators and flow controls.** Aerators reduce water flow and improve wetting. They are an integral part of many modern tap fittings or can be retrofitted to older taps. Tap flows controls vary from simple washer-like devices to systems which balance water flow and pressures throughout a building. Where low-flow taps are installed, 10mm pipes may often be used instead of 15mm pipes, reducing cost and heat losses in pipes, and halving the amount of water that must be drawn off before hot water reaches the tap.
- **Avoid mixer taps.** Most people use mixer taps with the mixer arm straight-ahead when they want only cold water. In this position, the tap delivers 50 per cent cold water and 50 per cent hot water, thus wasting hot water.
- **Select baths carefully, to limit water requirements.** Standard baths hold 125 litres, while large spa baths hold 500 litres. Select an appropriate size.
- **Prevent leaks.** To prevent leaks select long-lasting tap washers and regularly inspect taps for leaks. Taking meter readings when little activity is occurring helps identify water loss.
- **Ensure taps are not left running.** Spring-loaded taps can be used in public/communal facilities but would probably be seen as a bit draconian in private facilities unless there were severe water shortages.
- **Use liquid dispensers.** Many operators have expressed concern about the excessive use of packaging materials involved in providing small serves of soap and shampoo. Wash 50 metres away from streams and lakes and scatter the wastewater so it filters through the soil before returning to the stream.
- **Encourage the reuse of cloth towel before washing.** Many facilities are now successfully encouraging clients to use towels several times before putting them out for washing. The key to their success is providing information to clients and asking the clients to decide when towel-washing is desired.

- **Choosing between paper towels, electric hand dryers, and continuous roll cloth towels.** Most operators are seeking the definitive answer as to whether paper towels, electric blowers or continuous roll cloth towels are the best environmental option for drying hands in communal toilets. There is no simple answer. Recycled paper towels are preferable to non-recycled ones. Electric hand dryers with movement sensors are preferable to those with a push button timer. Continuous roll cloth towels without ready access to low impact laundering either on-site or within a short distance may not be a good environmental option unless usage rates are very high. Choosing between these alternatives will depend on operational efficiency and client preferences.

ISSUE: PUMPING WATER MORE EFFICIENTLY

Actions:

- **Reduce the need for pumping.** Pumps are used in many tourism operations to supply water, remove wastes, filter pools and circulate heated or chilled water. Very large amounts of electricity can be consumed, particularly when large pumps run for long periods. Where water is pumped to a header tank, any strategy which reduces water consumption reduces pumping requirements. Ensure that pumps operate only when needed. In many cases, pressurized water is pumped into an open container, then pumped (and re-pressurised) somewhere else. Arrange piping and controls so that water is delivered to its point of use without having to be re-pressurised.
- **Choose the right-sized pump and an efficient motor.** Avoid using an oversized pump and motor which unnecessarily add to capital and running costs. Where loads vary, install a variable speed drive to improve efficiency. Highly efficient motors are commercially available, and reduce energy consumption cost-effectively. Ask suppliers for written information on motor efficiency.

3.3. DEVELOPING BETTER WASTE MANAGEMENT TECHNIQUES

ISSUE: USING TOILETS MORE EFFICIENTLY AND HYGENICALLY

Actions:

- **Select an appropriate toilet system.** Toilets must dispose of human waste safely and hygienically. Sensitive ecosystems can be adversely affected by the nutrients in human wastes, and the environment may also be affected by large quantities of contaminated water that are consumed and released by toilets. Reducing the amount of water used by toilets also reduces the amount of energy used and the costs involved in water pumping treatment. The range of options for disposing of human waste includes:

- water-based toilets (with various sewage treatment systems)
- dry toilets, including composting and pit toilets;
- chemically treated toilets

Low volume dual flush toilets (3 litre/6 litre) should be used in accommodation with access to sewers. Ultra-low flush toilets which use less than 2 litres per flush are also available. A variety of on-site treatment systems exist for flush toilets. Dry toilets, including pits and composting toilets are viable options where water supplies are limited and on-site treatment desirable.

- **Managing free disposal.** Free disposal is a viable option only in little-used areas, as the nutrients released can affect local ecosystems. It is important to deal responsibly with human faecal waste to avoid exposure to gastroenteritis and Giardia. Disposal of human waste should occur at least 100 metres away from any water source. Waste should be buried 15cm deep; in some areas where this is not possible covering with rocks is more practical. Toilet paper should be buried with the waste or if not possible it should be removed from a site in sealable plastic bags.
- **Managing sewer-connected systems.** If your establishment uses a community sewage system, find out how the sewage is processed and the standards to which it is treated, so that you may be able to demonstrate to your clients that the system is environmentally responsible. Roof run-off and grey water (usually from bathrooms) can be collected and used for toilet flushing. However, grey water should be filtered and disinfected before being used again to minimise health risk. Minimise use of chemical cleaners and deodorants in toilet water, and check that those used break down quickly and do not harm the sewage treatment process. Low volume (3/6 litre) cisterns are not designed for connection to standard toilet pans. They require a specially-designed low volume trap.
- **Managing on-site water-based systems.** Minimise water consumption by selecting low volume dual flush toilets. The most common on-site, water based system for small facilities comprises a septic tank and a soakage area for effluent, where soils are heavy or the water table is close to the surface, evaporation trenches or mounds, or evaporation ponds, may be required. Wetlands, reed beds, woodlots or gardens can be irrigated with sewage effluent. Sludge must be pumped out at intervals. Aerobic treatment systems are now available for small-to-large scale facilities. Air pumps speed bacterial breakdown. Final effluent may be treated by ultraviolet light, micro-filtration, and/or chemicals. Each of these methods requires regular maintenance and monitoring by trained staff. While these systems can achieve high standards, their complexity and cost mean there could be value in sharing facilities with neighbours. Anaerobic treatment systems, which produce biogas (a potential fuel) and sludge (which can be used as a fertilizer substitute), are used in some large treatment plants and intensive farms.

- **Managing dry toilets.** Fans are used in commercial composting toilets to draw air through the composting chamber to evaporate liquids, provide air for the biological breakdown of wastes and remove odours. In sunny climates, a black painted vent pipe may replace a fan. Some composting systems use worms to speed up decomposition. The moisture content must be kept down so the worms don't drown. Pit toilets should not be located near water sources or in depressions or runoff areas. Compostable kitchen scraps can be added to dry toilets. Moisture levels must be monitored as biological activity will stop in toilets that are both too wet and too dry. In cold weather, biological activity slows. Locating the toilet in a sunny spot out of prevailing winds can help maintain biological activity, as can insulation of the composting compartment. Drawing the air supply from the heated room, instead of from outdoors, can maintain biological activity.

ISSUE: TO REUSE AND RECYCLE SOLID MATERIALS

Actions:

- **Minimise packaging.** Where packaging is necessary seek re-used or recycled packaging. Seek opportunities to buy material in bulk or as concentrates. Ensure that packaging is re-used or recycled. Select packaging made out of a single material (for example, cardboard boxes with cardboard spacers, rather than polystyrene spacers) to facilitate recycling.
- **Buy re-usable items.** Purchase re-usable items, such as cloth towels rather than paper towels and refill pouches of products such as detergents, rather than new bottles.
- **Buy re-used, remanufactured and recycled products.** An increasing range of re-used, remanufactured and recycled products is becoming available. Ask potential suppliers to provide details about the recycled input of their products.
- **Access recycling systems.** On-site recycling systems are the most effective way of collecting a range of recyclable materials. Take materials to a village recycling centre as part of your normal work routine. Flatten and squash recyclable containers to minimise their volume, and reduce the cost of transporting them, particularly where transport distances are long.
- **Recycle on site.** The main opportunities for recycling waste on site are likely to be the recycling of organic waste through composting, worm farming or anaerobic digestion (with energy recovery in the latter case). If too much compost is produced for use on site, it may be possible to find beneficial off-site uses.
- **Recover energy.** When all other options for recovering and recycling materials have been exhausted, recover energy from waste materials by burning the non-toxic materials for heat.

ISSUE: MINIMISE BUILDING MATERIALS WASTE

Actions:

- **Prepare and implement waste minimization plans.** Ask potential building contractors for a waste minimization plan. Many contractors may be unfamiliar with such plans, but if their preparation starts to become a key selection criterion they will quickly get the message. Ensure that all subcontractors are effectively included in the waste minimization plan.
- **Make accurate estimates of materials required and avoid over-ordering.** The size and shape of pre-fabricated materials should be considered carefully to minimise unused offcuts. Some thought and effort at the time of ordering can bring large financial savings as well as environmental benefits. Purchase recycled building material whenever possible.
- **Identify ways to re-use or recycle any materials unavoidably left over.** Use suppliers who will take back unused materials (including offcuts). Re-using and recycling will avoid waste disposal costs and may generate income from the sale of surplus materials.
- **Keep waste streams separate to facilitate re-use/recycling and to reduce environmental risks.** Mixing waste streams makes it far more difficult and costly to extract useable materials. The demolition and refurbishment of buildings may generate hazardous waste items, including PCBs in lighting capacitors that are more than 20 years old and mercury in fluorescent tubes. These should not be landfilled.

ISSUE: RECYCLING NEWSPAPER AND CARDBOARD

Actions:

- **Minimise purchases of newspapers and magazines.** Supply newspapers and magazines in communal areas rather than to individual units. Alternatively, consider not supplying newspapers or magazines at all.
- **Look for recycled content.** Where packaging is necessary to protect the goods purchased, make the recycled content of that packaging a purchasing criterion. Always prefer cardboard/paper to polystyrene. Ask about the recycled content of newspapers and magazines you plan to supply.
- **Recycle on-site.** Newspaper and cardboard may be used in composting or worm farms or as mulching agents.

- **Recover energy.** Recover energy from waste newspaper and cardboard by burning when all sensible options for material recovery have been exhausted. Burning these materials is far preferable to burying them in landfills (particularly wet landfills) where anaerobic decay and methane emissions may occur.

ISSUE: RECYCLE AND REUSE GLASS

Actions:

- **Reduce amounts of glass used.** Minimise the amount of glass to be recycled and disposed of by purchasing goods in bulk. Purchase concentrates (for cordials and fruit juices) and dehydrates (for milk and soups) wherever feasible. Aesthetics and client expectations will be the major determinants of the practicality of such options.
- **Re-use glass.** Some drink products, particularly those supplied by smaller, local manufacturers, are available in refillable, returnable containers. Refillable bottles are much heavier than non refillable ones. To compensate for the additional environmental impact from their manufacture (compared to light-weight bottles) it is best they be refilled at least ten times. Glass containers with flip-top lids (rather than screw tops) can often be re-used as drinking glasses.
- **Recycle glass.** Well-established and widespread infrastructure exists for glass bottle recycling; therefore it is generally a lot less complicated than paper and plastic recycling.

ISSUE: RECYCLE AND REUSE PLASTICS

Actions:

- **Reduce plastic use, particularly for short-term applications.** Over the last few decades, plastic wastes, particularly plastic packaging wastes, have comprised the fastest growing part of the solid waste stream. They are a highly visible component of litter and have had a significant impact on wildlife, particularly in aquatic ecosystems. The problems arise largely because the long-life attributes of plastics are put to long-term uses such as in appliances and equipment, and in plumbing and gas fitting, they may have less environmental impact than alternatives, such as metal and ceramics. The light weight of plastics can also be beneficial in increasing the efficacy of products and reducing transport fuel. Purchase goods in bulk whenever possible. Select consumer durables that are packaged in recycled, cardboard and paper rather than plastic. Do not use disposable (single-use) plastic tablewares.

- **Re-use plastics.** Select durable plastic packaging containers such as Tupperware, which have been available for a long time. Use re-useable plastic alternatives instead of single-use tableware. Many large plastic containers (for example, for oils, cleaners and chemicals) can be returned to their manufacturers for re-use. Select these products when available. When feasible, re-use durable plastic containers (for example, plastic beverage containers may be re-used as lightweight water bottles).
- **Recycle plastics.** Plastics recycling is even more complicated than paper recycling. If you have access to plastics recycling, whether through kerbside collection or depot drop-off, check with your recycler exactly what plastics are being collected. Public demand and a growing sense of responsibility within the plastics industry is expanding the range of plastics being recycled. Check up periodically to see if additional plastics items are being recycled, as the situation is likely to change quite markedly over the next few years.
- **Buy recycled plastic products.** An increasing range of products (for example, car battery cases, printer cartridges, some building materials and garbage and compost bins) are being manufactured with recycled plastic content. Do not shop at supermarkets that do not use biodegradable plastic bags. Better still, take your own non-plastic bag with you for grocery shopping.
- **Beware of energy recovery from plastics.** Recovering energy from burning plastics is toxic and dangerous. Emissions, particularly from chlorinated plastics such as PVC, are a major concern for health and safety.
- **Correctly manage hazardous material containers.** Do not send containers for hazardous materials to the tip or empty their contents down the sewer. Check with your local council and/or the environmental protection agency/department.

ISSUE: RECYCLE AND REUSE METAL CONTAINERS

Actions:

- **Reduce metal container use.** Purchase goods in bulk where possible. Avoid aerosol containers by substituting them for pump action or roll-on containers. CFCs are no longer used as propellants apart from a small number of medical applications, so giving up pressure packs will not help to save the ozone layer. However, most propellants are hydrocarbons and contribute to air pollution and the greenhouse effect.
- **Re-use steel containers.** Many large steel containers can be returned to their manufacturers for re-use or refilling. Select products in such containers, when available. Seek ways to reuse smaller containers with fitted lids.

- **Recycle containers.** Large steel items such as cars, whitegoods, concrete reinforcing and drums can be recycled. Aluminium cans fetch about 10 times the price of steel cans on a weight basis because of the huge savings in electricity achieved by recycling aluminium cans (compared with smelting aluminium from alumina). Recycling steel does not achieve such savings and there has been, until recently, a relative lack of interest by industry in recycling steel cans. Find out if aluminium can recyclers take other aluminium products such as foil and food trays as well. Crushing cans, or removing the ends and flattening rigid steel cans, reduce their bulk and can greatly increase the value of a given volume.
- **Correctly manage hazardous material containers and their contents.** Do not send hazardous materials to the rubbish dump (or tip the contents down the sewer) when you have no further use for them. This is rarely an appropriate means of disposal. For advice on specific products, contact the manufacturer/supplier (ask for material safety data sheets) and if in doubt, check it with your local council and the environment protection agency/department.

ISSUE: RECYCLING FOOD AND GARDEN MATERIALS

Actions:

- **Reduce food and garden wastes.** Food and garden waste can generally be recycled on site. Garden waste is often banned from landfill to reduce the volume of materials. Reduce food waste by preparing appropriate quantities of food. Most plant food waste can be readily composted, but animal food waste can be more difficult to deal with. Fat and oil-free cooking is healthy and reduces problematic waste. Where landscaping and gardens are necessary or desired, maximize the use of local indigenous species to reduce watering, cutting and trimming, and the generation of garden waste.
- **Prevent discharge of oils and fats into untreated sewage.** Remove oils and fats from crockery with absorbent towels prior to washing whenever dishwashing effluent is released to an untreated sewage system. Use grease filters on sinks. Medium sized and large kitchen facilities should use grease traps/arresters (which require periodic pumping) before discharge. Biological dosing systems which break down oils and fats reduce the need for pumping. Find a pump-out contractor who recycles this waste. Re-use cooking oils.
- **Recycle.** Most food and green garden material is ideal for composting or worm farming (vermiculture). However, such recycling requires active management. Compost that becomes anaerobic is not just smelly; it is generating methane-a potent greenhouse gas. Chip woody garden waste and use it as mulching material. This will assist with controlling weeds and reduce water requirements. Contact suppliers, or alternatively ask your local council or the environment protection

agency/department to find the name of a company that recycles cooking oils and fats.

- **Recover energy.** Burn dried wood to provide heat. Where viable, consider establishing a system for anaerobically digesting food and plant materials to produce useable methane and soil conditioners.

3.4. Environmental Management Guidelines for Village Accommodation Projects

Many local communities and villages are keen to be involved in the tourism industry. Many have already developed their own businesses, particularly smaller scale accommodation operations in the form of small hotels, resorts and guesthouses. Therefore, it is deemed relevant and important to provide some Environmental Management Guidelines for these village based operations.

MINIMISING ENERGY USE

THE ISSUE

Electricity costs for users in most Pacific island countries are amongst the highest in the world, with unit costs 2-5 times above those of most of our industrialized neighbours. Many studies have shown that hotels often use substantial amounts of energy in a very inefficient manner and that energy conservation measures are often the easiest, quickest and cheapest way to reduce costs and be environmentally pro-active.

The main uses of energy in small hotels and resorts include:

- Air conditioning
- Heating hot water
- Laundry
- Lighting
- Appliances in guest rooms and offices
- Cooking and refrigeration equipment
- Fuel for vehicles

Conserving energy also provides significant environmental benefits. Energy consumed by hotels in the majority of Pacific island countries is supplied primarily from diesel generators and this contributes to global warming and other air pollution problems.

Minimising the use of energy can be undertaken in numerous ways, some are provided in the checklist below. These are categorised as either ‘low cost options’ or ‘investment required’. Low cost options are generally suitable for all hotels and often provide opportunities for immediate savings. Investment required some means capital outlay initially but they can return major cost savings in the medium to longer term.

DESIGNING FOR ENERGY EFFICIENCY

The best way to ensure that buildings are comfortable for guests is to ensure that they are energy-efficiently designed in the first place. Such buildings require much less cooling energy with simpler equipment than those buildings which are not energy efficient. Building design contracts should provide calculations for energy consumption and estimates of capital and running cost for a range of design options.

GOOD MANAGEMENT PRACTICES – LOW COST OPTIONS

- Make maximum use of natural ventilation
- Regular cleaning of air conditioner filters, light fittings and fridge seals
- Ensure staff and encourage guests to close doors and windows in air conditioned premises
- Close curtains to minimize solar gain
- Minimise decorative lighting
- Make maximum use of daylight
- Reduce water temperature in laundry to 60 degree centigrade
- Set water heaters at a standard temperature 60 degree centigrade or even 50
- Drain and flush hot water tank every 6 months to reduce scale build up and deposits which reduce efficiency
- Decommission electric hand dryers
- Use full loads for laundry and kitchen appliances
- Encourage staff to turn off lights and equipment after use, particularly gas burners in kitchens

In direct sun, a square metre of window allows in as much heat as that emitted by a single bar radiator.

INVESTMENT REQUIRED

- Purchase energy efficient equipment. Energy labels rate the energy efficiency of many appliances now e.g. fridges, air conditioners and photocopiers etc.
- Maximise the use of fans rather than air-conditioners
- Install key-tag devices inside rooms for lighting, air conditioners and appliances
- Draft proof old windows and doors in air conditioned rooms
- Insulate hot water pipes
- Install solar heating for hot water system (use gas/LPG rather than electricity boosting)
- Shade windows from direct sun
- Replace incandescent with low-energy fluorescent light bulbs
- Install sensors and timers in intermittently used public areas so lights are switched off when not required
- Install sub-metering to monitor use in different sections of the hotel

- Review the capacity of central equipment relative to actual load – oversized equipment operates less efficiently
- Protect air-conditioners from the elements e.g. sun, saltwater and wind

Solar power is the most environmentally preferred fuel source followed by wood (from sustainable sources and used in an efficient, low emission wood heater). High efficiency gas/LPG or electric heat pumps come third.

