

Priority environmental concerns in Fiji

By Institute of Marine Resources
(University of the South Pacific)

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Abbreviations and Acronyms

ADB	Asian Development Bank
CSIRO	Commonwealth Scientific Research Organisation
DoE	Department of Environment
DoW	Department of Water
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FSP	Foundations for the Peoples of the South Pacific
FSPI	Foundations for the Peoples of the South Pacific International
GEF	Global Environment Facility
GoF	Government of Fiji
IAS	Institute of Applied Sciences
IGOs	Intergovernmental Organisations
IMA	International Marine life Alliance
IMR	Institute of Marine Resources
JICA	Japan International Co-operation Agency
MPA	Marine Protected Areas
MSP	Marine Studies Programme
NGOs	Non Government Organisations
NTF	National Task Force
NZODA	New Zealand Official Development Assistance
OISCA	Organization for Industrial, Spiritual and Cultural Advancement -International
PECs	Priority Environmental Concerns
PICCAP	Pacific Islands Climate Change and Adaptation Project
PICD-Fiji	Partners in Development – Fiji (<i>formerly FSP-Fiji</i>)
PWD	Public Works Department
SPAS	School of Pure and Applied Sciences
SPREP	South Pacific Regional Environment Programme
SSED	School of Social and Economic Development
STP	Sewage Treatment Plant
ToR	Terms of Reference
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Project
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USP	The University of the South Pacific
WWF	World Wide Fund for nature

Executive Summary

The coastal component of the International Waters Programme (IWP) aims to address root causes of the degradation of international waters in coastal regions by implementing projects on improved coastal and watershed management. It will support action at community level to identify priority environmental concerns (PECs) relating to marine and freshwater quality, habitat and community modification and degradation and unsustainable use of living marine resources. Once a priority environmental concern PEC is identified, IWP will implement a pilot project in each of the participating country in any one of its four focal areas:

- marine protected areas (MPA),
- sustainable coastal fisheries,
- protection of freshwater resources
- community-based waste reduction.

This paper was prepared to assist IWP's National task force (NTF) in Fiji to identify PECs in Fiji in order to select a focal area for their pilot project.

An overview of environmental problems in Fiji was made from a review of literature specified in the terms of reference as well as consultations with various stakeholders. A collation and assessment on past, present and future projects in IWP focal areas were also made. The review highlighted several important environmental concerns in Fiji that have arisen because of developments in coastal areas, increase in population, urbanisation and economic pressure. The priority issues include nutrient loading and sedimentation in rivers and coastal waters due to poor land use practices, marine pollution from disposal of sewage and industrial effluent, loss of marine habitats and disruption of coastal processes through coastal development, land and coastal-based pollution – liquid and solid waste, over-exploitation of marine resources and use of destructive fishing practices.

These problems have been of concern for at least the last decade. While several projects have been implemented to address these concerns, solutions are being outpaced by the rate at which Fiji's water and coastal resources are being depleted and degraded. There is a serious need for baseline studies to monitor environmental problems in Fiji.

Most of the environmental problems are inter-linked and they require a holistic and cross-sectoral approach if they are to be addressed. An integrated approach is essential and other issues like political will and commitment, community involvement, collaboration between stakeholders (including government ministries, NGO's, IGO's, communities, donors and the general public) and education at primary and secondary levels also need to be considered.

It is difficult to recommend a single project in just one focal area. Pollution of coastal watersheds poses a threat to the very fabric of coral reefs and over-fishing may render certain species locally and ecologically extinct. The rapid decline in coastal fisheries is perhaps the most urgent problem for a variety of reasons. This problem is identified throughout Fiji and is not unique to any given community. We therefore recommend to the NTF to consider projects focusing on managing and conserving coastal fisheries for the IWP pilot project. This may fall under the focal areas 'coastal fisheries' or 'marine protected areas'.

1 Introduction

1.1 Introduction to the International Waters Programme

The IWP is five-year programme for 14 Pacific island member countries¹, funded by the Global Environment Facility (GEF), implemented by the United Nations Development Programme (UNDP) and executed by the South Pacific Regional Environment Programme (SPREP). The project has an oceanic and a coastal component. The former focuses on the management and conservation of tuna stocks in the western central Pacific while the latter is directed at coastal watershed management. This report relates to the coastal component of the programme.

The main objective of the coastal programme is to address root causes of the degradation of international waters in coastal regions by implementing projects on improved coastal and watershed management. It will support action at community level to identify PECs relating to marine and freshwater quality, habitat and community modification and degradation and unsustainable use of living marine resources. A pilot project will then be established in each of the participating country in any one of the four focal areas of the programme:

- Marine protected areas
- Sustainable coastal fisheries
- Protection of freshwater resources
- Community-based waste reduction

These pilot projects will seek to strengthen capacity and provide lessons for best practice and appropriate methodologies for sustainable resource management in the respective focal area.