THE BENEFITS OF LOW ENERGY FLUORESCENT BULBS:

Low-energy fluorescent bulbs can produce up to 5 times as much light for an equivalent amount of energy and last up to 10 times as long as an incandescent light. Fluorescent bulbs also generate less heat.

- Reduced operational costs
- Reduced maintenance costs
- Reduced pollution through reduced energy consumption
- Improved worker safety
- Improved lighting levels

MINIMISING WATER USE

THE ISSUE

Water is a scarce resource on many Pacific islands and water conservation should be a very important environmental goal. Traditionally water has been supplied free of charge or at minimal cost in most Pacific island countries, however this is changing and users are increasingly being asked to pay a fair price for water. Even where they are charged, hotels often give little thought to conserving water supplies even though they can consume very large quantities.

Coastal or small island resorts can severely impact adjacent reefs if they introduce and discharge to the environment large quantities of freshwater where previously there was very little.

Principal uses and areas of water use in small hotels and resorts:

- Guest's rooms;
- Cooking and the kitchen;
- Public area toilets in bars, restaurants etc;
- Laundry;
- Swimming pool; and,
- Gardens

GOOD MANAGEMENT PRACTICES

- Invite guests to decide when they want their towels or bed linen changed;
- Reduce toilet cistern volume in single flush models (i.e. put in water filled bottles);
- Encourage/train staff to practice water conservation;
 - turn off taps and report leaks;
 - quick fixing of leaking taps, pipes and toilet cisterns;
 - sweep with a broom and pan rather than hose down external areas;
- Use full loads in the kitchen and laundry
- Minimise water use in the garden (see Landscape Management)

A dripping tap can waste up to 36,000 litres of water each year, the equivalent of filling around 180 baths

INVESTMENT REQUIRED

- Reduce water delivery in taps and showers, through the installation of:
 - low flow devices or aerators on shower heads
 - spring-loaded taps'
 - dual-flush toilets or a manual hand-pressed flush system;
 - sensors on urinal which ensure flushes occur only when required;
- Purchase water conserving appliances for the kitchen and laundry
- Consider installing a saltwater toilet flush system;
- Consider desalination plants where freshwater is severely limited;
- Recirculate all swimming pool overspill;
- Use suitably treated wastewater for reuse in the hotel, e.g. in water features or for garden watering;
- Install sub-meters on key areas of water use – monitoring water use is a precursor for management; and
- Collect rainwater, have guttering in houses.

Aerators fitted to shower heads can maintain the force of the shower but reduce the volume of water by 30%

MINIMISING SOLID WASTE

THE ISSUE

Poor waste management is a conspicuous and deteriorating issue for many islands of the Pacific. It is an issue which is readily noticed by visitors and can seriously undermine their experience and perception of an unspoiled environment. Environmentally acceptable waste management is a challenge that small hotel operators have to meet.

A substantial reduction in waste can almost always be achieved through no-cost or low-cost options. Often all that is required is a change in management practices.

In contrast, organizing for the safe disposal of residual waste often poses a serious dilemma for small hotels, especially those in rural or offshore island settings, and the strategies adopted will have to reflect the local circumstances. Prominent amongst these will be the waste management and recycling infrastructure available and the ecosystems that may be affected by local disposal near the hotel.

PRINCIPLES TO PONDER

- Rather than create your own dump, use a municipal dump even if it is a long way away and its management leaves a lot to be desired;
- If you cannot compost paper, cardboard etc. then burn it, rather than bury it;
- Bury rather than burn plastics,
- Identify and separate out hazardous wastes – batteries, pesticide cans etc. and take them to the municipal dump or store in a single location.

If you cannot use a municipal dump for your waste, then you should get advice from a professional or your government or Local Authority on a site and a method for disposal.

SETTING PRIORITIES CAN BE A CHALLENGE. While it is important to reduce large contributors to waste, clients may be more concerned about the minor, but more visible waste items, such as shampoo containers.

Recycling is (mistakenly) often seen as being more important than waste reduction or re-use, as guests are quite likely to be critical of operators who are not seen to be involved in recycling.

REDUCING POLLUTION

MINIMISING DISCHARGES AND EMISSIONS

THE ISSUE

All small hotels and resorts produce a number of discharges which have the potential to pollute air, land and water. The impact of these discharges depends primarily on the management practices undertaken by the hotel coupled with the location of the hotel and the sensitivity of the surrounding environment.

The main sources of pollution from small hotels and resorts through waste discharges and emissions are:

- Treated and untreated sewage (for those properties which are not on a reticulated sewage system)
- Discharges of hazardous chemicals down the drain
- Vehicle emissions
- CFCs from refrigeration and air conditioning systems

- Spills of fuels or hazardous chemicals to land or water
- Odours and spills from the kitchen and laundry

Phosphorous compounds in many detergents contribute to environmental problems such as algal blooms. Many detergents now carry 'NP' (No Phosphorous) and 'P' (Reduced Phosphorous).

GOOD MANAGEMENT PRACTICES

- Recover refrigerant whenever repairs may result in loss of refrigerant or when refrigerators are being disposed of
- Avoid products manufactured by or using CFCs, e.g. aerosol sprays, fire-extinguishers, solvents, foams
- Avoid products packaged in Styrofoam
- Use environmentally acceptable solvents/enzymes to degrease and deodorize drains, grease traps, sewers and compactors
- Avoid phosphate and chlorine-based detergents for washing machines and dishwashers
- Use vehicles which run on lead-free petrol
- Maintain vehicles regularly to ensure optimum combustion
- Purchase goods locally to reduce transport of goods
- Use mercury-free batteries
- Use water-based paints
- Ensure toxic waste is disposed of safely, e.g. old paints, solvents and batteries
- Establish procedures or monitoring spills or leaks of hazardous chemicals from underground tanks
- Avoid leaks and spills by lining and covering bins
- Check lids/containment seals
- Label all containers properly
- Prepare a spill containment plan for the hotel

INVESTMENT MEASURES

- Switch to refrigerants with low ozone depletion potential when new equipment is being purchased
- Replace halon-based fire extinguishers
- Install leak detection equipment on existing storage tanks
- Ensure that tanks are banded to 110% of their volume
- Install fuel storage tanks which meet the new high standard international safety specification, e.g. double-skinned tanks. (Some suppliers will install such tanks at no cost).

COMMON TOXIC PRODUCTS USED IN SMALL HOTELS AND RESORTS

Acids, adhesives, air conditioning refrigerants, automobile supplies, batteries, drain cleaners, disinfectants, dyes, glues, grease and rust solvents, lawn products, metal cleaners, polishers, medicines, paints, paint thinner, pain strippers/removers, pesticides, oven cleaners, plastics, starter fluids, wood preservatives, wood cleaners, polishes.

MATERIAL SAFETY DATA SHEETS

If you are not sure about the hazardous nature of a product, ask your suppliers for its Material Safety Data Sheets. If the supplier cannot produce it, consider changing your supplier to one which can.

LANDSCAPE MANAGEMENT

THE ISSUES

Many guests come to Pacific Island hotels with high expectations of lush tropical gardens and these can be an important asset for a hotel. Further rewards are gained when they include native species and attract birds and butterflies.

However, intensive land-scaping on tropical islands can have serious impacts. Turf and herbaceous annual plants can consume large quantities of water, while pesticides and fertilisers are often used in large quantities. More often than not proven 'international landscape species' displace 'unknown' hardy, native plants. This trend tends to make uniform landscapes which are less attractive to native animals and which require more attention.

Minimise intensive landscaping, instead maximize prudent extensive management of 'natural habitats'. Retaining native species and enhancing their interest with interpretive signs can greatly increase visitor interest and appreciation.

Cyclones can totally destroy a decade of intensive and expensive landscaping in a few hours. Native species are naturally and necessarily resilient to cyclones.

GOOD MANAGEMENT PRACTICES

- Plant native species – they consume less water and are more resistant to cyclones
- Plant native species which are known to attract birds,
- Use organic fertilisers and natural pest control methods
- Avoid large areas of turf or use a drought resistant species
- Avoid freshwater features
- Avoid (or minimize) use of chemical pesticides, herbicides, bactericides and fungicides

- Install drainable watering troughs for birds (drain regularly to prevent mosquitoes breeding)
- Compost plant and grass clippings (ensure it receives active management and does not become anaerobic when it starts producing methane – a potent greenhouse gas)
- Chip woody garden waste and use it as mulching material – reduces weeding and water requirements
- Water your garden at night to minimize evapotranspiration
- Include plaques on native species to educate visitors.

INVESTMENT MEASURES

- Store rain or use well water for irrigation purposes
- Use hoses with nozzle shut offs
- Use greywater from the hotel to water your garden
- Install drip irrigation systems
- Install automatic irrigation sensors which ensure gardens are only watered when necessary and for as long as intended – included amongst these are timers, falling rain and soil humidity sensors

WORM FARMING – AN OPTION

Cardboard, paper, garden waste, sewage sludge and some food scraps (not oils and fats) can be shredded, composted for about three weeks, and then fed to worms. After three to four months, the worm castings can be used on gardens instead of fertilizer.

The following Checklists can be used by the Village Environmental Ranger in conjunction with the business owner/operator to ensure that good environmental principles and practices are being followed in the construction, operation, management and marketing of the accommodation business.

1. Construction and Design

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Preserve native trees, plants, wetlands and mangroves</i>		
Avoid filling in or altering the course of wetlands and mangroves	✓ Construct around features or choose alternative sites	⇒ Important habitats will be destroyed and flooding may increase
Keep your trees	✓ Do not clear all trees during construction ✓ Retain and modify original vegetation around site	⇒ The trees will protect against coastal erosion
Protect your plants	✓ Store building materials in one place not several spots ✓ Provide well marked paths ✓ Set one place aside to mix concrete	⇒ Plants underneath building material piles will be killed ⇒ This minimizes damage ⇒ Mixing concrete at random spots kills plants
<i>Situate buildings to minimise damage to them from environmental factors</i>		
Set hard structures back from beach and shoreline	✓ Build at least 60m back from the beach	⇒ This minimizes damage from storm and coastal erosion
Elevate structures in flood-prone areas	✓ Piles may be used	⇒ Piles allow water to flow through with less damage
<i>Design structures to fit in with environment</i>		
Choose appropriate designs from buildings	✓ Local and traditional designs are adapted for the environment ✓ Use locally obtained native building materials	⇒ Traditional designs also give the guests a more local experience ⇒ These require less maintenance and cost less to transport
Avoid construction in areas of cultural or archaeological importance		

2. SAVING ENERGY

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Cooling rooms</i>		
Use natural ventilation	✓ Large areas of wooden louvre windows ✓ Open louvres on shady side ✓ Close louvres on sunny side ✓ Use glass windows that can open fully ✓ Close curtains or build shades over windows on sunny side	⇒ Mosquito screening important ⇒ Mosquito screening important
Use fans - avoid Air Conditioning	✓ Ceiling fans	⇒ Position over beds especially important
If you must use Air Conditioning It must be as efficient as possible	✓ Clean filters regularly ✓ Close doors and windows at all times to keep cold air in ✓ Set thermostats to 23 – 25°C to avoid over-cooling	⇒ Use a key-tag system that shuts off A/C when guest leaves room ⇒ A/Cs must be protected against sun, saltwater and wind
<i>Lighting rooms</i>		
Make the most of daylight	✓ Large areas of windows ✓ Clean all glass and screens often	⇒ Mosquito screening important
Make the most of your light fittings (shades and bulbs)	✓ Place light fittings where they shed the most light in the room ✓ Use smaller bulbs in bedside lights ✓ Clean light shades regularly ✓ Use energy-saving fluorescent bulbs	⇒ Avoid lights that are just for display ⇒ Should be moveable to aid reading ⇒ Save energy, last longer, keep room cooler, cheaper over a long time
Turn off unused lights	✓ All staff should be trained to turn off lights when leaving a room	⇒ Turn off any that guests have left on when they go out

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
Hot water		
Water heaters	✓ Do laundry in cold or cool water ✓ Use full loads in washing machines and driers ✓ Set showers to lower temperature ✓ Drain and flush hot water tanks every 6 months	⇒ Also better for clothes ⇒ Washing half-loads is inefficient ⇒ 50 or 60°C is fine ⇒ Reduces build up of deposits
Solar Power	✓ Use Solar power for lights and hot water. It is expensive at first but cheaper than electricity over time	⇒ Simple solar water heaters can be home made using plumbing pipes on the roof.
Other hot water systems	✓ Use Solar power first and then "top up" with other power source	⇒ Gas (LPG) heaters are better than electric
Insulate hot water pipes	✓ Wrap pipes to avoid heat loss between heater and user	
Other equipment		
Fridges and freezers	✓ Use chest freezers (top-opening) ✓ Clean door seals regularly	⇒ Opening doors on cupboard style loses cold air ⇒ If doors do not close properly, replace seals
Kitchen and office equipment	✓ Make sure staff always turn off equipment after work	⇒ Especially gas burners in kitchen
Buying equipment		
Buy energy efficient equipment	✓ Look for labels and ask for information	⇒ If your supplier cannot get this information, think about using a different supplier
Do not buy equipment that is larger than you need	✓ Make sure you buy the correct size generator, water heater, fridge etc for your purpose	⇒ Generators that are too big for the job are just wasting fuel

3 SAVING WATER

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Collect rainwater</i>		
Collect rain from roofs and store in closed tanks	✓ Put gutters around all roof edges, and direct into a storage tank.	⇒ Roofs and gutters must be cleaned regularly
<i>Stop leaks and deliberate wastage</i>		
Make sure all leaks are stopped quickly	✓ Train staff to report all leaks and send someone to fix them at once ✓ Fit 'water guns' to hosepipes so that they stop running immediately after use	⇒ Dripping taps, running toilet cisterns and leaking pipes waste a lot of water ⇒ Replace any that start to leak 1 dripping tap wastes 25 litres of water a day!
Do not use water unnecessarily	✓ Sweep paths and floors instead of washing down with a hosepipe	
<i>Watering gardens</i>		
Use grey water from bathrooms	✓ Showers and bathroom sinks can be plumbed so that the water runs directly onto the garden instead of into the septic tank	⇒ Do not do this with kitchen sinks, where waste food could cause problems
Use efficient watering systems	✓ Water using a drip-system or directed pipes	⇒ A system of narrow pipes with small holes by plants saves a lot of water.
<i>Toilets and showers</i>		
Reduce the amount of water used by toilet flushing	✓ EITHER buy two-flush or low-flush toilets, OR put a large stone or water-filled bottle in the cistern of a regular toilet to take up space ✓ Consider toilets that do not use fresh water	⇒ Do not reduce it so much that the flush doesn't work – experiment to get the right size stone or bottle ⇒ Salt-water flush systems and no-water composting toilets are available
Reduce the amount of water used by showering and washing	✓ Fit water-saving shower heads ✓ Fit spring-loaded taps in sinks, that turn themselves off after use	⇒ Use low flow devices on showers- (less than 12 L/min) and taps (6 L/min), ⇒ This is good for public rooms

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Kitchen</i>		
Make efficient use of water for dish washing	✓ Do not wash under a running tap, use washing up bowl ✓ If using dish washers, always wait until you have a full load. Do not wash half loads or just a few pots.	⇒ Dish washers use a lot of water – it is better to wash by hand, or buy the new more water-efficient ones.
<i>Swimming pools</i>		
Reduce spills and leaks	✓ Have pool re-surfaced every year ✓ Use a design where spills over the lip are channeled back into the system ✓ Consider having a salt-water instead of fresh-water pool	
<i>Laundry</i>		
Make efficient use of washing machines	✓ Try not to wash half loads- wait until there is a full machine before operating	
Reduce washing of guest linen – Let guests decide how often towels and sheets are changed	✓ Put cards and signs up asking guests how often they want their towels and sheets changed (See examples below)	⇒ Not doing daily laundry saves water AND energy

4. REDUCING RUBBISH AND LITTER:

 **RETHINK**  **REDUCE**  **REUSE**  **RECYCLE** 

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Reduce the Rubbish you buy</i>		
Reduce the amount of rubbish that comes to you	✓ Stop buying packaging you don't need ✓ Avoid products that have a lot of useless packaging ✓ Use cloth bags instead of plastic ✓ Buy in bulk instead of small packets ✓ Do not use single serve portions of anything – buy large containers and put it into small re-usable jars or pots. (This looks a lot nicer too) ✓ Use rechargeable batteries instead of regular ones – it comes out cheaper in the long run too	⇒ 20-30% of a hotel's solid waste is packaging ⇒ Preferably in refillable or returnable containers ⇒ For example do not buy single packages of jam, butter, sugars, cereals, biscuits, sweets, milk, salt, pepper, coffee/tea/drinking chocolate, shampoo, etc ⇒ Batteries are one of the worst kinds of rubbish – when thrown away the acid in them kills plants on land and corals in the sea
Cut down on disposable plastic and paper	✓ Do not buy one-use plastic or paper plates and cups, or Styrofoam food boxes. Do not use plastic knives, forks or spoons. ✓ Do not wrap anything in plastic film – get re-usable plastic containers with sealed lids instead ✓ Do not buy anything that comes packaged in Styrofoam (Polystyrene) ✓ Use cloth napkins instead of paper	⇒ Use thick plastic or pottery plates and cups, and metal knives, forks and spoons that you can rewash ⇒ Plastic film is used all over the islands and is totally unnecessary ⇒ Styrofoam (Polystyrene) never breaks down, and is permanent

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Recycle and Re-use</i>		
Reduce your use of new materials	✓ Try and buy things made from recycled materials whenever possible	⇒ This works for both plastic and paper
Save paper	✓ Use both sides of a piece of paper - use old letters and notices for office notes and scrap paper ✓ Re-use envelopes ✓ Use as few forms as possible – make one form do where you had two before. ✓ If you have a computer, use email as much as possible instead of letters and faxes ✓ Use cloth napkins instead of paper	⇒ You do not need to print out every email – most can be read and answered without using any paper
Re-use old material	✓ Recover and repair damaged furniture ✓ Keep old uniforms and use them for “dirty” jobs or where staff are not seen by guests ✓ Reuse worn sheets and tablecloths – cut them up and make them into pillowcases, napkins, cleaning rags etc. ✓ Give anything that cannot be adequately repaired or reused to the local community or staff members	⇒ Old towels can be made into facecloths or cleaning rags ⇒ Just because it doesn't look nice enough for use in the hotel does not mean it isn't useful to someone
Send whatever you can for recycling	✓ Some glass and plastic bottles can be sent back to the manufacturer and made into new products. Where possible, do this	⇒ There is very little recycling in the South Pacific. If necessary join up with other operations to organize collection etc

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Rubbish Disposal – NEVER let rubbish into the sea or rivers</i>		
Use public dumps and tips	✓ If there is one available, always send your rubbish to a public dump or tip. ALWAYS try and send Hazardous Waste to a proper tip (see below)	⇒ Not all are well-run or may be a long way off, but it is still better than starting your own tip
If you do not have a public tip, make sure that you create your own properly	✓ Split rubbish into different types for proper disposal ✓ Food waste – can be sent to feed local pigs ✓ Clean vegetable and fruit waste (no fats or oils) can be added to compost heaps (see gardens) ✓ BURN paper and cardboard ✓ BURY plastics ✓ Hazardous waste needs to be buried in a special dump that is NOT near any water or gardens. This one place should be the only one used for this type of rubbish	⇒ Get advice from your Local Authority on a suitable site. It should be more than 10m above the water table and not located in flood-prone areas. ⇒ NOT BURIED ⇒ NOT BURNED - can give off poisonous gases ⇒ Hazardous waste includes batteries, spray cans, pesticide cans, paint cans, oils etc. DO NOT BURN - there is a risk of explosion



The Problems with Plastics:

- Plastics take a very long time to decompose
- Buried plastics will stay the same for many years to come
- Most plastic cannot be easily recycled
- Some plastics slowly release poisons into the food or liquids they hold
- When burned, many plastics release highly dangerous gases
- Outboard engines can suck plastic bags into their water inlets and overheat
- Turtles often eat floating plastic bags, choke and die
- Seabirds have been found choked inside the plastic rings that hold 6 drink cans together



5. REDUCING POLLUTION

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Detergents</i>		
Reduce phosphate levels in waste water	✓ Only buy NP (No Phosphorous) or LP (Low Phosphorous) detergents – examples are Simple Green (from Cost U Less) and Black and Gold (from MH)	⇒ Phosphates from regular detergents get washed into the sea and feed seaweed growth, which kills corals and fish.
Reduce chlorine levels in waste water	✓ Use as little bleach as you can - boiling water will sterilise cloths and plates ✓ Do not use bleach to keep paths or decks clear of slime – scrub or water blast instead	⇒ Chlorine in streams and seas kills shrimps and fish
<i>Solvents and Spirits</i>		
Reduce solvents getting into the soil and water	✓ Use water-based paint not spirit-based ✓ Make sure waste paint is disposed of in well-sealed containers that cannot leak ✓ Dispose of all oils, spirits, fuel and batteries carefully and properly in sealed containers to special dumps ✓ Label all waste solvent containers carefully	⇒ Spirit and spirit-based paints leak to soil and poison plants ⇒ Spirit-based paint burns very easily and cause explosions and fires ⇒ As batteries rust, acids are released into soil and sea ⇒ Do not mix different solvent or spirits – you may cause explosion or poisonous gases
<i>Gases</i>		
Reduce the amount of CFC gases you release into the environment	✓ Do not buy more spray cans than necessary – instead use hand pumps, solid products or look for “No CFCs” sprays ✓ When buying new fire extinguishers ask for “Halon-Free” ✓ Dispose of old fridges and air conditioners properly – take to a tip or have the cooling fluids taken out by a professional ✓ When buying new fridges and freezers ask for “environmentally friendly”	⇒ CFCs contribute to Global Warming (e.g., aerosol sprays, fire-extinguishers, solvents, foams) ⇒ CFCs in the cooling fluids are released into the environment if they are allowed to rust and leak

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Motor exhausts</i>		
Reduce the amount of poisons that your cars and boats put out	✓ Carry out regular engine maintenance ✓ Use lead-free petrol ✓ Buy products from local suppliers to reduce the amount of transport needed to get things to you ✓ If possible buy 4-stroke outboard boat engines instead of 2-stroke – they do not put exhaust gases into the water	⇒ This also will make your engine last longer, and use less fuel ⇒ They are more expensive to buy, but pay for themselves by lasting longer and using less fuel
<i>Fuel storage</i>		
Avoid fuel leaks into the ground	✓ Avoid underground storage tanks, or line such tanks properly	⇒ Cracked tanks let water into the fuel, and fuel into the ground
Build a proper fuel storage depot	✓ Provide a concrete floor, shady roof, wire mesh walls and a lockable door to your fuel store. Keep it away from heat and fire sources. ✓ Keep different types of fuel in clearly marked drums ✓ Provide proper fuel pumps to avoid spills during pouring	⇒ Keep rain and sun away from fuel storage drums. Allow plenty of air circulation. No smoking in the area.
<i>Take precautions</i>		
Make a spill containment plan	✓ Have a properly thought out plan and equipment available for an emergency spill – absorbent powder for mopping up fuel etc.	⇒ Get suggestions from the OHS for your situation
Find out what is poisonous in the things you use	✓ Many regularly used materials are very poisonous. (See list below) Get a “Material Safety Data Sheet” from the supplier to find out the details	⇒ If the supplier cannot produce a “Material Safety Data Sheet”, consider changing your supplier to one who can.



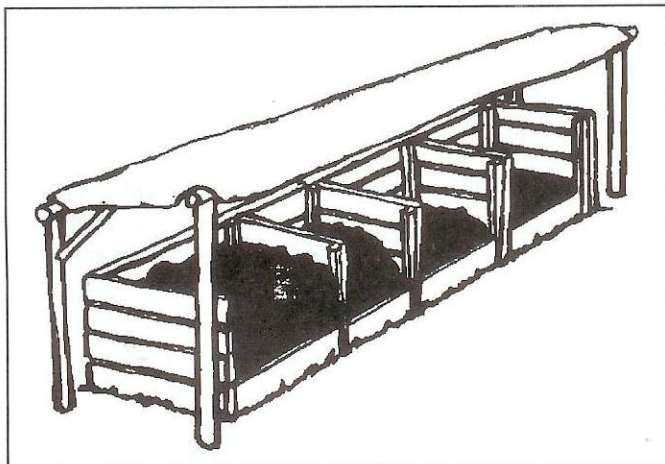
Poisons and acids found in normal-use products

Acids, adhesives, air conditioning refrigerants, automobile supplies, batteries, drain cleaners, disinfectants, dyes, glues, grease and rust solvents, lawn products, metal cleaners, polishes, medicines, paints, paint thinner, paint strippers/ removers, pesticides, oven cleaners, plastics, starter fluids, wood preservatives, wood cleaners, polishes.

6. MANAGING GARDENS AND LANDSCAPES

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Use local plants</i>		
Do not clear out all local plants and trees and plant foreign ones	✓ Use local plants wherever possible in your gardens	⇒ Foreign plants make everywhere look the same, use more water and are less cyclone and salt resistant
Keep shade trees over roofs		
Make an attraction of your local species	✓ Plant species that attract local birds and butterflies ✓ Use labels to explain what the plants are and how they are traditionally used	⇒ Foreign plants may not provide food and shelter for local animals ⇒ Tourists like to learn about local plants and customs
<i>Water and weed your garden wisely</i>		
Reduce water use in your garden	✓ Do not build pools, waterfalls and fountains ✓ Avoid large grass lawns – plant flowerbeds with local plants instead, or look for special drought-resistant species of grass that need less water ✓ Do your watering at night, not during the day ✓ Use grey water from bathrooms to water gardens	⇒ These waste water and can breed mosquitoes ⇒ Grass needs a lot more watering than other plants and loses a lot of water through evaporation ⇒ This reduces water lost through evaporation from sun ⇒ Plumb shower drains to run straight out into the garden
Use drip or spot irrigation instead of watering the whole area	✓ Run thin pipes over your garden, and drill small holes next to the plants you want to water. A small amount of water can then be used to water the plants without wastage	⇒ You can buy drip irrigation systems that use 30 – 70% less water than conventional irrigation systems

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Water and weed your garden wisely (continued)</i>		
Reduce use of chemicals and fertilisers	✓ Pull up weeds instead of spraying pesticides ✓ Use old coconut husks to cover soil between plants in flowerbeds ✓ Use natural pest control methods ✓ Make compost out of grass clippings, weed and food waste (see box below) and dig into soil instead of using chemical fertilisers	⇒ Pesticides get carried to the sea when it rains and kill corals and fish ⇒ This will stop weeds growing and reduce water loss ⇒ Fertilisers get carried to the sea when it rains and make seaweed grow, which kills corals and fish



Compost Piles:

Cardboard, Paper, Grass clippings, Weeds, Garden waste, Fruit and Vegetable food scraps (not oil or fat), can be shredded or cut up into small pieces, and made into a compost heap.

In time these will make rich natural fertiliser that can be dug into gardens.

Making a Compost Pile:

Composting can be done in a pile at the end of a garden without a bin. However, in resorts, bins make the process look much neater and cleaner. It also can speed up the break down of the materials.

A good size is 1.5 Metre x 1.5 Metre x 1.5 Metre. Several bins can be put side by side as shown in the illustration above (from Greenpeace). Walls can be wire fence or concrete block, a floor that lets air through will speed up the process.

All materials should be torn up into small pieces, and mixed well. Layer rich "green" materials like kitchen waste, fresh plant cuttings etc with drier "brown" waste such as shredded coconut husks, paper and cardboard. Add a little garden soil so that there are natural bacteria in the mix.

The heap should be dug and turned over regularly, at least once a week, to stop methane gas forming. If you can add worms to the compost heap after 3 weeks, they will speed up the break down. The heap will get warm after each time it is turned over. When it stops getting warm, the process is finished.

This will form a rich soil that can be dug into gardens instead of chemical fertilisers.

7. SUPPLIERS AND CONTRACTORS

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
<i>Only deal with suppliers and contractors who can provide environmentally friendly products</i>		
Work with suppliers and contractors who have adopted an environmental policy	✓ Choose suppliers who deliver in reusable crates ✓ Choose suppliers who refill packaging containers ✓ Choose suppliers who are open about environmental aspects of their products and services	⇒ If suppliers cannot answer your questions, ask them to find you more information, or change to another supplier who can
<i>A summary to use when looking for product suppliers</i>		
Avoid products made with, or containing, environmentally harmful materials i.e. ozone depleting substances or toxic chemicals	✓ Avoid halon based fire extinguishers ✓ Avoid CFC based refrigerators and chillers ✓ Avoid phosphate or chlorine based cleaning chemicals, ✓ Avoid vehicles running on leaded petrol ✓ Avoid CFC based aerosol sprays	
Avoid over-packaged products and suppliers	✓ Avoid single-serve packages for catering and guest rooms (e.g. condiments, beverages, bathroom amenity products) ✓ Avoid disposable or single use products, e.g. paper cups, napkins ✓ Avoid disposable packaging cases, e.g. cardboard boxes	
Buy water conserving equipment	✓ Buy two-level flush conserving toilets ✓ Buy conserving laundry washing machines ✓ Buy aerators or low-volume shower heads ✓ Buy flow restrictors for taps	
Buy energy efficient equipment	✓ Buy efficient computers ✓ Buy efficient photocopiers ✓ Buy efficient light bulbs ✓ Buy efficient laundry washing machines and driers ✓ Buy timers and sensors for switches	
Buy in bulk and only what you need	✓ Bulk buy bathroom products ✓ Bulk buy cleaning chemicals ✓ Bulk buy kitchen and bar supplies	
Maximise use of reusable, recycled and recyclable products	✓ Buy rechargeable batteries ✓ Buy recycled toilet paper for staff areas ✓ Bulk buy kitchen and bar supplies ✓ Use recycled paper for photocopying and notes ✓ Buy plain paper fax machines and use the back sides of used paper in them (Heat treated fax paper fades quickly in hot climates anyway)	

8. INVOLVING LOCAL STAFF AND COMMUNITIES

WHAT TO DO	HOW TO DO IT	CONSIDERATIONS
Staff		
Include all staff in the environmental policy	✓ Put up posters to remind staff of actions they can take to reduce environmental impact ✓ Provide incentives for staff to reward new ideas for good environmental practice ✓ Undertake awareness training sessions on environmental topics ✓ Organise staff and/or local community clean-ups/or equivalent functions	⇒ Make sure posters are in languages the staff can easily understand ⇒ An informal kava session is fine for this
Local community		
Engage in improving environmental facilities for the local communities	✓ Provide improved waste disposal facilities and education for the communities ✓ Assist local communities to conserve and manage 'tourist attractions' on their land	⇒ Start a communal dump and encourage the community to separate wastes as discussed in "Rubbish Disposal" ⇒ E.g. beaches, waterfalls, historic sites, forest walks or recreation areas
Get local people involved in environmental programmes	✓ Organise a local "Clean-Up Day" ✓ Run awareness programmes ✓ Provide educational materials for schools and community halls ✓ Employ local people for special cleans ups	⇒ World Environment Day is June 5th



One example of community involvement can be seen on the Coral Coast. The Shangri-La Fijian Resort and Cuvu district in Fiji have formed a mutually beneficial partnership facilitated by a local organisation Partners in Community Development Fiji (PCDF). Community discussions have been supported by the resort to develop a marine resource management plan.

Three main reserves have been set up to increase the health of the reef and fish stocks. One is in front of the resort where coral and giant clams have also been "planted". PCDF has also worked with the resort to develop artificial wetlands to remove nutrients from resort waste rather than allowing them to enter the reef area.

Food safety checklist

Personal hygiene	
	Food handlers well-groomed and demonstrating personal cleanliness
	Appropriate clean clothing worn
	Hair pulled back and/or covered
	Hands washed thoroughly with warm soapy water before handling foods and during food handling
	No jewellery
	Fingernails short, clean and no polish
	Food handling staff in good health with no open sores, burns or wounds
Purchasing	
	Only buy foods from reputable sources
	Check that foods are fresh and undamaged
	Check that used by dates have not passed
	Make sure frozen foods are frozen and do not show signs of having been thawed & re-frozen
	Check foods have been stored at the correct temperatures
Transporting food	
	Separate raw foods from other foods
	Keep frozen foods frozen (use a chiller with ice packs or ice)
	Keep chilled foods cool (use a chiller with ice packs or ice)
Storing foods	
	Refrigerator temperature is between 0° to 4° C & freezer is between -15° to -18° C
	Raw foods, such as meat, chicken & fish are stored at the bottom of the refrigerator
	Eggs are stored in the refrigerator
	Frozen foods are stored in the freezer
	Refrigerators and freezers are cleaned regularly using a mild bleach solution
	Allow space for air-flow in fridges and freezers
	Pantry items are stored above the floor and away from direct sunlight
	Use-by dates are checked regularly and out of date products disposed of

Food preparation	
	Thaw frozen foods in the fridge or in a cool water bath
	Do not cook foods until they are completely defrosted
	Cook meats until they are cooked through and the juices run clear
	Do not use foods with damaged packaging (torn packages, dented tins etc.)
	Wash fresh fruits and vegetables before peeling or cooking
	Use separate cutting boards and utensils for raw and cooked foods
	If foods are to be stored, cool quickly and place in fridge or freezer
	Do not serve re-heated leftovers to guests
	Take extra care with barbeque, lovo or picnic foods
	Wash hands regularly during food preparation
Food service	
	Keep hot foods hot and cool/cold foods cold
	Keep food covered as much as possible
	Use appropriate and separate serving utensils
	Clean spills with a clean cloth or towel
Facilities & equipment	
	Kitchen and eating areas are clean, and free of dirt, rubbish, pests and animals
	Bench tops, floors and walls are cleaned everyday
	Rubbish is stored well away from food preparation and service areas
	Rubbish bins are leak free with firm covers to keep out pests and animals
	All food contact surfaces are cleaned thoroughly and sanitised with a mild bleach solution
	All food preparation and serving equipment is properly cleaned and dried after each use
	Equipment is used and stored properly to prevent contamination
Special needs	
	Know if guests have special food needs or requirements
	Know how to handle food allergies & outbreaks of food poisoning
	Provide appropriate facilities for catering for babies and children

4. Applying National Conservation Strategies to the Village Conservation Management Plan

4.1. Fiji National Biodiversity Strategy Action Plan (NBSAP)

Fiji signed the Convention on Biological Diversity (CBD) at the Earth Summit held in Rio De Janeiro in 1992, where the Government of Fiji pledged the country's support to play its part, along with 150 other nations of the world, to halt the continuing decline of global biodiversity. The first step in this commitment was to produce the NBSAP.

The NBSAP, endorsed by Cabinet in 2003, aims to conserve and sustainably use Fiji's terrestrial, freshwater and marine biodiversity and to maintain the ecological processes and systems which are the foundation of national and local development.

Biodiversity is defined as the variety of life forms, the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form. It is usually considered at three levels: genetic diversity; species diversity and ecosystem diversity.

Fiji's biodiversity can boast a wide variety of flora and fauna, including:

- 2,600 vascular plants
- 2,225 seed plants
- 310 ferns
- 1,000 introduced plants
- 61 types of molluscs and crustracea
- 120 bird species
- known species of bats
- 96 different species of freshwater fish
- 26 reptile species

There are a variety of ecosystems in Fiji with various habitats containing a variety of these species of fauna and flora that help to sustain human livelihoods. There are also endemic (originating in and confined only to Fiji) species in the environment that must be protected as they are not found anywhere else in the world. Fiji has an obligation under the CBD to protect such endemic species.

The NBSAP document provides a useful overview of Fiji's biodiversity, emphasizing which species or groups require specific attention because of their endemic, culturally important or threatened status. It also sets out a framework for biodiversity management with specific focal areas, objectives and actions required. The main focal areas identified are:

- Community Support – Awareness, Involvement and Ownership
- Improving Knowledge

- Developing Protected Areas
- Species Conservation
- Control of Invasive Species
- Capacity Building and Strengthening

Much of the success of this National Strategy for a Conservation Program will rely on the effective partnerships that will need to be formed between Government departments, NGO's and local village communities to enable them to attain sustainable community level natural resource management practices.

There is an urgent need to increase awareness and implementation of biodiversity conservation in Fijian villages as 80% of the land and large expanses of the sea are under traditional ownership at the village level. While the traditional subsistence life style in villages necessitated respect for biodiversity as the basis for life, the current period of rapid modernization creates increasing pressures to utilize land and marine resources in an unsustainable manner. There are a number of project activities that can be undertaken to implement a Village Awareness of Biodiversity Conservation Program. These include:

- To undertake a study of all Fijian villages to ascertain their natural and cultural profiles through interviews and surveys.
- To conduct workshops in each tikina stressing the importance of environment protection, sustainable development and the protection of intellectual cultural property rights.
- To begin the process of documenting and registering traditional knowledge for each village as a basis for a traditional knowledge rights system in Fiji.
- To undertake biodiversity conservation pilot projects at tikina level such as setting up nurseries of culturally important plants and rehabilitation of degraded areas.

4.2. Working with Environmental NGO's, Regional Organisations and their Funding Agencies

All village communities interested in protecting their environment by establishing a Conservation Management Plan and on Environment Rangers Program, need to network with most of the following agencies.

Wetlands International (WI) is the only global NGO dedicated to the conservation and wise use of wetlands. They work globally, regionally and nationally to achieve the conservation and wise use of wetlands, to benefit biodiversity and human well-being.

Wetlands International is an independent, not-for-profit, global organisation, supported by Government membership from all continents of the world, extensive specialist networks and volunteers. It currently works through 15 country offices — in Central and Eastern Europe, Africa, South, East and North Asia, Oceania and South America; with its

Wetlands International has adopted the following four long-term, strategic global goals to provide direction to its future work.

Global Goal 1: Stakeholders and decision makers are **well informed** about the status and trends of wetlands, their biodiversity and priorities for action

Global Goal 2: The functions and values of wetlands are recognised and integrated into **sustainable development**

Global Goal 3: Conservation and sustainable use of wetlands is achieved through **integrated water resource management** and coastal zone management

Global Goal 4: Large scale, strategic initiatives result in **improved conservation** status of species, habitats and ecological networks.