1.2 Purpose of this report

As part of the IWP's efforts in implementing a pilot project in Fiji, the Institute of Marine Resources (IMR) was contracted to provide a report establishing priorities for environmental issues in Fiji. The report will assist the IWP NTF in Fiji to identify a focal area for the pilot project. The terms of reference (ToR) requires an outline of environmental problems in Fiji, a review of important environmental documents, consultations with stakeholders regarding environmental issues and a collation and review of past, present and future projects relating to IWP's focal areas. The environmental concerns drawn from the review were to be ranked into primary and secondary categories with recommendations on prospective focal areas for the pilot project.

1.3 Structure of this report

The report begins with a brief overview of various environmental problems in Fiji. This is based on a literature review done between 23rd December 2002 and 6th January 2003 which included the environmental reports specifically listed in the ToR (Table 1). In addition, IMR prepared a short questionnaire to assist in interviewing various stakeholders who were asked to identify important environmental issues in the IWP focal areas. A summary and analysis of these responses is provided in Table 2. The report concludes with current PECs in Fiji ranked into primary and secondary categories in each of IWP focal areas with recommendations for the pilot project (Table 3).

¹ Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

2 A Review of Environmental Concerns in Fiji In IWP Focal Areas

2.1 Geographical background of Fiji

The Fiji Group comprises approximately 320 islands of varying sizes with a total land area of 18,333 km². While all types of oceanic islands are found in the Fiji group, the largest islands (Viti Levu and Vanua Levu), are of volcanic origin. The major islands are “high islands” and their interiors are mountainous. (Chandra and Mason 1998). This limits the area of land for development to coastal areas. Typically, the coastal areas are less than 30 meters above sea level and form a narrow belt around the islands. A much wider belt of land ranging from 30 meters to 300 meters above sea level then predominates. Areas above 900 meters elevation occur only in the center of Viti Levu. (Chandra and Mason 1998).

Approximately one hundred islands are inhabited. According to the last census in 1996, the population size was 775, 077. This represents an increase of 59,702 (8.3%) over 1986 figures and an annual growth rate of 0.8% (Fiji Islands Bureau of Statistics 1999), slightly lower than in the previous decade. Since the majority of services, infrastructure, towns, and agricultural land are located along coastal areas, over 90% of this population lives on or near the coast. Over 75% of the population is concentrated on the main island of Viti Levu. Although Fiji has become increasingly urbanized in recent years, over 60% of the population still lives in rural areas. About 80% of the rural population lives within 5 km of the coastline. (Ministry of National Planning and Information, 2002).

2.2 Environmental problems in Fiji

Historically, the people of Fiji have relied on the coastal zone for their sustenance. The increase in population, urbanization, industrial and economic development over the years has placed increasing pressure on coastal resources leading to environmental problems such as loss of habitats from coastal development, improper waste disposal, increased water demand from freshwater lenses, and depleted fisheries. In Fiji’s national environment report (Chape and Watling 1991) to the United Nations Conference on Environment and Development (UNCED), the major environmental problems in Fiji were summarised as follows:

- urbanization - with subsequent waste disposal problems and pressure on peri-urban marginal agricultural land;
- the potential effects of global warming;
- soil erosion caused by increased planting on steep slopes and logging;
- land conversion for agricultural and non-agricultural uses;
- lack of long-term land tenure;
- significant use of pesticides with little surveillance;
- poor sewage disposal from septic tanks;
- problems with solid waste disposal and littering in urban areas;
- lack of recycling;
- moderate deforestation due to large commercial agriculture/rural development projects;
- potential hazards from gold, sand, and coral mining;
- production of toxic chemicals and other wastes by the sugar industry; and
- spread of settlements, urbanization, and related infrastructure.

Development in coastal areas such as building of resorts, ports and roads may detrimentally affect the ecology of the coastal zone. Of concern are changes in the patterns of sediment transport (e.g. caused by

dredging), alteration of current systems, destruction and degradation of coral reefs through excessive sedimentation and increased nutrient loadings.

Felling and in-filling mangroves forests interferes with the many roles that these important habitats play in the coastal zone such as protecting shorelines from erosion, nursery habitats for juvenile fishes and habitats for a variety of invertebrates. Large mangrove areas have been reclaimed for resort development in Fiji such as Denarau and Raviravi. (Watling and Chape 1992). Majority of the rubbish dumps in Fiji are also located in mangrove areas.

Industrial developments in the coastal zone can decrease the productivity of wetlands by introducing pollutants, including heavy metals, and by changing water circulation and temperature patterns. This is quite evident in industrial areas such as Walu Bay where there is Tributyl Tin (TBT) pollution from marine antifouling paints, petroleum pollutants, heavy metals leaching from a battery factory, and discharge of waste waters from food processing factories (UNESCAP, 1999).

The increase in population and industrialization in urban areas also means an increase in the amount of refuse generated. Solid and liquid waste disposal is a major problem in all municipal centers in Fiji. The Lami rubbish dump, which receives wastes from the greater Suva area, has exceeded its assimilative carrying capacity. The non segregation of wastes and general improper disposal of refuse over the years has resulted in leaching of various pollutants including pesticides, oil and heavy metals into the adjoining waters. Laucala Bay receives nutrient enriched wastes from the Kinoya Sewage Treatment Plant (STP), storm water from roads and buildings and large amounts of silt from Rewa River. The Kinoya STP designed for a population of 80,000 is currently serving about 180,000 people. This poses a significant health risk. During torrential rain (Suva's annual rainfall exceeds 300 cm) raw sewage is discharged directly into the bay without treatment. Likewise, episodic flooding during cyclones and heavy rainfall increase inputs of nutrients and sediments and creates large sediment plumes that extend far beyond the lagoon probably to the detriment of corals on offshore islands and distant reefs.

Further inland poor catchment management also increases sediment, nutrient and pollutant loadings in streams, rivers and eventually upon reefs and lagoons. Common examples in Fiji are leaving no buffer zones between sugar cane fields and river edges, permitting stock to trample and foul river margins, discharging dairy farm, piggery and other wastes directly into water courses, planting on slopes, poor logging (especially poorly planned road construction) and excessive burning for grazing. Studies by Togamana (1995) on the Rewa River and by Mosley and Aalbersberg (2002) along the Viti Levu Coral Coast reported increased concentrations of nutrients in rivers and lagoonal waters.

Over-fishing and exploitation of other marine species such as corals, continues to be a major problem in Fiji. Removal of major fish predators through fishing may allows populations of invertebrates such as sea urchins, snails and starfish to flourish. This may have deleterious effects on coral reefs and fish populations. Over-fishing has caused localized extinctions of species like giant clams, sea cucumbers and trochus. Over-fishing coupled with the use of destructive fishing practices such as use of *Derris sp*, explosives and fine meshed nets have resulted in habitat destruction and depleted fisheries resources. The trade in corals and coral reef organisms for the lucrative overseas aquarium and the live reef fish markets also poses a serious environmental risk. If managed properly, however, this trade can be sustainable and very profitable. Fiji is the world's second largest exporter of live reef products for the aquarium trade, after Indonesia, and the market continues to expand. (Sulu et al. 2002).

The Fiji Government has signed various international conventions and agreements pertaining to these environmental issues. Legal instruments and relevant policies exist or are currently in the making to address these problems. A significant achievement for the Department of Environment (DOE) is formulating the Sustainable Development Bill which aims to address environmental issues in Fiji. The Bill, or rather a revised version, is currently awaiting parliamentary approval. Approval of the Bill will

strengthen legislation for protecting the coastal environment and fisheries in principle. There is a need for greater initiative, resources, and enforcement on the part of local governments to render such environmental effective.

2.3 List of reports used for literature review

Several documents, prepared within the last decade, provide detailed assessments on environmental problems in Fiji. We have taken a series of these reports dating from 1992 to 2002 (a list of these reports is provided in Table 1) and have extracted the environmental issues relating to the focal areas of the IWP.

Author(s)	Title of Report	Shortened Title
(Watling and Chape 1992)	Environment Fiji - The National State of the Environment Report.	NSE 1992
(Mataitini 2002)	Fiji's National Assessment Report to the World Summit on Sustainable Development, Johannesburg, South Africa 2002	WSSD 2002
(DoE 1999)	Fiji Biodiversity Strategy and Action Plan	FBSAP 1999
(Watling and Chape 1993)	The National Environment Strategy - Fiji.	NES 1993
(Whippy-Morris and Pratt 1998)	Marine Biodiversity Technical Group Report. Fiji Biodiversity Strategy And Action Plan	MBTR 1998
(Vuki et al. 2000)	Fiji Islands. In: Seas at the Millennium: An Environmental Evaluation.	SMEE 2000
(Seeto 1992)	Pollution in Laucala Bay and Suva Harbour	LBSH 1992
(Lal 1984)	Environmental implications of coast development in Fiji.	CDF 1984
(UNESCAP 1999)	UNESCAP Report on Institutional Arrangements and Environmental Management	UNESCAP 1999

Table 1: Reports used for reviewing environmental problems in Fiji

2.3.1 Brief description of the reports:

i) NSE (Watling and Chape 1992)

This is the most comprehensive report prepared on environmental problems in Fiji. It was commissioned by the National Environment Management Project, in order to formulate the National Environment Strategy for Fiji. This report has also been used extensively in formulating other important documents such as the Convention on Biological Diversity - 1997 National Report to the Conference of the Parties by the Republic of Fiji, the UNESCAP report (1999) on Institutional Arrangements and Environmental Management and the Sustainable Development Bill.