In Fiji their studies have revealed that of the 124 species of freshwater fish found in Fiji, 11 are endemic of which 4 are newly identified species. Threats to these species included industrial logging and communal waste dumped into waterways. They are in the process of preparing a red list that contains species that are becoming endangered, so that people will be aware of which species are protected and are prohibited from being caught. Their surveys also revealed many sites are classed as exotic and that ecosystem based management is crucial for watersheds/islands which are exotic and should be prioritized for conservation.

Birdlife International (BI) Pacific Partnership

Birdlife International was established in 2002 in a global partnership with about 100 member countries of which 8 are Pacific Islands including Fiji. Out of the 289 endangered species in the world, 37 are found in the Pacific. Fiji hosts 12 threatened species. Birds are the best known indicators of biodiversity and are being threatened by commercial logging, alien pests (especially rats) and wild plants. Recently, they are in line with the requirements of the NBSAP

Activities under the projects have included awareness as a integral part of all programs, publication of IBAs which documented fourteen(14) bird areas in Fiji, identification of sea colonies and the 11 oldest grown forests; an interim commitment to protect 3000ha in Natewa for protecting critically endangered species which will be followed by species recovery process; and assisting in the feasibility studies on the Vatuiria management of invasive species. BI is also contributing to community capacity building by sponsoring 2 students at USP and promoting Fijian conservation in the international arena.

Conservation International

Conservation International, through its Future for Life strategy and campaign has the following main objectives:

- Save **species** in the most biologically diverse and irreplaceable regions of the world, which contributes to the vital balance of all living things.
- Conserve **landscapes and seascapes** – from tropical forests to crucial coastal habitats – to support human well-being, biological diversity, and natural resource preservation.
- Empower **local communities** to ensure that responsible and effective use of natural resources happens around the world, for the benefit of local people.
- Develop **innovative methods** to address issues such as climate change, human well-being, and corporate best practices, by undertaking carbon projects to benefit local communities, protect biodiversity, and address climate concerns.
- Raise awareness of a **conservation ethic** and build a shared mindset in governments, development institutions, corporations, partner organizations, and local communities.

In Fiji, CI is focusing on:

- Building and strengthening the capacity of the National Trust, Government departments, landowners and other partners in the Sovi Basin conservation and management plan.
- Providing support to existing marine related projects through the FLMMA project.
- CI is also embarking on a new concept of faith based conservation working with religious groups and institutions to set up a curriculum for conservation.
- Establishing legal policy frameworks in setting up forest management units involving the local resource owners.

Wildlife Conservation Society (WCS)

The Wildlife Conservation Society saves wildlife and wild lands through careful science, international conservation, education, and the management of the world's largest system of urban wildlife parks. These activities change attitudes toward nature and help people imagine wildlife and humans living in sustainable interaction on both a local and a global scale. WCS is committed to this work because they believe it essential to the integrity of life on Earth.

WCS was established in Fiji in 2001 with their head office in the USA. Their work on environment management and conservation has been science based as they believe that the best conservation result could be obtained from integrating modern science with traditional knowledge. WCS works with communities and values traditional knowledge. WCS is currently working on the Waimanu Watershed management project to establish conservation areas. They have also partnered with WWF on marine protected areas.

Their approach towards conservation education have included conducting awareness programs

with communities to change their perceptions and stimulate interest, using traditional knowledge with modern science and taking it to the people, workshops with quarantine on ants as part of their effort in addressing invasive species, and the involvement of students and communities in doing surveys.

Fiji Locally Managed Marine Areas (FLMMA)

With communities as their main priority, FLMMA entered into a collaborative partnership in 2001 with the mission “everlasting fish of the future generation”. The main purpose is to set up marine protected areas (MPA’s) for conservation and healthy ecosystems, to combat the common threats to marine fisheries which include overfishing, mangrove cutting, pollution and coral harvesting.

FLMMA is managed by the USA Management Support Team, mainly comprising NGOs, church, community groups, Peace Corps and field officers.

The key to FLMMA’s success has been that they receive requests from the communities to

manage their i qoliqoli. FLMMA is currently working on 116 i qoliqoli out of a total of 205 sites. They work in 187 districts in empowering local communities to manage their marine resources. FLMMA facilitates communities in developing an activities plan and management plans, restriction on tabu area, restrictions on marine species and marine life, and adopt approaches for increased awareness and monitoring programs.

USP Institute of Applied Science (IAS)

IAS has about 300 senior support staff with their key focus is to support environment projects through consultancy work and capacity building. In 1999, a series of field studies were conducted while a case study for biodiversity is currently being done for the Sovi Basin. For surveys to be conducted, they rely on overseas consultants but seek more local involvement. At present, 6 local people are being trained and 12 are currently completing their Degree PHD.

IAS also do EIAs upon request from the proponents. It supports the Integrated Coastal Management community based projects and have successfully implemented projects with the Nature Conservancy based on socio economic research. They also work through FLMMA network on monitoring and evaluating marine protected areas.

World Wide Fund for Nature (WWF) South Pacific

The World Wide Fund for Nature (WWF) South Pacific Programme Office is a non-governmental conservation organisation serving the Pacific Island countries. The programme was established in 1990 as part of WWF's endeavour to work effectively and locally in the region. The programme is managed from a regional base in Suva, Fiji and organises a strategic series of conservation field projects, policy reviews and campaigns in different Pacific Island countries on behalf of the WWF network. As well as the

Regional Secretariat in Suva, Country programme offices have been established in the Cook Islands, Fiji, Solomon Islands and Papua New Guinea and New Caledonia.

Established in 1961, WWF (formerly known as the World Wildlife Fund) is headquartered in Gland, Switzerland. It has 4.7 million supporters and a global network active in more than 90 countries. WWF is currently funding over 2,000 conservation projects around the world. In just over four decades, WWF has become one of the world's largest and most respected independent conservation organizations. WWF's ultimate goal is to stop and eventually reverse environmental degradation and to build a future where people live in harmony with nature.

WWF has been working since 1990 with the governments and peoples of the Pacific on conservation and natural resource management programmes and projects. In Fiji, WWF is working with 64 villages and 10 tikinas. Besides working with communities and establishing MPAs they also work towards protecting species such as turtles, vesii, humphead wrasse, whales and parrot fish.

For communities, WWF is currently working on improving knowledge, biological marine baseline surveys, developing protected areas and identifying linkages between sustainable natural resources and conservation area establishment.

Foundation of the People of the South Pacific International

- The Foundation of the Peoples of the South Pacific International (FSPI) is a network of South Pacific island non-governmental organisations and overseas affiliates working in partnership across the South Pacific. The main function of the FSPI Secretariat, based in Suva, is to coordinate the planning and design of regional development projects, based on the needs identified by the members and their constituencies. Their vision focuses on the empowerment to protect the in sites. Fiji who undertake the following programs, FSPI is working through Partners in Community Development (PCDF).
- The Governance Program evolved from efforts to address the critical governance issues facing the Pacific community and promote the development of good governance from the community level in the region
- The Communities and Coasts Program works towards self reliant coastal communities securing their quality of life through sustainable and integrated resource management
- The Health Program includes The Masculinity, Mental Health, and Violence project (MMHV) which addresses the growing numbers of out-of-school and unemployed youth, a severe shortage of employment opportunities, and the related increase of mental health problems, violence and crime
- The Disaster Preparedness Program is a new program to assist countries in their preparation for national emergencies, by examining existing response procedures,

and implementing processes that will enhance risk reduction and crisis management capabilities.

- The Rural Development Program will look at ways to support innovative work (e.g. niche product development and new crop development: coconut oil, market flowers, off-season pineapple etc) where knowledge and infrastructure already exist in communities

International Union for the Conservation of Nature (IUCN)

The IUCN or World Conservation Union as it is commonly known was founded in October 1948 as the International Union for the Protection of Nature (or IUPN) following an international conference in Fontainebleau, France. The organization changed its name to the International Union for Conservation of Nature and Natural Resources in 1956.

The IUCN is the world's largest and most important conservation network. The Union brings together 83 States, 110 government agencies, more than 800 non-governmental organizations (NGOs), and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership.

The Union's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. The World Conservation Union is a multicultural, multilingual organization with 1100 staff located in 40 countries. Its headquarters are in Gland, Switzerland.

The IUCN continues to improve scientific understanding of what natural ecosystems provide to humans. But the Union also seeks to ensure this knowledge is used in practical ways by bringing together scientists, policy makers, business leaders and NGOs to impact the way the world values and uses nature. The IUCN supports and develops cutting-edge conservation science; implements this research in field projects around the world; and then links both research and results to local, national, regional and global policy by convening dialogues between governments, civil society and the private sector.

The priority of the Union's current Programme is to build recognition of the many ways in which human lives and livelihoods, especially of the poor, depend on the sustainable management of natural resources. In its projects, the Union applies sound ecosystem management to conserve biodiversity and builds sustainable livelihoods for those directly dependent on natural resources. The Union is actively engaged in managing and restoring ecosystems and improving people's lives, economies and societies.

As the world's largest environmental knowledge network, the Union has helped over 75 countries to prepare and implement national conservation and biodiversity strategies. The Union also has the official status of Observer at the United Nations General Assembly.

Some examples of the type of work IUCN are involved in, include:

Knowledge

- Monitoring the state of the world's species through the IUCN Red List of Threatened Species
- Contributing to and supporting the Millennium Ecosystem Assessment
- Convening multi stakeholder events such as the World Parks Congress in 2003
- Disseminating the Union's knowledge and expertise through the World Conservation Bookstore

Policy

- Giving policy advice and technical support to governments, UN organizations, international conventions and other groupings such as the G8 and G7.
- Assessing all new sites nominated for natural World Heritage Site listing
- Contributing technical assistance to prepare national biodiversity strategies and action plans
- Providing technical support for drafting environmental laws and natural resource management strategies

Action

- Through the Water and Nature Initiative, working with 80 partners in a five-year global action plan in 10 water basins
- Through the Forest for Life Strategy, promoting wise management through guidelines for fire prevention and community management of forest resources
- Working with the corporate sector on energy and biodiversity, and mining and protected areas
- Facilitating Parks for Peace between countries in areas of conflict

National Trust of Fiji

The National Trust of Fiji is a statutory currently in Fiji devoted to the conservation of public resources. The trust was created in 1970 by the National Trust of Fiji Act.

It administers the country's six national parks and various historical sites. The parks are Koroyanitu National Park, Sigatoka Sandunes National Park, Colo-i-Suva Forest Reserve, Bouma National Park, Nausori Highlands, and Lovoni Trail.

The National Trust's primary purposes are preservation of historic and natural resources; promotion and augmentation of the amenities to those resources; conservation of flora and fauna; and provision of access to the historic and natural resources for the public.

Live and Learn Environmental Education

Live and Learn Environmental Education is a non-profit, non-government organisation which promotes greater understanding and action toward human and environmental sustainability through education and dialogue building.

Poverty reduction and improving the quality of life are two issues central to all their environmental education approaches. At the most basic level for all of us, quality of life includes regular access to safe drinking water, nutritious food, and access to basic sanitation. Live & Learn works with communities through critical entry points, such as safe drinking water issues, to address community health concerns but also to facilitate community ownership of problems and the action necessary to address and sustain a better quality of life for all community members.

The Austral Foundation

The Austral Foundation is a private operating foundation that works to achieve productive, sustainable, and accountable advances in conservation and development. The Austral Foundation describes itself as somewhat unique as it adopts the following approach in its work:

Independent - All programs are funded internally through an endowment. The Foundation does not rely on government, public, or special interest group support. Austral owns its products and is thus uniquely positioned to utilize and communicate its findings to achieve outcomes.

Cost Effective - Austral maximizes investment in program activities. Austral has no office, minimal overhead, and does not engage in fundraising from the public.

Philanthropic - Austral does not charge fees for the professional services it provides because program funding is covered by an endowment.

Expert - The Board of Directors consists of independent, internationally recognized experts in their respective fields who are actively involved in program implementation.

Multidisciplinary - Austral works in a number of fields including conservation, economic development, and governance.

Outcome Focused - Foundation support is typically directed to opportunities where investments generate products that are used to influence policy, enhance accountability, promote transparency, or advance education across a range of disciplines.

Proactive - Austral actively seeks program opportunities through established networks, research and investigation by its directors, and regular meetings to discuss emerging issues in the respective professions of board members.

International - The Foundation works in developed and developing countries.

What Austral Provides

- policy analysis and research services in a wide range of areas to promote conservation and development within countries in a manner that contributes to poverty reduction and protection of the environment.
- capacity building support services to facilitate improved governance, management, organizational development, and accountability.
- strategic analysis and review of approaches and performance of various aid donors and NGOs to facilitate accountable, transparent, efficient and effective utilization of donor funds.
- program design and development assistance to facilitate indigenous and local development of nationally-based organizations, poverty and conservation analysis, poverty alleviation, and sustainable development strategies.

South Pacific Regional Agencies

- **The Pacific Islands Forum Secretariat (PIFS)** is the region's principal political institution; It brings together independent states of the Pacific in an annual leaders' summit. Part of the Pacific Leaders' vision is to "seek a Pacific region that is respected for the quality of its governance, the sustainable management of its resources, the full observance of democratic values and for its defense and promotion of human rights". The Forum Secretariat is also responsible for formulating and implementing the Pacific Plan
- **The Pacific Islands Forum Fisheries Agency (FFA)** supports and enables members to achieve sustainable fisheries and maximize social and economic benefits in harmony with the broader environment. It is a regional intergovernmental organization set up to provide expert fisheries management and development advice and service to member countries.
- **Secretariat of the Pacific Community (SPC)** is a non-political organization delivering development assistance to the territories and countries of the region; the Pacific Community is serviced by the Secretariat of the Pacific Community (SPC). At 60 years old, SPC is the oldest of the Regional agencies with a membership that includes all 22 Pacific Island Countries and Territories as well as Australia, New Zealand, France and the United States of America. SPC has a complement of more than 350 staff and discharges its assistance through three technical divisions: Land Resources, Marine Resources, and Social Resources.
- **The Secretariat of the Pacific Regional Environment Programme (SPREP)** promotes regional cooperation and assistance in environmental matters. The vision of the organization is that "People of the Pacific islands are better able to plan, protect, manage and use their environment for sustainable development". The SPREP Annual Work Programmes is guided by and implements the "Action Plan for Managing the Environment of the Pacific Islands Region 2005-2009", and by its Strategic Programmes 2004-2013".

- **The Pacific Islands Applied Geoscience Commission (SOPAC)** an intergovernmental regional organization dedicated to providing products and services through three technical program areas of: Community Lifelines; Community Risk; and Ocean and Islands. It assists members to assess, explore and develop their mineral and other non-living resources.
- **The University of the South Pacific (USP)** is the region's premier provider of tertiary education and an international centre of excellence for teaching, research and capacity building on all aspects of Pacific life, including environment and sustainable development. Through its Institutes and Centers (mainly Institute of Marine Resources, Institute of Applied Science and the Pacific Centre for Environment and Sustainable Development) it also implements field projects in the latter two areas.

GEF Funding Agencies

The World Bank (WB) will work with countries and other partners to implement projects where it has been nominated as a GEF agency. The Bank has strong experience in investment lending focusing on institutional building, infrastructure development and policy reform across all the focal areas of the GEF. This focus on investment is enhanced by the Bank's convening power to support donor alignment, its policy dialogue and emphasis on analytical underpinnings, and its ability to leverage support to help mainstream global environment issues into national sustainable development strategies

United Nation Development Program (UNDP) with its network of field offices in the Pacific, is experienced in integrated policy development, human resources development, institutional strengthening, and non-governmental and community participation. It would assist countries in promoting, designing and implementing activities consistent with the goals of GEF or PAS.

United Nations Environment Program (UNEP) has important networks in the region through its sub-regional office in Samoa. It is engaged in projects that promote sub-regional collaboration and integration as well as the exchange of information in the relevant GEF focal areas backed by the best available science and knowledge. It will also promote targeted research and capacity building in priority areas identified as bottlenecks by the countries. UNEP also has good experience in serving as a broker in multi-stakeholder consultations

Food and Agriculture Organisation (FAO) specializes in providing policy, technical and thematic support services on fisheries, forestry, agriculture and natural resources management. It has strong experience in sustainable use of agricultural biodiversity, bioenergy, biosafety, sustainable development in production landscapes, and integrated pest and pesticides management, land degradation and POPs and has experience in integrated approaches and frameworks to address land degradation

The Asian Development Bank (ADB) is experienced in implementing investment projects at country and multi-country levels as well as the ability to incorporate capacity building and technical assistance into its projects. Similar to the World Bank, ADB has strong experience in the areas of energy efficiency, renewable energy, adaptation to climate change and natural resources management including water and sustainable land management.

4.3. Local Conservation Projects and Programs - Fiji Case Studies

These case studies have been taken from the following sources to be used as excellent examples of what local village communities can achieve in the conservation of their biodiversity

➤ **NBSAP Project Profiles**

- Drugs from the Deep, a Conservation Project in Tikina Verata
- Acropyle Sahniana, Fiji's rarest Tree
- Yaduataba, Home of the Crested Iguana
- Sigatoka Sand Dunes National Park, Nadroga
- Koroyanitu National Heritage Park

➤ **Fiji Times and Fiji Sun Newspaper Clippings**

- Local Conservation Projects: Live and Learn Schools Rivercare Program, Hideaway Resort/Tagaqe Village Coral Farm, Park Heritage in Young Hands Project – National Trust/Local Sigatoka Schools
- Ono-i-Lau/WWF Seaweed Farming
- Fiji Water/CI and Sovi Basin Conservation Program
- Marine Protected Areas helping to alleviate poverty – Nature Conservancy
- Yadua/National Trust/WWF Turtle Tagging Project
- Plastics poisoning the Pacific – join with list of “How long it takes to break items of garbage down”
- Vorovoro Island – web based ecotourism/conservation project
- Solevu – Water for Life Foundation project

6 PROJECT PROFILES AND BRIEFS

Following are some profiles of on-going Biodiversity Conservation Projects in Fiji, followed by some Project Briefs submitted during the course of the preparation of the BSAP and discussions at the National and Regional Workshops

6.1 PROJECT PROFILES

Project Profile 1

'DRUGS FROM THE DEEP' : NATURAL PRODUCTS DEVELOPMENT AND CONSERVATION IN TIKINA VERATA, FIJI

The project was supported by the Biodiversity Conservation Network (BCN), a consortium of World Wildlife Fund, The Nature Conservancy and World Resources Institute with funding by the United States Agency for International Development.

The BCN was initiated to :

- (a) support site-specific biodiversity conservation efforts in the Asia/Pacific Region
- (b) evaluate an enterprise-based approach to community-based conservation.

The Fiji project involved the eight villages in Verata Tikina in the central east coast of Viti Levu. The main facets of the program were:

- creation of a bio-prospecting enterprise to provide income to the community to support conservation and development needs formerly met by the harvesting of marine resources
- formulation of an innovative and equitable bio-prospecting agreement
- development of a community-based marine resource management plan
- biological and socioeconomic monitoring of effects of the project (by local community members)
- research to add value to biological extracts before being licensed for study by pharmaceutical companies overseas

Accomplishments

The project succeeded in setting up a bio-prospecting venture with the Strathclyde Institute for Drug Research in Scotland after negotiations with Smith Kline Beecham pharmaceutical firm were not fruitful (they closed down their natural products division). Licensing fees alone could bring F\$100,000 to Verata and much more to the stakeholders should a commercial product be developed. Verata people living in Suva have been authorised by the Tikina Council to develop a Verata Conservation Trust Fund to administer these licensing fees. During the process both the Fiji Government and the University of the South Pacific developed a policy on bio-prospecting. The bio-prospecting contracts have been reviewed by international experts to help ensure equitable benefits to the people of Verata and Fiji.

The University of the South Pacific has enhanced its ability to determine the activity of extracts and to identify the compounds responsible for this activity. This could increase licensing fees by factors in the hundreds.

The people of Verata, led by their chief the Ratu mai Verata, have developed a marine resource management plan which includes:

- ban of taking turtles and coral extraction

- moratorium on granting commercial fishing licenses
- size limitation of gills nets
- declaration of no-take refugia to support an enhancement of marine populations

Concurrently a workshop was held in which 20 people of Verata were trained in biological monitoring techniques. They are currently monitoring changes in "kai koso" and "mana" populations, both in the no-take refugia and control areas. After eighteen months "kai koso" populations have increased by 600% in the "tabu" area and 200% in a similar area where harvesting has continued.

The turaga-ni-koros from the eight villages have also been trained to conduct socioeconomic surveys and have designed and carried out with the assistance of SPACHEE (a regional environment group) a baseline socioeconomic survey of their villages which should help them in their future decision making.

During the BCN analysis of the project almost all conservation objectives (12 of 13) were seen to be met, the highest of the 20 BCN projects. There were major successes in policy development in relation to access and benefit sharing from biological diversity. Perhaps most importantly the people of Verata feel that they have the knowledge and confidence to conserve and wisely utilise their resources for generations to come.

Project Profile 2

ACMOPYLE SAHNIANA FIJI'S RAREST TREE

Acmopyle sahniana is a very rare tree endemic to Fiji. It is a gymnosperm (related to pines) in the family Podocarpaceae. In Fiji, the only known trees are found in Namosi Province. There is one small group of trees (ten trees in 1995) on Mt. Vakarogasiu, a spur on Mt. Nakorolo. There are three more small groups of trees in the Korobasabasaga Range – two groups together on one high ridge and one group in Waisoi on a lower ridge. Altogether there are 46 trees which are one meter or taller. The tallest *A. sahniana* tree is about 12 meters. There are 17 seedlings and saplings which are under one meter tall in 1996. *A. sahniana* is also known from Mt. Koroyanitu in the Ba province, but recent searches have failed to find it there, cyclones might have destroyed that group of trees.

A. sahniana trees are mostly small and thin and of no value for timber. They are not used by people for medicine or anything else, but the trees are very important for other reasons. They are important because they are part of the forest, part of the vanua. They are important because *Acmopyle* is a very old type of tree and how it grows now tells us something about how the climate and the land used to be millions of years ago. *Acmopyle sahniana* is most important and interesting to scientists because each small group of *A. sahniana* tree is very different from the other groups of *A. sahniana* trees. The trees look the same, but genetically they are more different than anyone would expect for such a small population. It is very, very unusual to have genetic information for an entire species. The genetic information on *A. sahniana* can give us information about all small groups of plants and animals, and maybe even about people too.

Research on *A. sahniana* in Namosi has been undertaken by scientists from the University of the South Pacific and currently the Pacific Regional Herbarium monitors the small remaining populations.

Project Profile 3

YADUATABA – HOME OF THE CRESTED IGUANA

The Crested Iguana, *Brachylophus vitiensis* is found in small numbers on certain islands in the Mamanuca and Yasawa Groups, but the largest population by far, over 5,000, is on the island of Yaduataba. The uninhabited island is a rainshadow island with less than 180cm of rain per year. The vegetation is comprised of a mixture of beach forest, introduced casaurina scrub, disused copra plantations, coastal scrub and grassland.

The late Dr. John Gibbons first brought worldwide attention to the Crested Iguana in 1979 and then described it as a new species in 1984. In 1980, the National Trust for Fiji secured a management agreement with the landowner to establish the island as a sanctuary and immediately began a programme to eradicate the island of goats.

The National Trust for Fiji while pursuing a formal lease over the island has developed MOU's with the New South Wales Zoological Parks Board and the Kula Eco Park which has seen the development of further research of the crested iguana. Recent research programs include :

- A research program to establish the genetic distance between crested populations in Yaduataba and Monuriki began in 1998 with collaboration between the Trust, Kula Eco Park and the Taronga Zoo.
- The first Crested Iguana population census was carried out in 1985. In April 1999, another census was carried providing a more accurate population of approximately the same number as in 1985.
- A captive-breeding programme for the iguana was established at the Kula Eco Park in 1997 and has proved very successful.

A programme between the National Trust and Greenforce a conservation organisation from the United Kingdom, was established in 1998 and this has resulted in a marine survey and monitoring programme of the biodiversity of reefs around the sanctuary. A Marine Park is an objective of the National Trust

The Trust intends to nominate the island sanctuary to the UNESCO World Heritage List when lease agreements are concluded.

Project Profile 4

SIGATOKA SAND DUNES, NADROGA

The Sigatoka sand dunes are situated at the mouth of the Sigatoka River and are a unique feature of the Fiji's natural heritage. Covering an area of 650 acres the dunes extend along the coastline westward from the mouth of the Sigatoka River and provide a landscape of great natural beauty. As one of Fiji's earliest recorded prehistoric sites, discoveries prove evidence of the link between the Melanesian and Polynesian people of the Pacific. The dune vegetation is a mixture of introduced and indigenous coastal species while fauna consists mainly migratory birds and coastal lizards.

The Fiji Government designated the Sigatoka Sand Dunes as Fiji's first National Park in July 1989 with management entrusted to the National Trust for Fiji.

To ensure the continued preservation of the area, and at the same time to give visitors the maximum benefits of the park, the Trust has developed aspects of the Park.

- An Information Center was built in 1997 as the central point for visitors to the Park. Managed by two Rangers who assist and provide visitors with information or guided tours through the park, the Centre also provides facilities for visitors and visiting scientists.
- Recreational facilities for visitors around the Park, such as shelters, BBQ areas, walking trails etc have also been built.

Current development plans include :

- Drawing up a new marketing plan
- Re-vegetation of the dunes to help in stabilisation
- Extension and improvement of the Visitor Information Centre.
- Provision of a station for the Tourist Train.

The National Park is one of Fiji's most important educational and recreational facilities.

Project Profile 5

KOROYANITU NATIONAL HERITAGE PARK

The Mt. Koroyanitu Range, known as Mt. Evans on most maps, is located inland between Nadi and Lautoka. Mt. Koroyanitu rises to 1,195m above sea level and is the 3rd highest peak in Fiji.

Scenically, the area is spectacular with waterfalls, towering cliffs of lava, and luxuriant forest growth. Within the range, the Sabeto, Teidamu, Varaciva and Vitogo Rivers gather their headwaters.

The Koroyanitu National Heritage Park area covers around 25,000 ha and belongs to 50 landowning units in 13 different villages. Ownership of the core area resides primarily with people from Abaca, Vakabuli, Nalotawa, and Navilawa villages..

The villagers still depend on the land for food, medicine and building resources. Currently the landowners are subject to pressure from loggers, plantation foresters, agricultural developers and mining companies to utilise their land. In the late 1980's the Native Land Trust Board initiated discussions with the landowners on a landowner-managed ecotourism project as an alternative form of income generation and this has developed today to the best developed ecotourism attraction in Fiji. The significance of the area which makes up the Koroyanitu National Heritage Park is derived from both its natural and cultural assets, specifically.

- some of Fiji's vast remaining old-growth stands of Fiji Kauri (*Agathis vitiensis*) which have a particularly high value for logging.
- unlogged tropical montane forest, the only remaining stand in western Vitilevu.
- a diverse variety of flora and fauna, twelve plant species are endemic to the mountain range;
- the primitive Gondwanaland gymnosperm species *Acmopyle sahniana*, has been recorded on Koroyanitu although not located recently
- many plant species of economic importance for building and construction, reed (*Miscanthus floridulus*) and bamboo stands, the only source of traditional thatching remaining in the Vuda District.
- outstanding scenic beauty.
- high importance of its watershed to the dry western Viti Levu.

Culturally the area has a high significance with a large number of archaeological sites and cultural landscapes throughout the area and strong cultural associations with the people who live there.

Today the landowner managed project offers a range of day and half day walks; a trans mountain hike overnighing in a traditional bure high on the mountain; trained local guides; waterfalls and swimming holes; spectacular scenic lookouts; village visits; village stays; lodge accommodation and camping facilities.

The project is a successful example of a viable rural income-generating project with long term prospects which also plays an important role in the conservation of a unique part of Fiji's Natural Heritage.

Significant assistance in developing the Koroyanitu National Park has been provided by the Native Land Trust Board, Fiji Pine Ltd., the South Pacific Regional Environment Programme and New Zealand Official Development Assistance.

Environment program targets teachers

Resort eco-tourism project wins award

THE Hideaway Resort on the coral coast has scooped an international eco-tourism award for its community-based coral walk and coral farm scheme.

The resort won the prestigious Skal International Ecotourism Award for 2007 ahead of 24 other countries and against 46 entries from Asia, the Americas, Europe, Africa and Oceania.

The award was presented at the 6th annual Skal International Ecotourism Awards ceremony during the opening ceremony of the 68th Skal World Congress held in Anatolia, Turkey on November 5.

Hideaway Resort spokesperson Annie Wade said the coral farm and tourist reef walk and sponsorship scheme developed in 2003 aimed at teaching tourists and local communities about maintaining their natural resource.

"It also supplies an income for the village of Tagage. Tourists can sponsor a piece of coral that is harvested from frag-

ments in the coral farm which is then planted onto a rock base in the lagoon.

"All donations go to the local village for their own ecological development projects. There have been many people involved in the development and maintenance of the project including marine biologist Zaidy Khan, Helen Sykes of Resort Support, Alex and Alice Hill of Diveaway Fiji Limited as well as Ratu Timoci Batirerega who is the *turaga ni koro* of Tagage Village to name a few," she said.

The coral and rock farm is part of the Pacific Aqua Farm program whereby fragments of coral are planted on wire grids to mature. Pieces of artificial rock are then laid out to grow essential algae before shipping to overseas aquarium market.

Ms Wade said in this way the reef is not disturbed while at the same time the local community would benefit from the income from the farm.

MORE support is needed from schools if students are to become aware of the need to protect their environment.

Live and Learn River-Care trainer Rocky Ralifo said the message was getting through very slowly and schools needed to support awareness programs.

He made the comment at a week-long environmental education training workshop for students of Marist Brothers High School in Suva yesterday.

Teachers were engaged in training workshops by Live and Learn at the beginning of each school year.

"The message is slowly but definitely getting through. It's just that it needs more support from teachers and from the school itself," said Mr Ralifo.

There are 49 schools around the country involved in the Aqua Youth Rivercare program, 30 of which are within the southern division.

The project is funded by the ATH Foundation until June 2009 and was developed by the NGO in response to growing populations in Fiji and the region and associated pollution problems.

Mr Ralifo said the program generated a positive response with schools like Nasinu Secondary School adopting a no plastic policy to avoid pollution in their academic environment.

Conservation moves south

Suva: Conservation has reached one of the most isolated islands of Fiji — Ono-i-Lau, Fiji's southern most territory. Recently, a group of environmental workers together with government and community partners visited Ono-i-Lau for its first extensive environmental survey.

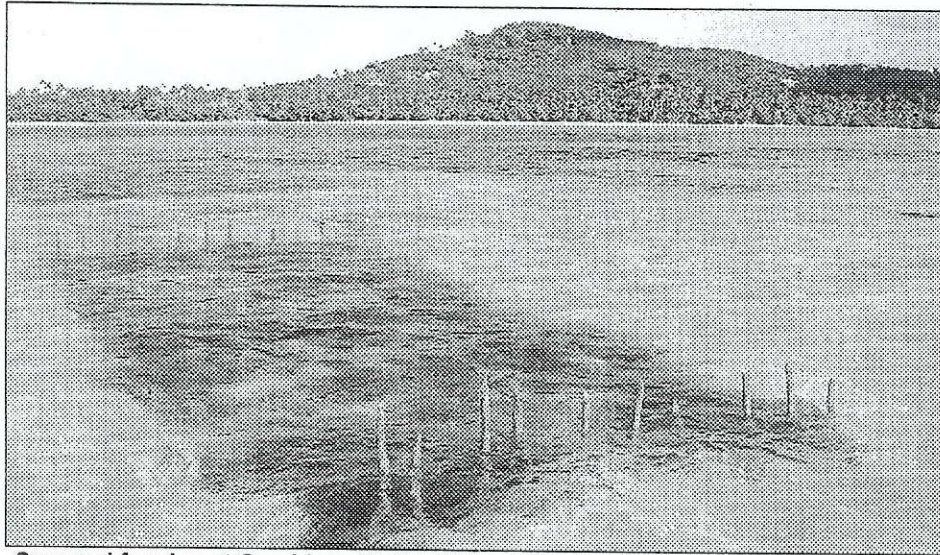
WWF Fiji in partnership with UNDP GEF Small Grants Program, Lau Provincial Office, Department of Land Use and Planning and the Ono-i-Lau Tikina Development Committee conducted its first community biodiversity status survey of Ono-i-Lau.

Ono-i-Lau is listed as an area of national significance for marine biological diversity as identified during a 'national marine biodiversity prioritisation workshop' conducted by WWF in 2003 with the participation of local and international marine experts and scientists.

"The island's four village communities are heavily dependent on fisheries and agriculture for their subsistence needs and to an increasing extent income generation. This makes natural resource management and overall community commitment to protect their natural resources on the island extremely important," said Kesaia Tabunakawai, WWF Fiji program manager.

"This will help villagers safeguard themselves against unsustainable exploitation and harvesting practices; natural disasters and the negative and devastating impacts brought about by Climate Change."

The target of this community initiative will be to



Seaweed farming at Ono-i-Lau. Right - Anare Jale with children from Ono-i-Lau planting yasi seedlings as part of a reforestation project



build and enhance the Ono-i-Lau community's capacity for self management and long term sustainability of their natural resources within the context of an integrated ecosystem, community development and sustainable livelihood approach.

"A number of activities undertaken with the island community included biodiversity inventories and more importantly community awareness on the protection of biodiversity and the need for an integrated approach to sustainable development in consultations with the resource owners were done during our visit," said Ms Tabunakawai.

"This island is rich in marine and terrestrial resources and WWF's aim is to work with its partners such as the Ono Development Committee to include natural resource management into its development plans to safeguard the islands unique biodiversity and community livelihoods," she said.

She said the Ono-i-Lau community in Suva have received the findings of the initial trips and found it to be very informative.

"They have expressed a keen interest and commitment in supporting the initiative to protect and sustainably manage their natural resources, especially their *qoliqoli*."

Similar sentiments were voiced by Anare Jale, the Ono development committee's secretary who was part of the team that visited the island. He stated the initiative on the island was timely as it was vital for the future of the islands resource owners and the next generation of Ono.

"The initiative comes at

a time after the people of Ono-i-Lau have witnessed exploitation and over harvesting of their natural resources through financial enticement by buyers whose main interest is to maximise profit. Including biodiversity conservation with sustainable livelihoods is the best way to manage natural resources for a small island economy such as Ono-i-Lau," he said. "The involvement of the resource owners (including women and youth during this visit) in identifying threats and coming up with solutions is most encouraging. Their contribution to the development of the community development plan, places its ownership in them and their commitment to it will surely enhance its implementation and management," he added.

"It is essentially our goal

to ensure that our community is environmentally aware, educating people through training, workshops, and meetings are important to bring about attitude change. An environmentally conscious community is better equipped to plan, manage and decide about resources. In our case this will ensure there is plentiful of sea and land resources to sustain our community now and into the future and reverse the current trend from island to urban drift," he said. Other activities undertaken on the island during the visit included; the development of their marine protected areas, management plans, community action plan targeted at addressing land degradation, enhancing food security and sustainable livelihoods, and climate change awareness and the develop-

ment of the their community adaptation plans. Youth were also engaged to develop their training program, as part of long term motoring activities on the island.

In addition to other unique factors the area is considered important because it is frequented as a foraging site by three turtle species due to the area's lush and pristine sea grass meadows. The green turtle (*Chelodonia mydas*) is recorded to nest on the beaches of the surrounding islands of Mana, Udui and Tuvana and the island group is frequently visited by migratory whales. The Ono-i-Lau waters also support a multitude of unique coral, invertebrate and fish species, including one of Fiji's largest natural occurring colonies of giant clam. Due to its isolation in the extreme south, a more thorough biological survey of the area's reefs would be needed to ascertain the extent of this uniqueness, in terms of endemism and rarity.

The terrestrial environment is also similarly unique, as much of the islands still support intact littoral and island native forests. The area supports a number of sea bird species and undisturbed sizeable sea bird colonies, such as those of the red footed booby.

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As consumers become more environmentally aware and active, they are looking toward leadership brands like FIJI Water that support their efforts to live a greener lifestyle and reduce their own environmental footprint'



The Sovi Basin, located on the Fiji island of Viti Levu, covers over 50,000 acres of land and is the largest remaining lowland rainforest in Fiji.

The Sovi Basin - Fiji's largest remaining lowland of rainforest will be protected from logging after FIJI Water, one of the fastest growing, leading premium bottled water brands in the world announced a Sustainable Growth Initiative.

FIJI Water will partner with Conservation International (CI), a leading conservation organization to develop an ambitious multi-benefit carbon offset plan that would reduce CO2 in the atmosphere.

This will benefit Fiji's local communities and its biodiversity.

FIJI Water's relationship with CI also includes a major program to permanently protect the Sovi Basin, Fiji's most important land ecosystem, from logging.

The Sovi Basin, located on the Fiji island of Viti Levu, covers over 50,000 acres of land and is the largest remaining lowland rainforest in Fiji.

The Basin, is Fiji's most important land ecosystem in terms of its biological and landscape heritage and is located in the Naitasiri Province.

Fiji lies within the Polynesia/Micronesia biodiversity hotspot - one of 34 such hotspots around the world - and is home to a number of unique and diverse species.

The distinctive bowl shape of the Basin with its encircling volcanic peaks create a landscape unique in both Fiji and the rest of the Pacific. Its floor is composed of hard granite rock which has slowly eroded over time to form low rolling hills, drained by crystal clear rivers and streams. The entire landscape is covered with undisturbed tropical lowland forest.

Fiji Water to protect Sovi Basin

Sovi Basin is the largest, most diverse and most scenically outstanding of Fiji's natural forest. FIJI Water states that, "If it were to be protected it would be the 'jewel in the crown' of Fiji's protected areas system, functioning as the main storehouse of Fiji's land-based biodiversity."

The spectacular natural and cultural features of the Sovi Basin together build a strong imperative for ecotourism development. International promotion of the wilderness and cultural features of the Sovi Basin would form the lynch pin of a new heritage focus to Fiji's tourism industry.