The report includes the status of environmental resources, resource use and development, relevant legal and institutional framework and concludes with issues of concern, and directions for the anticipated roles for the newly created Department of Environment and the National Environment Management Project. This reports identifies unsustainable resource use, and pollution in the urban environment (particularly

waste disposal), and protection of genetic and biodiversity resources as the priority environmental concerns in Fiji.

ii) CDF (Lal 1984)

This report discusses developments in Fiji's coastal zone and examines their impacts on the natural environment. It also looks at problems arising from urban and industrial development and discusses legal institutional arrangements in Fiji relating to the environment.

iii) WSSD (Mataitini 2002)

This document discusses the progress that Fiji has made towards the implementation of Agenda 21². These include policies and legislation, national implementation programs, plans of action and ratifications of conventions to fulfill commitments under Agenda 21. The major achievements include the signing and ratification of 19 international and regional conventions, formulation of 17 international and regional plans of action, 25 national policies and plans, and 17 national implementation programmes addressing sustainable development.

Perhaps the most important components of the action plans mentioned above are the

- a) the National Environment Management Strategy,
- b) the Biodiversity Strategy and Action Plan (which recommends resource management projects to address depleting resources, land degradation and unsustainable use of resources) and
- c) the Sustainable Development Bill. Mataitini's report (2002) also provides an analysis of the constraints faced in the progress of the implementation of the projects, lessons learnt and some recommendations for further progress.

iv) SMEE 2000 (Vuki et al. 2000)

This report reviews the condition of Fiji's coastal and marine environment at the turn of the millennium; summarizing the extent that they are being impacted or reduced; and the actions being taken to ensure their sustainability.

v) LBSH (Seeto 1992)

Most documents on Fiji's environment have highlighted pollution in urban areas. Seeto's report (1992) provides an in-depth review of pollution in Suva Harbour and Laucala Bay. It reviewed major environmental reports prepared prior to 1992 relating to water quality (e.g. various pollutants, sediments such as nutrients, microbiological quality, water clarity, heavy metals, hazardous wastes, solid wastes), land reclamations, sources of pollution, maritime and industrial accidents as well as addressing environmental laws and conventions in Fiji.

² Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment. This was adopted at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992.

vi) FBSAP 1999 / MBTR 1998

The FBSAP principally outlines the state of Fiji's biodiversity with recommendations for its conservation. The document was prepared after Fiji signed the Convention on Biological Diversity. It was drawn up in the context of existing strategies, policies and plans of action. These included the report on Fiji's State of the Environment (GOF 1992), the National Environment Strategy (GOF 1993), Sustainable Development Bill (1997) and the Revised Sustainable Development Bill (1999). The FSABP also summarized findings and recommendations of reports from Six Technical Groups, recommendations of community workshops and contributions from the members of the FBSAP Steering Committee. The Technical Report most relevant to IWP was the Marine Biodiversity Technical Report. It describes the state of Fiji's marine biodiversity and makes a series of recommendations for protecting the resources. It highlights the need for baseline scientific studies on stock assessments and inventories of marine habitats.

vii) NES (Watling and Chape 1993)

The 1993 National Environment Strategy Report was based on the findings of State of the Environment report. It identifies development, environmental and resource management issues and outlines several strategic areas where action was needed to ensure sustainable development. The goal of the strategy is to achieve sustainable economic development and resource use and conserve Fiji's natural and cultural heritage through effective environmental management, comprehensive heritage protection and meaningful private sector and general public involvement.

viii) UNESCAP (UNESCAP 1999)

The UNESCAP report analyses strengths and weaknesses in existing institutional arrangements and mechanisms for including environmental considerations in decision-making for economic, social and physical development. It provides a synopsis of the environmental implications of growth and development in Suva with a review of the problems that development and growth has placed on the environment and its ability to withstand such pressures.

2.4 Environmental concerns from the literature review

2.4.1 Marine and freshwater quality

i) NSE (Watling and Chape 1992)

- Freshwater bodies affected by logging, deforestation, reforestations, poor agricultural practices, and poor land management practices. Water catchments need be managed actively based on sustainable land use.
- Lack of conservation practices in freshwater management.
- Localized deficiencies of freshwater supplies, e.g. in heavily populated sugar-cane growing areas in the dry zones of Viti Levu and Vanua Levu and outer low-lying islands.
- Removal of too much water from freshwater lenses in low islands letting salt water to intrude compromising future freshwater supply.
- Disposal of treated or raw sewage into the sea and rivers by resorts, hotels and communities situated upstream, along the coastal fringe and from sewage treatment plants.

- Seepage of leachates (e.g. heavy metals, persistent organic pollutants, pesticides and microbial pathogens) from municipal rubbish dumps into surrounding streams, creeks and coastal environment.
- Seepage of sewage from the Suva area into creeks, rivers, Laucala Bay and Suva Harbour.
- Discharge of industrial effluents into creeks and near shore waters causing large areas of turbidity and increased biochemical oxygen demand (BOD) causing an overall reduction in water quality. Industrial areas that need monitoring include Lami, Walu Bay, Vatuwaqa and Laucala Beach Estate in Suva and industrial areas in Lautoka. Dumping of pollutants and sometimes hazardous material are commonly seen in these areas.
- High levels of heavy metals and tribute tin from boat yards and the persistence of these pollutants in sediments.

ii) CDF (Lal 1984)