"As consumers become more environmentally aware and active, they are looking toward leadership brands like FIJI Water that support their efforts to live a greener lifestyle and reduce their own environmental footprint," said chairman and CEO of Conservation International Peter Seligmann.

"We applaud FIJI Water for offsetting the climate impact of its products, reducing the impact of its operations, and funding crucial conservation efforts that support local communities and protect some of the last remaining forests in the South Pacific," he said.

The FIJI Water Foundation, launched

through a grant from FIJI Water owners Lynda and Stewart Resnick. It is also supported by contributions from 700 FIJI Water employees around the world and will provide funding to endow a Sovi Basin trust fund. Stewart Resnick is also a member of the board of directors at Conservation International.

As part of this conservation effort, CI's Global Conservation Fund will also donate funding toward the trust fund. Revenues from the fund will support the annual management costs of Sovi Basin, compensate communities for revenue that could have been generated from logging, and cover the annual lease payments to the Sovi Basin landowners.

The revenues will also fund a small grants facility that will support community development activities. The National Trust of Fiji is responsible for management of the Sovi Basin, and will receive and administer revenues from the fund.

This effort to preserve the Fijian rainforest will ensure that about ten million tons of CO2 stored in the forest will remain out of the atmosphere in perpetuity. According to the Greenhouse Gas Equivalencies Calculator, this is the equivalent of about two million passenger cars not being driven 12,000 miles.

"We applaud FIJI Water's leadership and corporate responsibility in committing to making their operations carbon (negative) and also their contribution to protecting Fiji's natural resources," said Interim Minister for Environment Bernadette Round-Ganlian.

"We hope other businesses in Fiji will be encouraged to follow FIJI Water's example. The heart and soul of our brand and the integrity of our product all depend on preserving one of the last remaining virgin ecosystems on earth," said FIJI Water senior vice president, Sustainable Growth, Thomas Mooney.

"By endowing a Sovi Basin trust fund, we will be able to protect one of Fiji's most important natural watersheds, maintain the global climate benefits associated with this rainforest, and continue to provide significant benefits to the village communities around the Sovi Basin. In addition, the FIJI Water Foundation is funding the study and protection of the Yaqara Valley watershed, home to FIJI Water source," he said.

To achieve this, FIJI Water will account for the carbon footprint throughout the entire lifecycle of its products and then, through a combination of meaningful reductions and carbon-reducing land use

and renewable energy projects, the production and sale of each bottle of FIJI Water will actually result in a net reduction of carbon in the atmosphere.

No other major beverage brand has ever made a similar commitment to help mitigate the effects of climate change.

FIJI Water's Sustainable Growth Initiative is a multi-pronged effort that includes several significant strategies:

- Reduction of CO2 emissions associated with the company's operations
- Purchase of permanent and verifiable carbon offsets to cover 120 percent of the emissions that cannot be reduced directly
- Protection and permanent preservation of the largest remaining area of pristine rainforest in Fiji

Reduction of CO2 Emissions

An aggressive plan to reduce CO2 emissions, is also the centerpiece of FIJI Water's sustainability program. This plan will account for all product lifecycle carbon emissions from raw materials production through post-consumer handling of its products. By 2010 the company's products, across their entire lifecycle, will deliver the following sustainability benefits (compared to a July 2006 - June 2007 baseline):

- 25 percent reduction in CO2 emissions
- 50 percent reduction of energy used in the production process to come from renewable sources
- 20 percent reduction in product packaging
- 33 percent reduction in waste from the production facility in Fiji

"Climate change continues to be one of the biggest, most challenging problems our planet faces, and our Sustainable Growth Initiative is a comprehensive and sustained effort for FIJI Water to do its part, take a leadership role and the long-term pursuit of holistic environmental solutions," said Thomas Mooney, senior vice president, Sustainable Growth, FIJI Water.

Over the next three years, FIJI Water will reduce the amount of energy required throughout the lifecycle of its products through a number of efforts including engineering projects to increase the energy efficiency of its bottling facility in Fiji, optimization of logistics to make greater use of low carbon shipping modalities (primarily ocean freight and rail), and a reduction in packaging.

Remaining energy demands will increasingly be met with renewable energy such as wind to power its bottling facility in Fiji, and bio-diesel to replace traditional diesel use in transportation and other applications. ICF International, a global leader in analyzing emissions inventories and providing advice on climate strategy, will independently review and verify the company's carbon footprint. To ensure transparency of its carbon negative commitment, FIJI Water will work with ICF International to publicly report its progress against the above targets on an annual basis.

low marine protected areas help alleviate poverty

Many of the world's richest and most diverse habitats are found in places where poverty is a real and pressing issue. But all too often, conservation is considered a luxury that impoverished communities cannot afford.

In one of the first studies of its kind, The Nature Conservancy has worked with leading academics on a study that conclusively proves that marine protected areas (MPAs) can help alleviate poverty.

An MPA is an area of ocean or coastal water that is recognized both by government and society having specific conservation value. Measures are put in place to preserve the quality of marine life that can include restricted access for fishing, diving, and other potentially harmful activities.

Governments around the world are wrestling with questions about whether investments in conservation benefit the lives of extremely impoverished people. The "Nature's Investment Bank" study provides new, tangible evidence that these investments do bring out measurable economic and quality of life benefits.

Co-authored by Nature Conservancy policy advisor Craig Leisher, Dutch economist Peter van Beukering, and Australian/American social scientist Dr. Lea M. Scherl, this study found that restoration of coastal resources -- be they fisheries or coral reefs -- increased fish catch and economic opportunities, improved community health, and directly enhanced the lives of local residents.

"When marine protected areas are developed with government support, scientific data, and are managed primarily by local communities that take pride in the management of their natural resources, significant improvements in quality of life can be seen," said Craig Leisher, co-author of the study. "Building networks of resilient marine protected areas will help maintain the food and income necessary to support coastal communities as well as curb the use of destructive fishing techniques, and enable coral reefs to survive the impacts of climate change."

As a Fijian community leader from Waiqanake village, outside Suva, Weku Ratumainaceva noted, "The marine protected area is like a bank to the people. Opening more branches of the bank in developing countries can contribute to coastal poverty reduction."

The study team conducted more than 1,100 interviews with people in poor communities in four countries and, using rigorous scientific methodology endorsed by several leading environmental economists and social scientists, analysed the effect of marine protected areas at four very different sites - Navakavu Locally Managed Marine Area outside Suva; Indonesia's Bunaken National Marine Park; In the Solomon Islands Arnavon Community Marine Conservation Area, and on Apo Island in the Philippines.

According to Nature Conservancy, the worldwide poverty crisis has risen to the forefront of global issues, and with nearly 3 billion people

around the world living on the equivalent of US\$2 a day or less, millions are forced to make decisions that damage their environment in order to feed themselves and their families.

"When poverty increases, fish stocks are depleted. Fishers are often driven to use destructive methods to catch what little is left, damaging the reefs and fish habitat that produce the food local communities depend upon for survival. With every 5 percent loss of coral reefs, 250,000-500,000 tons of fish are lost as well, threatening food security for millions," Nature Conservancy said in a press release.

"This study highlights the importance of protecting these ocean habitats, to both preserve essential marine life and reduce poverty in coastal areas -- not only in Asia-Pacific but across many impoverished coastal communities around the globe."

Working in partnership with local non-governmental organizations and universities, the researchers talked to over 1,100 local people about the changes they had seen in their quality of life since the creation of the nearby marine protected areas. Across the four sites, there was clear evidence that poverty had been reduced by several factors:

- Improved fish catches. Fish are now "spilling over" from the no-fishing zones of the four marine protected areas, leading to increased catches and higher incomes for fishers at three of the sites.

- New jobs, mostly in tourism. The marine protected areas' greatest boost to household incomes came from new

jobs, especially in eco-tourism. In Apo Island, tourism has surpassed fishing as the largest source of income.

- Stronger local governance. In all four study sites, community governance mechanisms were established for the management of the marine protected area. Involving the community in management and decision-making of the marine protected area gave the communities a more united voice and frequently reduced conflict within the communities and with neighboring communities.

- Benefits to health. Greater fish catches led to greater protein intake in Navakavu and Apo Island and a perceived improvement in children's health, in particular. In Bunaken, visitor entry fees improved public health by funding water-supply tanks, public toilets and washing places in several villages.

- Benefits to women. In all four sites, the marine protected area helped empower women economically and in some cases socially. In the Arnavons, the development of alternative livelihoods to fishing, such as seaweed farming and basket weaving, provided new income opportunities for women. As a result, they gained a stronger voice in community meetings.

"By focusing on potentially positive examples, we aimed to identify key factors for success that could be replicated elsewhere," explains Craig Leisher, co-author of the report and a senior policy advisor for the Conservancy.

The Conservancy hopes that

governments will use these study findings to harness the full benefits of marine protected areas to improve the well-being of local people while conserving marine life. The study recommends key strategies for strengthening the creation and management of MPAs that include:

- Committing to financial investment in protected areas, both in the initial set up and in subsequent years.

- Developing a network of smaller, ecologically connected MPA sites, each linked to a community, to increase local access to benefits.

- Empowering local communities in the decision making and management of the marine protected area.

"Marine protected areas and local communities need each other. Without the support of the local community, marine protected areas will not succeed," says Leisher.

"Similarly, by preserving marine life, we can help the communities that depend on the bounty of the sea for their survival. We should not artificially separate conservation and poverty reduction in the places where we work - they are almost always inextricably linked."

"The marine protected area is like a bank to the people," noted a Fijian community leader. By conserving marine resources, people will reap higher returns in the future. The study findings demonstrate that opening more branches of the "bank" in developing countries can contribute to coastal poverty reduction.

Yadua cheers turtle tagging

by JONE NIUKULA of The National Trust of Fiji
and SAINIVALATI NAVUKU, WWF Fiji Country
Program

ATTEMPTS over the past two years to locate and tag a nesting turtle in Fiji bore fruit last month.

The collaborative effort of the National Trust of Fiji, the community of Yadua, REP (Secretariat of the Pacific Regional Environment Program), NOAA (National Oceanic & Atmospheric Administration) and WWF has been the max of on-going efforts over past years protect an endangered cultural icon.

Yadua community celebrates

turtle tagging

North-east of Yadua Taba Island (in Bua province and a famous iguana sanctuary) a secluded beach locally known as Ilice, a nesting Hawksbill turtle was located.

The turtle was spotted by National Trust officer Jone Niukula and other members of the team as they made their way to an adjacent beach to await nesting turtles and carry out research work.

This was the final attempt during this nesting season, to locate and tag a Hawksbill nester, a first for Fiji.

The sight of the turtle tracks on the beach triggered excitement among the research team.

Pita Biciloa, the park ranger on Yadua, manoeuvred his boat in an attempt to travel through a small passage to get to Ilice. Against all odds, the team managed to secure the boat ashore, their determination and enthusiasm fuelled ever more, as they approached the turtle tracks on the beach and heard loud "ooshes" — the sound of sand being stirred as the Hawksbill started to dig on the beach.

The sound of waves crashing on the shore, as if to applaud and cheer the turtle, lighting flashes on the horizon as darkness began to swallow the earth was most majestic greeting to this ancient reptile as it crawled up to land to nest after decades of navigating the seas.

This (nesting) is the only time that turtles are found on land. It is highly possible that the 88.8cm Hawksbill is a hatchling of a female returning after more than 25 years the beach of her birth to transfer her genetic code into the future.

The Hawksbill was named Marama ni Yadua by the villagers, who expressed great emotion at seeing the turtle lay its eggs and with the attachment of the satellite tag, said this would be an unforgettable experience for them. A small church service was conducted before the turtle was released into the sea with the hope that it return to Yadua in years to come.

Fiji's first satellite tagged turtle

The excitement generated out of locating the nesting turtle on Yadua stems from the fact that this is Fiji's first satellite-tagged turtle.

It has become increasingly difficult to find nesting turtles in Fiji, hence the team reacted promptly and set off to Yadua with the satellite tag donated by REP.

Turtles are known to nest (lay eggs) from November through to March. Thus, over the holiday period, several other teams were conducting nesting beach surveys around Fiji including the Mamanuca group, Koro Island and Yadua.

The surveys are part of Fiji's Sea Turtle Recovery Plan — a document developed by various stakeholders to address key issues that are contributing to the decline of the turtle population in Fiji.

Implementing these activities has been greatly assisted by funds that were raised through the 2007 Inaugural Turtle Ball.

Marama ni Yadua has been transmitting signals since the satellite tag attached and the team expects to receive a



TOP: Yadua park ranger Pita Biciloa, right, with Josaia Sukalao take measurements of the nesting Hawksbill in the background; RIGHT: Turaga na Tunimata Ratu Jone Cakautavata places the satellite tag on 'Marama Ni Yadua' with Sukalao, the village headman.



plotted map this month. Around the region, satellite telemetry work has enabled several Pacific Island countries and territories (PICTs) such as Samoa, the Cook Islands, the Solomon Islands, Papua New Guinea and New Caledonia to track the migration of turtles that nested on their beach. Several of the telemetry results illustrate a westward trend of migration, with turtles tagged in three of the countries/territories listed above migrating to Fiji.

Fiji's healthy seagrass meadows and coral reefs are hot spots for turtles to feed.

One famous illustration of this type of work was the migration of Lady Vini — a female Hawksbill tagged in Samoa in March 2006 and then moved through the Exclusive Economic Zones of 6 PICTs before entering Fiji in October 2006, where the signal died.

For several years now, turtle migration has been tracked through various tagging methods including titanium flipper, passive internal transponder (PIT) or satellite tags.

Titanium flipper tags are the more commonly employed method as it is relatively inexpensive. However, data retrieval is entirely dependent on the serial numbers being reported to the relevant authorities by those who come across turtles carrying the flipper tags.

Based on these reports, authorities are then able to plot the path the turtles take on their migration.



Plastic patch poisons Pacific

IT HAS been described as the world's largest rubbish dump, or the Pacific plastic soup, and it is starting to alarm scientists.

It is a vast area of plastic debris and other flotsam drifting in the northern Pacific Ocean, held there by swirling ocean currents. Discovered in 1997 by American sailor Charles Moore, what is called the Great Pacific Garbage Patch now alarming some with its ever-growing size and possible impact on human health.

The "patch" is in fact two massive, linked areas of circulating rubbish, says Marcus Eriksen, research director of the US-based Algalita Marine Research Foundation, founded by Moore.

Although the boundaries are vague, it stretches from about 500 nautical miles off the coast of California, across the northern Pacific near the coast of Japan. The islands of Hawaii are located almost in the middle, so piles of plastic regularly wash up on some beaches there.

"The original idea that people had was that it was an island of plastic garbage that you could almost walk on."

"It is not quite like that. It is almost like a plastic soup," Eriksen says.

"It is endless for an area that is maybe twice the size as continental United States," he says.

The concentration of floating plastic debris just beneath the ocean's surface is the product of underwater currents, which conspire to bring together all the junk that accumulates in the Pacific Ocean.

Moore, an oceanographer who has made the study of the patch his full-time occupation, believes there are about 100 million tonnes of plastic circulating in the northern Pacific — about 2.5 per cent of all plastic items made since 1950.

About 20 per cent of the junk is thought to come from marine craft, while the rest originates from containers around the Pacific like Mexico and China.

Australia plays its part too, he says.

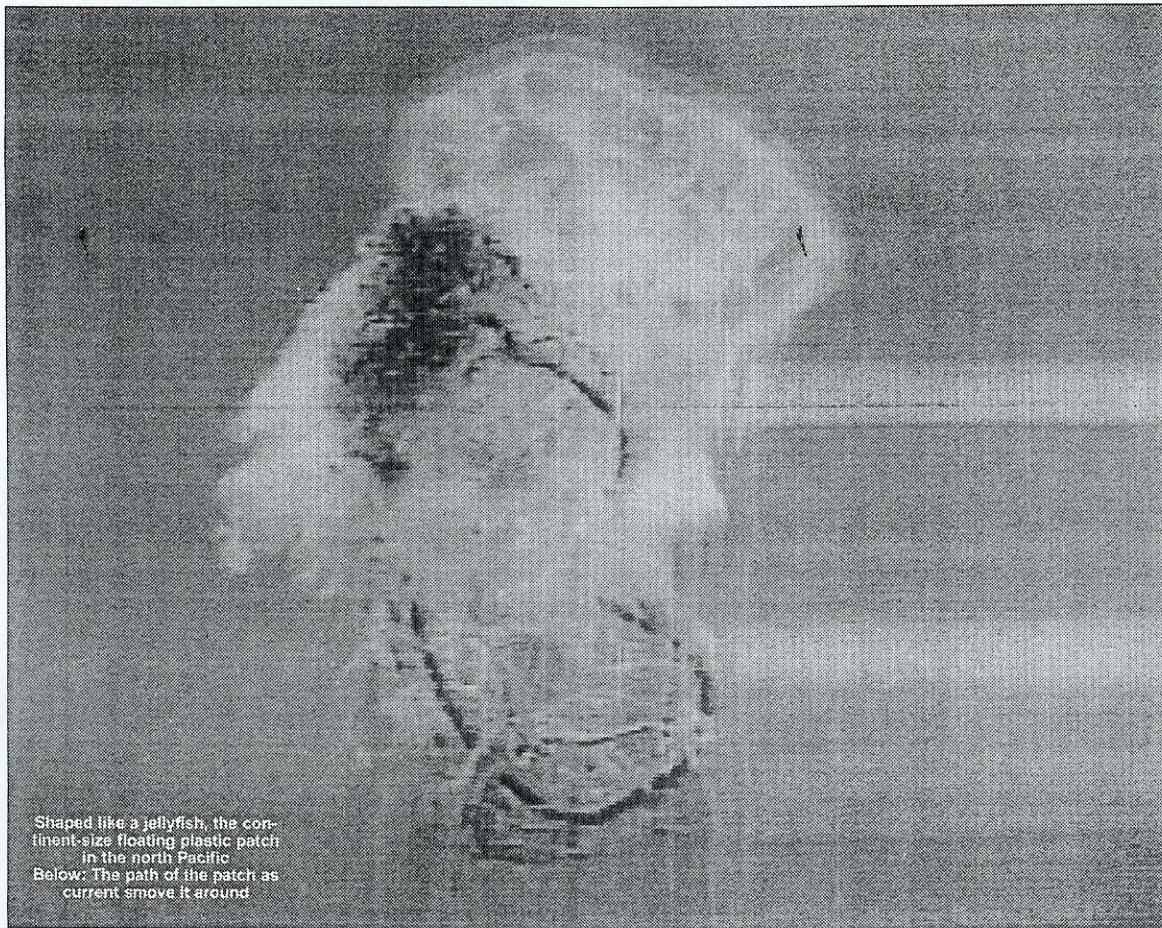
The waste forms in what are called tropical gyres — areas where the oceans only circulate due to extreme high pressure systems and where there is little wind.

The garbage in the patch circulates around the North Pacific Gyre, the world's largest.

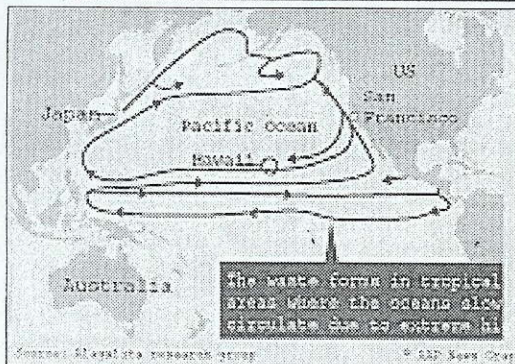
A lack of big fish and other winds mean it's an area of the Pacific less travelled by fishing boats and yachts.

Moore says he discovered the floating mass of rubbish by chance, after steering his catamaran into the area while returning home from a yacht race.

Historically, flotsam in the gyres has biodegraded. But modern plastics do not break down like other organic debris, meaning objects half a century old have been found in the North Pacific Gyre. Instead the plastic slowly photodegrades, becoming



Shaped like a jellyfish, the continent-size floating plastic patch in the north Pacific
Below: The path of the patch as currents move it around



beneath the surface, it is apparently undetectable by satellite photos.

Moore tries to explain what the patch looks like.

"It is not like going to a parking lot after a rugby match. It is not like a landfill," he says.

"The material is breaking down continually. It is photodegrading all the time."

"It is what I call a kaleidoscope or an alphabet soup."

"You won't see it from a satellite shot of the ocean. You only see it from the bows of ships," he says.

If the waste is to be controlled people must stop using unnecessary disposable plastics, otherwise it is set to double in size during the next 10 years, Moore warns.

Because the plastic breaks into ever-smaller parts the gyres do not just contain large items like tonnes of tangled fishing nets and antique buoys, both of which have been pulled from the patch).

the food chain. Eriksen said the small plastic particles acted like a sponge to trap many dangerous man-made chemicals that found their way into the ocean, like hydrocarbons and DDT.

"What goes into the ocean goes into these animals and onto your dinner plate. It is that simple," Eriksen said.

Larger pieces of plastic are a threat to birds, which mistake them for food.

Eriksen said he has found syringes, cigarette lighters and tooth brushes from the patch inside sea bird carcasses.

Professor David Karl, an oceanographer from the University of Hawaii, said little study had been done of the garbage patch, but warned of its potential danger to marine life.

"Plastic debris is one of the worst things possible in the ocean to birds, fish and marine mammals."

"This is a death-trap, if it is as has been described," he said.

Fiji Times
2/2/08

Beyond technology



**DIGITAL
TALANOA**

with JONATHAN SEGAL

I've always tended to be more interested in the impact of technology on people rather than the actual technology itself.

In other words, the changes to our culture through inventions like the internet can be more fascinating than just the internet itself. Although we can make pretty accurate assumptions about what kinds of technology we'll have available to us in the future, it's much harder to determine how that technology will actually alter our future. When the internet first started grabbing hold, no one could have predicted the impact it would have on so many aspects of our lives. It seems as if it's only just beginning to.

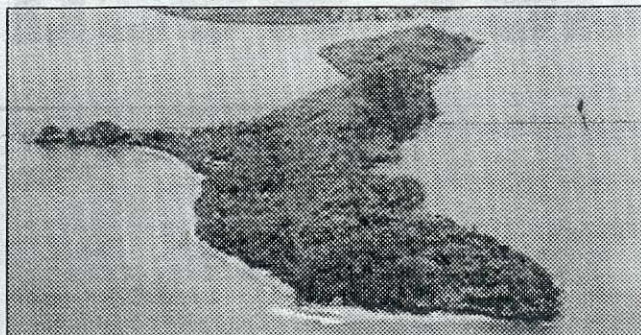
Tribewanted has been in the news worldwide these past few weeks. For those unaware, it is an eco-tourism and sustainability project happening on the island of Vorovoro, just off Labasa's coast. The project is notable more for the way it has developed rather than where it has developed.

Unlike traditional tourism initiatives, Tribewanted has an online counterpart in www.tribewanted.com where virtual discussions guide the evolution and development of the project itself.

For Fiji, the residual attention Tribewanted is receiving from around the world is immeasurable.

That attention focuses entirely upon an unspoilt, beautiful part of the country and with a five-hour BBC documentary beginning last week, Fiji will be on the TV screens of millions of British households on a weekly basis.

To call Tribewanted a case study for tourism would be like calling kava a beverage. It runs much deeper than that. The community being built on Vorovoro is much more than just a place to travel to. It's a confluence of environmental sustain-



Vorovoro Island off Vanua Levu

ability, personal responsibility, travel, cultural immersion, exploration and collaboration. That's just on the off-line side, too. The online side of the project has its own growing culture. There, tribe members from around the world gather virtually to discuss and debate the issues facing the off-line development effort on Vorovoro as well as to vote on the direction in which development should go.

At least, that was the initial idea. One of the ongoing project challenges is a tighter integration between the off-line and online tribe, continually made difficult by the lack of a broadband internet service.

What really differentiates Tribewanted from most other tourism initiatives is the way in which many of the tribe members work to positively impact things going on around them. That impact is not necessarily limited to just Vorovoro, either. Last month, one of the tribe members successfully negotiated an anti-litter campaign with the two biggest bus companies in Labasa. The transport companies agreed to print stickers to place on the backs of each seat asking their riders to "Bin It!" and not throw trash out the windows. The Labasa-based Parmod and Waiqele Bus companies also agreed to make rubbish bags available on the bus. Those businesses should be commended for this action, something that every bus company in the country could certainly copy. Back on the island and online, this "win" is highlighted, discussed and celebrated.

In November last year, the tribe published their

first sustainability report on the project's impact on Vorovoro. In it, they list the weight of all the food and materials transported to the island as well as the weight of all the waste that leaves the island. Again, this information is made available online for discussion and analysis. By determining that 12 per cent of Tribewanted's waste ends up in a landfill, they can better plan for ways of reducing that amount next year.

Interestingly, last year's report included the fact that 22 per cent of the project's waste is recycled on-site and 66 per cent is recycled off-site. These are already very impressive figures against any tourism project. As the tribe grows and more people visit Vorovoro, how can they still maintain these percentages or better yet, improve upon them? With the heads and experience of over 1300 members, all with access to the website and a desire to see the project succeed, the answers are in there somewhere.

They've already built eco-friendly toilets, grown food and herbs with soil made from compost bins and constructed a grand bure. They're supplying themselves with power through wind turbines and they've made rainwater catchments. They've wired nearby Mali Primary School and created it's first library with donated books by tribe members visiting from around the world. On Fridays, tribe members guest-teach and have introduced the children of Mali to the importance of conservation.

This is clearly not a typical tourist stop.

In my own visit to Vorovoro last year, I

remember a grog session with *Tui Mali*, the chief of the Yavusa tribe and landowner of Vorovoro. A wonderfully open man who seems genuinely pleased with the effort happening around him, *Tui Mali* spent years working on a ship laying the Southern Cross Cable in the Pacific. The irony that he was indirectly involved with the eventual establishment of internet services in Fiji shouldn't be lost on anyone. We had just completed the set up of a laptop and GPRS connection donated by Vodafone Fiji and had sent the first ever message using the internet from Vorovoro. Elated over the event, we all sat down with *Tui Mali* around the *tanoa* to announce the breakthrough. *Tui Mali* listened to the news with interest, sat up straight, nodded his head and said "That's great. What's next?" He couldn't have nailed the moment any better.

Vorovoro is a collection of activities all leading to "what's next". As a project, Fiji should be proud that it's happening on its shores because there's nothing else in the world like it and appropriately so, it's attracting attention. As a destination, it's one more place in the friendly north being developed. As a lifestyle, it is having an impact on the community well beyond just the island. As a socially-responsible initiative, it is something continually in a state of "what's next" flux, held back by nothing other than a person's inability to imagine where it's able to go.

This is the kind of stuff no one could have imagined when the internet was developed. It's what the world needs more of, too. Here's hoping Fiji can help set the standard for this innovative model and always be remembered as the place where it happened first.

■ Jonathan Segal is the managing director and CEO of Oceanic Communications (www.oceanic.com.fj), an advertising, marketing and technology agency in Suva. Send comments and suggestions to talanoa@oceanic.com.fj

Piped water at last

Solevu's unique beach market

Stories by
MERESINI MARAU

VISITING a village is usually a very exhilarating something experience that most of us look forward to.

The genuine warmth typical of villagers and the easy friendships one makes usually leaves a lasting impact with visitors.

You go to any village in the country, whether it is in the interior or somewhere closer to town, and the story is the same.

The people are always friendly no matter what.

It is this friendliness that draws tourists and local urbanites like myself.

The same courtesy I expected was unfailing in the people of Solevu, in Malolo - an island in the Mamanuca Group.

With its beautiful and crystal clear waters, long white sandy beaches and friendly people, the Mamanuca is what most people dream off.

Some tourists call it the real Fiji, the Fiji Islands of the movies and the lost paradise featured in their vacation dreams.

While some are homes to villages, there are few that are uninhabited.

The trip to Solevu last Tuesday, which was organised by the Water for Life Fiji Foundation, was an educational one as well as an early Christmas treat given such serene surroundings.

It was organised to inspect a water project funded by the Foundation, of which Vodafone, the ATH Foundation, Fiji Water, Golden Manufacturers and Westpac Bank are contributors.

The directors are Vodafone's managing director Aslam Khan, Fiji Water's David Roth, John Cashmore of Westpac and Ashif Razak of Golden Manufacturers.

They were warmly welcomed by the island's 342 grateful villagers.

Grateful because their lives had been easier by the Foundation's piped water project.

After 20 years of relying on wells and rain water, the villagers now have a reliable



Women of Solevu Village test the village's new taps

water source: four bore holes.

It was thus no surprise that the visitors from the mainland were treated like royalty.

Turaga ni Koro Jone Kadivuka said the boreholes were the best Christmas gifts ever.

It now meant they had more time for themselves instead of carting water to and from wells and water containers.

Malolo is in the Nadroga Province.

It is the province's second island. Vatulele is the other one.

There are seven mataqali in the village who own land on which several nearby resorts are located.

Solevu is different from other villages in the Mamanuca Group.

While it hosts tourists who come to buy from the market everyday, its tradition and culture are still intact.

It has a big bure right on the village rara.

Mr Kadivuka said that it



Foundation directors John Cashmore, right, and Warwick Pleass with Solevu's chief, the Taukei Nalotu Ratu Sevanaia Vatunitu

is their vale ni vanua.

"No other village here in the Mamanuca have that kind of bure," he said proudly. The villagers revere their chief - Taukei Nalotu Ratu Sevanaia Vatunitu.

Though villagers remain very traditional in their ways (for instance, everyone

had to wear sulu upon arrival), their homes are modern as most are made of concrete.

Solevu has one health centre and a primary school, Solevu District School.

There are no medical staff at the health centre.

Solevu District School with Class 1 to 8 is just outside the boundary of the village with a fence separating them. Most villagers are employed at nearby resorts while the women sell artifacts and other handicraft on the beach everyday, except Sunday.

EVERYDAY at first tide, the women of Solevu in Malolo will gather on the beach.

Dressed in their colourful jabs, it will leave any first timer wondering as to what the occasion was.

This is what they call market time, when the women come out and sell their handicraft to the tourists.

Their timing is almost always perfect because as soon as they have set their makeshift stalls up, boatloads of tourists arrive on the shore.

It is thus no surprise that Solevu is dubbed the market by the tourism industry in the Mamanuca Group.

It is where tourists from nearby resorts like Musket Cove, Plantation, Funky Fish, Navini, Malolo Resort, Wadigi and Walu Beach flock to buy their souvenirs.

These souvenirs are no different from the ones we can get here at the mainland's handicraft markets.

Turaga ni Koro Jone Kadivuka said the women buy the artifacts from Nadi and sell it to tourists - at a higher price.

He said a vendor's average daily earnings would be about \$100.

For 67-year-old Imeri Nagale, she has been a vendor for the past 20 years.

This has helped her to be independent, she said.

She said on a good day, she could earn as much as \$200.

Kasanita Bevu, 59, a retired cashier, said she raked in more money as a vendor than as a resort worker.

Widow Mere Vuanuci said the money she earned helped her support her to care for her four children, adding that they earned more than most of the resort workers.

Resort revenues to fund facelift

ALL the 115 houses in Solevu, Malolo, will undergo a facelift next year.

Turaga ni Koro Jone Kadivuka said this was possible from the grant received from two resorts - Tavara and Namotu - for the use of their *qoligoli* or fishing grounds.

Mr Kadivuka said the resorts used their *qoligoli* for surfing and in return contributed money to help improve the living standards of villagers.

"The resorts give about \$6000 each per year and this goes towards our housing scheme," he said.

He said though most of the houses were of a good standard in the villages, repairs were long overdue.

Mr Kadivuka said they would build new houses for families whose houses were beyond repair.

Those that require little repair



Solevu women sing Isa Lei to farewell guests

would be renovated, the remaining ones.

"All these houses will be repaired by next year," he said.

Mr Kadivuka said that would change the whole village.

"By the end of next year, this place will have a new look," he said.

Mr Kadivuka said that they had begun by building a new house for their church leader Paula Cumu.

"This is a four bedroom house with a big sitting room," he said.

While he was not clear on the

whole cost of that four bedroom house, he said that the scheme would benefit everyone in the village.

He said that they were also working on flush toilets for the 342 villagers.

"We want all the families to have flush toilets," he said.

He said that this would be possible as they now have water.

Mr Kadivuka said it was all part of their development plans for the village.



Youths Aldo Varani, Seva Vatu, Samuela Digitaki, Semesa Ramasi and Solo Dan are at the borehole

Learning to love nature

'If we destroy the parks, they are gone forever and we may lose something valuable to us. We cannot just sit around watching them, we have the moral obligation to help protect them'

ALUMECI NAKEKE

Childhood is a time when some of life's most valuable lessons are readily learnt and mostly from those who are older than them.

And, whether we like it or not, they then imitate the behaviour they see, so for that reason, the examples set by older people are vitally important.

If a child walks through a forest and sees a name carved into a tree, the chances are they would want to add theirs, too.

To help children learn about the environment and their role in its protection, the National Trust has chosen three schools in the Sigatoka area to participate in a pilot programme on how to be good conservationists.

The interactive programme called 'Park Heritage in Young Hands' is an initiative of the National Trust of Fiji, funded by the British High Commission, and is taking place at the Sigatoka Sand Dunes National Park.

Students aged from 10 to 13 have been participating in sand activities, rubbish collection, identifying plants and birds, and calls and treasure hunts.

National Trust project officer Milika Ratu said the three schools - Sigatoka Methodist, Nadroga Sangam and Ilukulu Public - were chosen because children from neighbouring villages tended those schools and would need to be taught to look after the park.

"What they loved most was the treasure hunt because they would be divided into additional roles and would try to find an additional item associated with their roles. The six groups are warriors, carpenters, potters, fishermen, chiefs and jesters," she explained.

"Each student is given a tool kit and it will also be used by other schools who use the park and we want to show these schools that this is something different from the study and learning techniques portrayed by teachers in the classroom. It is a different scenario because students are taken to the park."

Before students took part in the activities, teachers from the three schools attended a workshop to familiarise themselves with the programme.

"When students come to the park, the teachers would assist the rangers. After the activities, the students have to present to the class and we found after the activities that they really knew what they are talking about in their presentation and it was amazing," Ms Ratu said.

"It is much different from doing a search, a field survey or a scientific ambient walk in which they are only going to listen to someone talking and be taught how this is done."

She said the activities provided opportunities for children to interact with the environment and also to respect it.

"In this way, they compare things like grains of the sand - this one is bigger than this one - and ask why it is bigger and on. And then the teachers and rangers would be there to help them. Another per-



National Trust project officer Milika Ratu

spective is they will take their toolkit home and disseminate what they learned."

Although the students live near the sand dunes, they do not get a chance to go there and find out for themselves and the organisers do not know if their elders have

told them anything about it, Ms Ratu said.

"National Trust is also writing up myths and legends about the place so that they can take pride in what they already have to protect and appreciate it, especial-

ly the birds and plants," she said.

Before picking up rubbish, students would have to know the importance of the park and the threats it faces from pollution coming from the dump and the sea and litter.

They also learn not to play with matches or throw cigarette butts because careless mistakes can cause fires.

Ms Ratu said students were taught about trespassing as they needed permission from the rangers to enter.

Animals should not be grazed there because they eat plants and without them, the winds take the sand inland, destroying the present form of the dunes.

If blown further, it would cover residential and agricultural land and risk coastal flooding during high seas.

She said children would then collect rubbish and categorise it, for example: glass, plastic bottle, tins, plastic-ware like shoes, bags, containers, etc. and others such as green vegetables and fruits.

In their discussion, the students would discuss what made dirty beaches and would learn they were mainly caused by people from coastal villages and picnickers and at high tide, the rubbish is swept on to other beaches.

Because some of the students live near the beaches, they would be able to help in the protection of the environment by telling others what they had learnt.

However, before the programme was introduced, some other schools such as those in Nadroga/Navosa, had been planting trees at the park.

"There are also activities like 'tree-huggers' where the students would hug the trees and say 'I love trees and have respect for the environment' or 'save the trees, save the world'."

She said this created a different feeling for the children. It was meaningful because they would learn to plant trees to replace those cut down.

"The students of Nadroga/Navosa Prov School have been watering and weeding in the park and this encourages their participation. The National Fire Authority in Sigatoka has also helped us clean the park and we are grateful for that," she said.

Furthermore, the objectives of the programme were to raise awareness of the Sigatoka Sand Dunes National Park, offer hands-on activities for visiting students and to promote the protection of natural resources.

Ms Ratu said it was essential that each country kept part of its natural heritage untouched, as a record for the future, a baseline to measure change, so people could see the splendour of their past before the land was degraded.

These untouched places were also genetic reservoirs, where plants and animals that did not exist elsewhere still survived.

They could be valuable to the human species as sources of food or medicine.

"If we destroy the parks, they are gone forever and we may lose something valuable to us. We cannot just sit around watching them, we have the moral obligation to help protect them," she said.

5. Monitoring and Evaluation

5.1. Environmental Impact Assessment and Analysis

The Environmental Impact Assessment or EIA has a special purpose and there is usually a specific terms of reference to be followed to determine:

- the environmental baseline condition at each site,
- the environmental impact of the construction and operation of the associated facilities, and
- identification of any mitigating circumstances.

The EIA is a technical report that should outline the following components of the project:

Project Description and Justification

Provide a brief description of the development plan, including a conceptual plan, and the typical features of the site in terms of location, population, other economic activities, geography and natural environment. This should also include information on:

- Location criteria, including constraints
- Area of land required
- Excavation and/or clearing to be undertaken.
- Methods of storm water drainage, including details of the expected volumes and velocity of discharge and the proposed point/s of discharge.
- Justification of project, stating need and objectives
- The current timetable for the development
- Background information on a list of all consents required or consents sought with their areas of interest in relation to the project.

Description of Existing Environment

(a) Physical Environment

- Geology, landscape, and topography in relation to the different aspects of the development
- Water quality of existing water courses likely to be affected (this may include the foreshore area fronting the development). Parameters to be measured include temperature, clarity/ turbidity/ suspended sediments, conductivity, pH, dissolved oxygen/BOD and faecal coliform count.
- Examine cyclone frequencies.
- Assess the integration of the accommodation units and associated facilities in the existing environment
- Description of current wastewater treatment and disposal system practices as well as current solid waste management.