- Poorly planned or improper refuse and sewage disposal. e.g. the Lami rubbish dump leaches heavy metals and other toxic waste into the coastal waters.
- Excessive sediment and nutrient loading into coastal waters from rivers. e.g. Laucala Bay receives significant loads of sediments and nutrients from Rewa River and the Kinoya STP.
- Localised pollution from the discharge of industrial effluents, e.g. from flour mills, electroplating plants, fuel oil depots, shipbuilding and repair docks, sugar mills and fish canneries.

iii) WSSD (Mataitini 2002)

- Freshwater shortage in low lying islands.
- The lack of expertise in water management and lack of awareness on sustainable use of quality freshwater.
- Severe marine pollution in Suva including high levels of heavy metals in the harbour.

iv) SMEE 2000 (Vuki et al. 2000)

- Poor water quality in urban areas due to sewage pollution, and poor land practices causing sedimentation and eutrophication.

v) LBSH (Seeto 1992)

- Increased microbial concentrations around heavily populated areas, recreational beaches, and major rivers in the Suva and Laucala Bay area.
- Increased sedimentation due to poor land use, mining and construction.
- Major sources of pollution into Suva Harbour and Laucala Bay from industries in the industrial area, sewage treatment plants, Lami Rubbish dump and general septic tank seepage.

vi) NES (Watling and Chape 1993)

- Severe marine pollution in Suva.
- Lack of water conservation practices.
- High levels of TBT in Suva Harbour.
- High levels of BOD, nutrients, suspended solids and faecal coliform bacteria in industrial discharges entering water bodies.

- Inadequate treatment of sewage before discharge.

vii) UNESCAP (UNESCAP 1999)

- The extensive water pollution in the vicinity of the Lami rubbish dump.
- The discharge of effluents and waste waters by industries into the coastal waters thereby contaminating the coastal environment and water quality as well as affecting the fishery in the Suva Harbour.
- Release of pathogenic bacteria and viruses which are detrimental to health.
- Increased nutrient levels triggering algal blooms.
- Hazardous waste disposal. This includes agricultural chemicals such as pesticides and fertilizers, petroleum products and other hazardous materials disposed on land or into watercourses, to the use of old vehicle batteries in foreshore reclamation which can leach heavy metals into adjoining waters.

2.4.2 Habitat and community degradation

i) NSE (Watling and Chape 1992)

- There is no inventory of marine inshore habitats apart from mangroves in Fiji.
- There is significant deforestation in Western Viti Levu especially in Sigatoka and Ba river valleys and upper Wainibuka catchments.
- Poor agricultural practices such as planting on slopes, close to streams, banks causing soil erosion, siltation and eutrophication.
- Poor logging practices in forest areas that compromise forest regeneration and which increases soil erosion.
- Coastal development for tourism activities resulting in the loss of ecological habitats such as mangroves, loss of fisheries and disruption of coastal processes.
- Global warming causing likely increases in sea-level that will inundate low lying areas (where about two thirds of Fiji's population live).
- Pollution in the urban environment and the fact that there is no regular monitoring of pollution levels.
- The national dilemma of waste disposal - especially solid wastes and sewage effluent. The Lami rubbish dump is a serious concern.

ii) CDF (Lal 1984)

- Degradation of mangrove areas - reclamation of mangrove land for agricultural purposes, resort and industrial development, use as rubbish dumps.
- Degradation of coral reefs and consequent decline in populations of marine organisms as a result of agricultural activities, tourism, urban and industrial development, over fishing and natural threats such as outbreak of crown-of-thorns starfish.
- Accelerated soil erosion - soil transported into coastal ecosystems smothers coral reefs and mangroves causing a reduction in fish populations.
- Poor agricultural practices of plant of crops on slopes without proper contours, slash and burn subsistence farming to the detriment of water quality and freshwater and marine habitats.

iii) WSSD (Mataitini 2002)

- Impacts on Fiji's coastal zone through development.
- Reduced abilities of coastal systems to cope with climate change, sea-level rise and human activities.
- Poor waste management at all municipal dumps in Fiji. This is mainly due to lack of government resources, enforcement and inadequate waste management initiatives.
- Loss of habitat from agricultural developments, fires, destructive harvesting practices such as use of chemicals, dynamite, poorly planned developments in coastal areas and small islands, release of industrial pollutants. These factors have all affected Fiji's natural resources, posing major threats especially to inshore marine communities and their biodiversity.
- Increase in environmental and social problems due to urbanisation.
- Lack of finances and capacity to implement sustainable development programs.

vi) SMEE 2000 (Vuki et al. 2000)

- Loss of major coastal habitats in urban areas e.g. mangroves, seagrass beds, as a result of unplanned development in urban areas. Beach erosion was flagged as a serious concern.
- Degradation of coral reefs because of elevated sediments and nutrients.
- Biological disturbances e.g. outbreaks of crown of thorn starfish and coral bleaching.

v) LBSH (Seeto 1992)

- Coastal development activities resulting in loss of coastal habitats such as mangroves.
- Over exploitation of living marine resources.
- Improper disposal and management of domestic and non domestic waste.

vi) FBSAP 1999 / MBTR 1998

- That Fiji's coral reefs are constantly under threat from human activities.
- There is a need to strengthen integrated coastal zone management and conservation awareness.
- The lack of effective MPA.

vii) NES (Watling and Chape 1993)

- Uncontrolled pollution levels.
- Poor logging practices (forest and pine) causing avoidable environmental damage.
- Poor municipal waste management.
- Soil degradation.
- Widespread informal developments which have given rise to a host of environmental and social problems.
- Poor development planning.
- The lack of effective biodiversity conservation measures.

viii) UNESCAP (UNESCAP 1999)

- Loss of coastal resources and the impact of land reclamation.
- The increase in population growth coupled with unemployment rate and shortage of affordable housing, which has resulted in the increase of squatter settlements on marginal coastal land, usually adjacent to mangrove areas. This leads to the use of mangroves as waste disposal areas and as a source of firewood.
- Improper refuse disposal, in particular the dump at Lami.

2.4.3 Unsustainable use of living marine resources

i) NSE (Watling and Chape 1992)

- Sedentary species such as giant clams, trochus, pearl oysters, bêche-de-mer, mangrove crabs and rock lobsters are seriously threatened by over fishing.
- Inadequate fisheries management; traditional fishing-right owners should be encouraged to conserve their fisheries.
- Environmental management and control is very weak. There is a major need to strengthen supervision and law enforcement to protect fisheries resources and habitats.

ii) CDF (Lal 1984)

- Fish caught in coastal and estuarine waters off urban centers are declining because of over fishing for cash, efficient fishing gear and degradation of habitats.

iii) WSSD (Mataitini 2002)

- Destructive fishing practices such as chemicals and small mesh nets causing habitat destruction and over fishing.

vi) SMEE 2000 (Vuki et al. 2000)

- Severe over fishing of reefs and lagoons especially in urban areas is causing local extinctions of several important inshore species, e.g. bêche-de-mer, sea turtles, giant clams.
- Destructive fishing practices such as explosives, poisons are ruining both habitat and marine life.

v) FBSAP 1999 / MBTR 1998

- There is an urgent need for scientific stock assessments of Fiji's marine resources to ensure effective fisheries management.
- Local extinction of several marine species while several other sedentary species are under threat due to increased fishing pressure and use of destructive fishing practices. There is a need for stock assessment to determine marine species which are endangered or threatened and need to be protected.
- There is a need to designate areas such as the great astrolabe lagoon in Kadavu, as MPAs to conserve marine biodiversity.

vi) NES (Watling and Chape 1993)

- Resources are used unsustainably because the local government has inadequate policies, legislations, lacks strategic planning and ineffectual administration.
- Widespread over-fishing in heavily populated localities.
- There is an Increase in the use of destructive fishing practices, which requires greater vigilance and enforcement by responsible authorities.

2.5 Results from consultations with stakeholders

The various stakeholders (Table 2) that IMR consulted prior to writing this report were asked to complete a short questionnaire designed to try and establish what they thought were the most pressing marine environmental concerns in Fiji. Responses were obtained in writing and by interviews and tabled below (Table 2).

The major concerns highlighted by stakeholders were as follows:

i) Marine and freshwater quality

- Solid and liquid waste disposal is generally inadequate.
- Sediment and nutrient loading in coastal waters is excessive and increasing.
- Freshwater resources are inadequately protected and conserved.

ii) Habitat and community degradation and modification

- Loss of marine habitats through coastal development
- Degradation of marine habitats through pollution, sedimentation, eutrophication and harmful fishing practices

iii) Unsustainable use of living marine resources

- Many important marine resources are being exploited unsustainably by both communities and by commercial enterprises.
- The major issues were over-fishing, use of destructive fishing practices, coral reef degradation, coral harvesting.
- Poor agricultural practices, bad land management, unplanned developments, human negligence and weak coastal planning was degrading coastal waters and marine life.
- Environmental legislations are inadequate or outdated and poorly implemented.
- There is a need for a proper management plan for coastal areas and resources.
- Vulnerability of resources to natural phenomenon such as coral bleaching, climate change, sea level rise.
- The concept of conserving biodiversity conservation needs to strengthen at the local community level.
- There is an urgent need to instill conservation ethics into the curriculums of primary and secondary schools.

Table 2: Results on consultations on priority environmental concerns in Fiji with various stakeholders.