(b) Biological Environment

- Present brief baseline inventories of terrestrial flora and fauna with emphasis on endemic, rare, endangered or traditional medicinal plant species of conservation significance (as relevant).
- Locate any sensitive habitats and significant natural sites (as relevant).
- Identify species (if any) with potential to become nuisances, vectors or dangerous

(c) Socio-cultural Environment

- Existing infrastructure-access and transportation;
- Sources of water supply and evidences to state that there is enough freshwater to support the development activities.
- Archaeological, cultural or historical sites.

Potential Significant Environmental Impacts

(a) Construction

Site preparation works, vegetation clearing, effect of the development on the local topography.e.g. via earthmoving, soil stability and erosion; identification of routes that construction vehicles will use to and from the site; wastewater treatment and disposal, solid, waste (including construction waste) disposal, storm water runoff and sedimentation.

(b) Operation and Maintenance

Use and disposal/reuse of surplus solid waste material/ use and storage of chemicals (as required); wastewater treatment and disposal (including water from the swimming pools); storm water runoff particularly from the golf course; sedimentation and visual impacts.

(c) Ecological impacts

Loss of, damage to and alteration of, terrestrial and marine habitats and species as relevant.

Social Study

The study area will encompass an area around the border of the development sites. The impact of the proposed project on human beings and their activities shall be assessed. Particular attention shall be paid to impacts arising from land ownership issues. Central to the purpose of the social study is to identify issues or problems, which the landowners and/or residents in or around the study area may have concerning the proposal. Hold at least one meeting in the presence of the Provincial and /or District Advisory Council. Minutes must be kept of these meetings and appended to the report.

The summary needs to include the expression of commitments of the developer to the respective issues raised in the social study, for instance, how to solve the issues raised,

which will be eventually incorporated in the mitigation measures addressed in the subsequent chapter.

Mitigation and Abatement Measures

The study shall examine and recommend suitable mitigating and abatement measures for the adverse impacts identified. The effectiveness of the measure proposed, should be stated and impacts of significance clearly identified. Measures recommend should be practical and readily implemental. This should include a description of the measures envisaged to prevent, minimize and where possible offset any significant adverse effects on the environment of the project. The major issues and /or concerns raised should be addressed well in the mitigation measures. Appropriate conclusions should be drawn. It is useful to summarize the environmental impacts of the proposal and the steps that would be taken to mitigate adverse impacts.

FIJI ENVIRONMENTAL MANAGEMENT ACT 2005

Enforcement of this Act commenced on January 1st, 2008. This gave effect to the following regulations:

- Environmental Management (Waste Disposal and Recycling) Regulations 2007
- Environmental Management (EIA Process) Regulations 2007

The Government of Fiji, through its Department of Environment, is hoping that this Act and its Regulations will help protect natural resources and better control and manage the damaging effects of pollution and improper waste disposal. However, all villages will need to assist the Government and the Department of Environment by implementing their own Environmental Management Guidelines, particularly through the utilization of a Village Environmental Ranger Program, as outlined in this Manual.

5.2. Accreditation Schemes

Case Study Example: Cook Islands Environmental Tourism Accreditation Scheme.

What environmental issues should be addressed?

Identifying which environmental issues should be addressed by the accreditation scheme is important. There are three key factors that have guided the selection of environmental issues for inclusion in the accreditation scheme.

- **necessary** for the achievement of the two environmental objectives of the Tourism Charter;
- **essential** for any comprehensive and credible environmental management scheme; and

- **relevant** to the industry

As a result, six broad environmental issues have been selected for inclusion in the Cook Islands Tourism Accreditation Scheme. These are energy, water, waste, discharges, hazardous substances and natural ecosystems.

The following section discusses the ways in which the tourist industry is associated with these broad environmental issues and the contribution of the industry to any adverse environmental impacts.

Waste

All tourist activities generate waste – it is the form and quantity of waste which varies. Solid waste includes any unwanted or discarded items requiring disposal and can include materials such as cardboard, paper, plastics, glass, metals, garden waste, kitchen waste, textiles, and waste building and construction materials. The storage, transfer and disposal of solid waste has the potential to create adverse environmental effects. These effects vary with the practices used. For example local reuse and recycling causes minimum environmental effects while landfill disposal causes contamination of marine and freshwater bodies, land contamination, air pollution, and visual nuisance. In an island location with major space constraints the effects of landfill-based disposal are even more significant. Responsible management practices include reduction, reuse, recycling and recovery of waste followed by the responsible management of any residuals.

Water

Reliable supplies of good quality drinking water are essential for everyone on the Islands – local and tourists. The majority of the Islands water supplies are from surface water, although a limited number of boreholes are used as well. There are many factors which can affect the reliability of supply, quantity and quality of water. These include natural and human factors such as drought, storms, high consumption, leaks in the network and contamination of water. Tourist activities that consume water include toilet facilities and the provision of drinking water. Other activities, such as accommodation will also use water for laundry, washing, recreation and irrigation. Consumption of water also has energy costs through pumping and in some cases through heating. Any efforts taken to protect the quality of supply and minimize the wastage of water will benefit locals and tourists.

Energy

All tourist activities consume energy for lighting, heating and cooling, for appliances and equipment and for transport. Forms of energy used in the Cook Islands include non renewable and renewable sources. Solar power is a renewable energy source with minor impacts on the environment. It is commonly used to heat water in the Cook Islands tourism industry. Electricity, petrol, and diesel are non renewable forms of energy. The extractions, generation, supply and use of non renewable energy forms has the potential to adversely impact on the environment. Adverse effects can include air pollution, contribution towards global warming, and water and soil contamination from oil and fuel spills. Reducing energy consumption helps to reduce these adverse environmental

effects. Given the high costs of energy locally it also makes sense to conserve energy to reduce energy costs.

Hazardous Waste

Many hazardous substances are very useful and all tourist activities use hazardous substances at some time during their operation. Hazardous wastes include those materials that have flammable, toxic, corrosive, or explosive properties that could cause adverse effects on the health of people and ecosystems unless stored, handled and disposed of with particular care. Hazardous waste materials include batteries, pesticides, chemical cleaning agents, oil, petrol, paints and solvents, and CFCs. Spills or uncontrolled dumping of any hazardous substances can create significant adverse environmental effects – contaminating soil, water and natural ecosystems to the point that they cannot be used for extensive periods of time. Many hazardous substances are persistent and are concentrated up the food chain. These very significant adverse effects have to be managed responsibly. Use of many hazardous substances is now controlled through international agreements. The tourist industry can contribute towards minimizing these adverse effects by reducing their use of hazardous substances and ensuring responsible disposal practices.

Discharges

All tourist activities generate discharges which can contribute towards a range of local and global environmental problems. Local problems include the discharge of untreated waste from poorly designed or functioning septic tanks or package plants which can pollute water and soil. Another discharge which is very common in the Cook Islands is the discharge of smoke and contaminants from local incineration of waste. When waste is burnt at low temperatures there is incomplete combustion of plastics and chlorine based materials which can create dioxins which are carcinogenic. In many countries local incineration of waste from households or commercial activities is banned. As local incineration can impact on the enjoyment of the tourist experience it is something that needs to be controlled. The use of older fridges and aerosol propellants which use chlorofluorocarbons (CFCs) can contribute towards ozone depletion. International conventions banning the manufacture of CFCs has had a significant impact on the tolerance of individuals regarding the use of CFCs. Responsible actions which can be taken by the tourism industry include minimum use of materials creating discharges and efficient operation and maintenance of activities to minimize discharges.

Natural Ecosystems

All activities have the potential to adversely impact natural ecosystems through the removal of vegetation, soil and land, and damming or reclamation of water through the construction of new buildings, facilities or paths. Such impacts affect the habitat value and can affect the integrity and diversity of native species. A number of activities, particularly those involving tour guiding, have the potential to affect natural marine and land ecosystems through their ongoing operations and the introduction of visitors into sensitive locations. Some activities are more damaging than others. Many tour-based tourism activities in the Cook Islands could be classified as eco-tourism as the tourist experience is nature-based. Eco-tourists are even more demanding of high environmental

standards than other tourists. Therefore, management of activities to minimize adverse impacts is critical if they are to appear credible and sustainable in the longer term.

It is clear that every sector of the tourism industry creates adverse environmental effects through its use of energy, water, materials, hazardous substances, generation of discharges and impacts on natural ecosystems.

Six environmental goals have been identified to address the six environmental issues. The goals highlight the long term achievements sought by the industry in the key environmental areas.

Six Environmental goals

1. To minimise waste as far as is practicable
2. To minimise the use of water as far as is practicable
3. To minimise use of energy as far as is practicable
4. To minimise the use of hazardous substances and ensure their disposal causes minimum adverse environmental effects
5. To minimise the adverse effects of any discharges
6. To minimise any adverse effects on natural ecosystems and to promote the natural beauty of the islands

How can the environmental goals be achieved?

Identifying entrance criteria

Having identified the environmental goals it is necessary to identify where specific actions can be taken which will enable progress towards achieving the goals. Having identified actions it is possible to draft criteria which operators will have to meet to be a member of the accreditation scheme.

There are many actions which can be taken by all sectors of the industry to reduce environmental effects and work towards the goals. Some of these require simple no cost changes to business operations and are often classified as “good housekeeping actions”. Examples include improved maintenance, segregation of waste for recycling and reuse and bulk purchasing of materials. Often these changes result in financial savings and therefore all operators should be encouraged implement these actions.

Other action requires low cost changes to business operations such as the purchase of alternative products with less impact on the environment or the responsible disposal of waste through the community landfill. These are however necessary to reduce serious environmental effects or avoid negative feelings of tourists.

A third group of actions exist which require more investment to achieve. These include replacement of incandescent with fluorescent bulbs, installation of solar energy, and installation of a water tank to collect rainwater or recovery of treated wastewater for irrigation. While these have significant investment costs they are also likely to result in considerable cost savings yielding a longer term payback to the business.

Key and recommended entrance criteria

These three groups of actions have been used to determine environmental entrance criteria for the accreditation scheme. For each action we have identified minimum entrance criteria for year one. Some of the year one criteria are easy to achieve – these have been classified as “key” criteria which means they must be achieved in year one to become a member of the accreditation scheme. Criteria which are more difficult to achieve either because they have financial implications or require time to establish are classified as “recommended” for the accreditation scheme. Because the recommended entrance criteria are still very important they could be reclassified as key in year 2 of the scheme.

Best Practice criteria and phased implementation

In general the minimum entrance criteria require taking initial steps to improve environmental management. However, the long term objective of the accreditation scheme is that all members will demonstrate best-practice in environmental management. We recognize that not all actions can be achieved immediately given budget constraints. Therefore, we have also drafted “best-practice” criteria which clearly show the ultimate minimum standard which members of the accreditation scheme are working towards. An indication of the likely timeframe in which these standards will become key is also provided.

Amendment of the criteria from year to year

The environmental criteria, and the key and recommended status will be amended from year to year to reflect changes in visitor expectations, technology and infrastructure changes which mean that actions which are currently not viable or achievable are undertaken as appropriate. It is also critical that the scheme keeps up with changing visitor expectations to protect the integrity of the industry.

What are the benefits of responsible environmental management?

In addition to the specific benefits gained by the environment, benefits will also be gained at an industry-wide level and by individual operators.

Industry-wide benefits

- Maintenance and enhancement of natural resource quality, ecosystem health and the natural beauty of the Islands sustaining the industry in the future
- Satisfied visitors whose environmental expectations have been exceeded or met
- Growth in market share of the global “green” tourist market
- Increased purchasing and use of local products
- Improved environmental quality for local residents as well as visitors.

Individual operator benefits

- Reduced operational costs gained through reduced purchasing, energy, waste and sewage costs.

- Increased efficiency through use of better practices and equipment
- Reduced health and safety risks by using less hazardous substances and managing wastes better
- Improved staff morale through staff working for a responsible employer who cares for the local environment
- Growth in share of “green tourist market”
- Increased competitive advantage gained from all the above

Assessment of applicants

As a voluntary scheme, no business is forced to adopt any of actions specified or participate in the scheme. However, it is hoped that industry operators will understand the scheme benefits to be attractive enough to justify membership.

Although there are key entrance requirements for year one and for each subsequent year, assessors will be flexible in determining eligibility for membership. Where applicants are not able to achieve all key items at the initial inspection, they will be permitted as a conditional member of the scheme on the condition that they are able to make the changes necessary to achieve the action within a specified timeframe. In this way the scheme recognizes the individual environmental achievements as will the overall commitment of the business towards improving its environmental management. This flexible approach ensures that the accreditation scheme will be open to all organization providing tourism services.

5.3. Monitoring Climate Change Issues

The WWF South Pacific Program in its ‘Climate Witness Toolkit’, for the use by and education of, local village communities, states that:

“Climate Change is perhaps the greatest threat to the viability of Pacific Island economies and communities in the 21st century. Climatologists have shown that due to the ever increasing consumption of fossil fuels, global temperatures are predicted to rise by up to 5.8° C by 2100. This will result in a sea level rise of up to 88 cm and disrupt global weather and rainfall patterns. This will place greater pressure on our Pacific communities as it will have a detrimental impact on the availability of food and water resources, our health and on our unique and fragile island ecosystems and biodiversity. Although the Pacific region is an insignificant emitter of greenhouse gases that drive global warming, the region is faced with the predicament of being amongst the most vulnerable to the impacts of climate change. This is partly due to limitation in our land area, our largely coastal dwelling populations and almost complete dependence on natural resources for subsistence living and economic development.

With the reality of climate change in the Pacific, it is imperative that we work to prepare Pacific communities to deal with adverse impacts that it will bring about. This Climate Witness Toolkit is the result of a process undertaken on Kabara, Fiji, (the first Climate

Witness site in the Pacific) to document local impacts of climate change and to devise appropriate adaptation measures that local communities can implement themselves. The methodologies within the toolkit are an adaptation of participatory techniques WWF South Pacific has used over the years in community resource conservation and development projects' which should give facilitators a clear sense of process when trying to illicit information specific to impacts of climate change and developing appropriate community response.

UK Climate Change Bill 2007 – Press Release

The Climate Change Bill will make the UK the first country to put carbon emissions reduction targets into law. Prime Minister Gordon Brown has committed the UK to reducing carbon dioxide emissions by 60% before 2050 to help tackle global warming.

An independent committee on climate change will be set up to advise on "five-year carbon budgets" - part of a new commitment to carbon reduction.

Environmentalists welcomed the move, but said higher targets were needed.

While the bill will also enforce reductions of greenhouse gas emissions of between 26% and 32% by 2020, Mr Brown previously said he would consult the new committee to see if bigger reductions were required.

Green campaigners have urged the government to go further.

A report from think tank the Institute for Public Policy Research, the RSPB and WWF on Monday claimed the government's 60% target did not go far enough.

Instead, it claimed Britain could achieve an 80% cut by 2050.

Yearly targets 'needed'

Tony Juniper, director of Friends of the Earth, said he was "delighted" the UK was to become the first country "to introduce legislation to cut its contribution to climate change".

"But the government must strengthen its proposed legislation if it is to be truly effective and deliver the scale of action that scientists are now calling for."

He said Britain needed to set yearly targets, as well as show a commitment to reducing emissions by 80% by the middle of the century.

He also called on the government to include international aviation and shipping, which are currently not covered by the Bill.

Along with the measures on climate change, the Queen's Speech also included an Energy Bill, which aims to reduce emissions while ensuring secure energy supplies.

It will allow private investment in offshore gas supply projects as well as carbon capture and storage, and boost renewable energy in the UK.

CLIMATE, TECHNOLOGY AND POPULATION CHANGE

In a paper authored by Neva Goodwin, she outlines what the future may be like in 2075.

- The human population, which probably surpassed the Earth's carrying capacity sometime in the 20th century, is now declining in numbers, while its age profile is heavily weighted toward the elderly. For some time yet individuals will feel that the human population is still above a sustainable level, and will respond as they have in Russia, Japan, Italy, and many other countries where fertility rates below the level necessary to replace the existing population have emerged out of individual decisions, and often in spite of government efforts to the contrary.
- The destructive impacts of climate change will have hit hardest in tropical areas, small island nations, and other areas where poverty has made adaptation most difficult. At the same time, the energy transition may have been accompanied by substantial flows of resources and technology from the rich to the poor world. This, combined with humanitarian impulses and some self-interest, may have worked to reduce the world's worst inequalities in material well-being; as the rich world reduced its throughput, and its materialist aspirations, the developing countries may have found ways to improve the health, education, and material well-being of their people.
- The energy transition will have occurred quite successfully by 2075, so that energy for most uses is no longer expensive, and virtually all of the people of the world have access to energy from inanimate sources in amounts that are not much less – and may even be more – than the amounts of energy used today by people in the wealthy countries. Those who have lived through the previous period will have experienced a number of shifts in relative prices – first making energy and many material goods very expensive relative to the income people could expect to earn, then lowering the price of energy, allowing the world's many belt-tighteners to draw a deep breath. However the products of the natural world – the food, fuel, minerals, etc. whose prices, as “commodities,” plummeted throughout the 20th century – will be re-valued at levels representing the full, long-range cost of their extraction, processing and re-insertion into nature, or else their re-cycling within the production process.
- With wide recognition of the dangers of resource overuse, cheap energy will not tempt people and societies back to the profligate resource use of the 20th century. Much of the low-hanging fruit in energy and materials conservation will already have been plucked by 2050. While human ingenuity will continue to find ways to “do more with less” (to quote the 20th century visionary, Buckminster Fuller), the bottom line will be that everyone will need to accept life-styles that require reduced throughput of materials, probably of energy, and also of human labor (given population aging). Aspirations to live in the style of Americans at the beginning of the 21st century are off the table for virtually everyone – including Americans.

- The previous 50 years will have been times of tremendous institutional experimentation and reform. Some institutions for global governance will have been created. If corporations have not managed to redesign themselves to orient toward the promotion of human well-being, then the corporate form will have been replaced with other modes of production: co-operatives, local trusts and other not-for-profit organizations, and perhaps other forms not yet discovered.
- These realities will inject into cultures of the year 2075 a number of critical lessons:
 - To stop poisoning the oceans with run-offs from agriculture and other land uses.
 - To use fresh water sparingly and wisely, so that stores of fresh water can begin to recharge, and are not polluted by human agency.
 - To cherish and protect land and water ecosystems, looking forward to a gradual reversal of the process by which more and more of the surface of our planet has been taken over, and made over, for human uses.
 - To value food, and the growing of it, so that, while food production will be more labor-intensive than the factory farms of the United States today (where less than 1% of the labor force is enough to feed our entire population), farm workers will be relatively better paid than they are today.
 - To value the integrity of language, culture, and arts, and to resist their pollution by advertisers whose goal of selling more goods or services is not well aligned with the healthy development of human beings as individuals or as members of society.
 - To revise expectations, behaviors, policies, and theories, to assist declining populations to adapt to a changing age profile. One important challenge is to discover how the elderly population can be more of an economic and cultural resource than a drain; this is desirable from an economic point of view, and also in terms of the psychological well-being (sense of meaning and purpose in life) of the elderly.
 - To express the value of leisure by making it easy for those who want it to have a shorter work week, recognizing that this is a trade-off. High status will not automatically go to those who make the other choice – of less leisure and more stuff.