Person consulted/ Department	Priority environmental concerns in Fiji
Sandeep Singh National Coordinator, IWP. Department of Environment	Solid and liquid waste disposal Pollution in coastal waters Unsustainable use of fisheries resources
Aliti Susau, Veena Nair, Penina Namata & Etika Rupeni WWF	Unsustainable use and exploitation of marine resources by locals and commercial enterprises. Degrading land-based activities that impact on the marine environment.
Cameron Hay Director IMR	Pelagic and near-shore resources are being overfished There is an urgent need for training and capacity building in fisheries research and management Fisheries Dept needs a properly resourced research division Coastal planning developments are steadily degrading habitat and water quality Governments interest in MPAs is mainly tokenism and lip service
Vandhana Naidu Waste and Pollution Officer Department of Environment	Outdated and poorly implemented environmental legislation, unsustainable use of resources, littering, uncontrolled discharge of industrial waste
Leba Mataitini Coordinator SPACHEE	Faxed questionnaire – no response
Iliape Tuwai Marine Officer IMA, Fiji.	Ignorance on the part of resource users to protect their resources Over-fishing and harvesting of marine resources; inadequate legislation to cope with environmental and fisheries related issues
Peni Puamau Environment Officer Fiji Industries Limited	Water – sustainability, conservation and availability. Management of coastal areas and its vegetation. Management and sustainability of natural resources.
Shereen Sharma MSc Student in Marine Pollution, USP.	High nutrient levels in Laucala Bay, currently being discharged from the Kinoya STP and Rewa River.

Manoa Malani Ministry of Tourism, Culture, Heritage and Civil Aviation	Faxed questionnaire – no response to date
Curly Carswell Fiji Dive Operators Association	No responses to phone calls
Ed Lovell Biological Consultants, Fiji	Eutrophication (leaching of topsoil in agriculture, nutrient loading in lagoons and septic seepage), coral degradation, sediment loading onto reefs and harbour from Kinoya outfall and Rewa river, algal reef formation. Community level – awareness on use of reef resources, over fishing and use of duva (fish poison).
Dr. Koshy Director Pacific Centre for Environment and Sustainable Development	Faxed/emailed questionnaire – no response to date
Alena Lawedrau Graduate Hydrogeologist Trainee SOPAC	Sediment loading and run-off in the major rivers (the main contributors to the nation’s drinking water).
Pio Manoa Greenpeace Pacific	Sustainable fisheries management. Discharge and pollution into marine environment.
Sunia Waqainabete Acting Principal Research Officer	Lack of awareness and education on environmental impacts arising from unsustainable practices e.g. Gear use Unsustainable use of living marine resources Point and non-point sources of pollution Reduced marine and freshwater quality
Dick Watling Environmental Consultants	Faxed questionnaire – no response to date
Winnie Nainoca Fiji Institute of Technology	River water degradation (freshwater) due to pollution by improper disposal of community rubbish, sedimentation from erosion due to unsustainable farming method, gravel mining, farm run-offs (fertilisers, animal wastes)
Johnson Seeto, Lecturer, Fisheries, MSP. USP.	Solid waste disposal. Marine water pollution. Unsustainable use of marine resources.

Bill Aalbersberg Director, IAS	Over harvesting of marine resources. Destructive fishing practices. Unsustainable agricultural practices. Pollution – marine and freshwater. High nutrient level in coastal waters. Coral bleaching.
Marika Tuiwawa Curator of Regional Plant Herbarium, USP	Pollution of marine and freshwater through unsustainable agricultural and logging practices and unplanned development such as road construction that affects surrounding water catchment areas.
Culwick Togamana Lecturer, Chemistry, SPAS	High nutrient levels at point sources of pollution, rivers (from sediment and land run-offs).
Philomena Gangaiya Head of Department, Chemistry	Deteriorating marine and freshwater quality without adequate measures at promoting protection of water quality or prevention from further deterioration.
Randy Thaman Professor, Biogeography, SSED	Protection of marine biodiversity Destruction of coastal and marine habitats Threats from natural phenomenon
Patrick Nunn Lecturer, Geography, SSED	Emailed questionnaire – no response to date
Joeli Veitayaki Coordinator, Marine Affairs, MSP	Marine and freshwater pollution is a major threat. There is a general lack of appreciation of the change in quality of marine and fresh water caused by human activities such as high population concentration, agriculture, infrastructure development, etc. Development of roads has altered water system flow; habitats have been degraded and changed in areas where forests have been replaced by farmland and where coastal lowlands have been extended. My fear is that humans are now well-equipped and motivated to exploit natural resources to enrich themselves.
Veikila Vuki Ex Lecturer, Marine Pollution, MSP	Over fishing of marine resources, degradation of coral reefs through increased nutrients and sedimentation, deteriorating water quality.
Malakai Tuiloa Deputy Director, Fisheries Department FSM	Habitat degradation – loss of mangroves and coral harvesting. Officer in charge is on leave.
George Tami Special Officer, NLTB	Land mismanagement upon leasing due to rainforest and mangrove destruction for construction. Destruction of coastline and sewage disposal in coastal waters.

<p>Severo Tagicakiverata Ecotourism Officer Fiji Visitors Bureau</p>	<p>Deforestation – exploitation tropical rainforest by locals. Mining – exploitation of natural habitat (proposed Namosi copper mine), leaching to Beqa lagoon destroying one of the world’s best diving sites. Coral extraction – affects the pristine waters, destroys habitat and food source for locals.</p>
<p>Sher Singh Scientific Officer Kinoya Sewerage Treatment Plant</p>	<p>Solid waste disposal – seepage into water bodies. Waste water disposal – industrial discharge into water bodies. Habitat destruction – mangrove areas for construction work.</p>
<p>Kotoiwasawasa Director Health Services Suva City Council</p>	<p>Faxed questionnaire – no response to date</p>
<p>Sandip Narayan Building and Health Inspector Lami Town Council</p>	<p>Solid waste disposal - at Lami rubbish dump. Waste water discharge - from factories into river and sea, especially from Fiji Industries in Lami.</p>
<p>Samuela Lagilagi Health Inspector Sigatoka Town Council</p>	<p>Waste water and oil from restaurants and service stations and household discharge into river. Solid waste disposals - at rubbish dump which needs to be relocated.</p>
<p>Sakaraia Serau Health Inspector Nadi Town Council</p>	<p>Solid waste disposal - in the form of littering in drains, rivers and beaches because there is no rubbish dump. All rubbish is taken to the Lautoka rubbish dump (Vunato). Waste water - from Rainbow Textiles – dye discharge – into Nadi Bay.</p>
<p>Rajendra Pratap Director Health Services Lautoka City Council</p>	<p>Improper solid waste disposal – litter, household and industry waste. Lautoka rubbish dump is also catering for Nadi, Island Resorts and resident rubbish. Waste water problem – Sewerage, FSC mill waste, oil waste from Punjas and Soap factories discharging into foreshores.</p>
<p>Dip Narayan Health Inspector Ba Town Council</p>	<p>Solid waste disposal – littering along riverbanks.</p>
<p>Suman Khan Acting Town Clerk Tavua Town Council</p>	<p>Poor waste water disposal - no sewerage system. Poor drainage system with only open V-drains.</p>
<p>Prakash Chandra Senior Health Inspector Nausori Town Council</p>	<p>Solid waste disposal – Lakena rubbish dump closed in 2000. Rubbish dumped at Lami rubbish dump now. People still using Lakena rubbish dump illegally. Wastewater problem - drainage system of surface water is poor because the Lakena irrigation scheme has closed.</p>

<p>Laisiasa Corerega Health Officer Nasinu Town Council</p>	<p>Faxed questionnaire – no response to date.</p>
<p>Mohammed F. Ali Health Inspector Labasa Town Council</p>	<p>Wastewater discharge – FSC Mill discharge into Qawa river is very detrimental. The river is devoid of aquatic life. Sewerage overflows due to outdated and worn out sewerage system. Industrial oil and parts waste discharged in drains. Heavy agriculture and logging near rivers pollute drinking water. Squatter settlements disturb mangrove ecosystem.</p>
<p>Sailosi Qalilawa Health Inspector Savusavu Town Council</p>	<p>Improper wastewater disposal – Savusavu has no sewerage treatment plant. There is seepage of sewage from septic tanks into the sea. Poor water quality as there is no water treatment plant. Poor solid waste disposal – dump located near the sea so there is seepage of effluent into the coastal environment.</p>
<p>Manasa Racava Senior Assistant Health Inspector Levuka Town Council</p>	<p>Improper waste water disposal – Levuka has no sewerage treatment plant. Seepage of sewage into sea, which results in algal blooms that stink when dry. No water treatment plant for villages.</p>
<p>Banuve Kaumaitotoya Principal Economic Planning Officer National Planning</p>	<p>Unsustainable land use – improper cultivation techniques. Unsustainable fishing practices.</p>
<p>Jese Verebalavu Coordinator Women in Fisheries</p>	<p>Over-exploitation of marine resources Land and coastal pollution</p>
<p>Jone Niukula Natural Heritage Officer National Trust of Fiji</p>	<p>Biodiversity conservation – community based needs to be encouraged.</p>
<p>Tevita Kanalagi Executive Officer PWD</p>	<p>Inadequate wastewater disposal – especially sewerage. Deforestation – disturbance of virgin forests during road construction, habitat destruction, and disturbance of food source when leaching occurs to creeks and rivers.</p>
<p>Una Cera Senior Health Inspector Health Ministry</p>	<p>Solid waste management needs to be strengthened. Fresh water shortage in rural areas.</p>
<p>Madhukar Mudaliar Water Education Officer Live & Learn Environmental Education</p>	<p>Deterioration in freshwater quality from pollution, improper agricultural practices and long-term cultural/social impact (sewage, etc). Decrease in diversity and abundance of native freshwater species. There is need for community based solid/liquid waste management practices, a national water quality database and a general awareness on impacts on freshwater bodies.</p>

2.6 Discussion

Our literature review and consultations with various stakeholders have revealed a wide range of environmental problems occurring in Fiji that impact coastal waters. These problems are discussed below with respect to each IWP focal area.

2.6.1 Marine and freshwater quality

Waters are grossly affected around point sources of pollution such as sewage outfalls, sugar mill effluent discharge areas, rubbish dumps and industrial areas. The most pressing issue relating to quality of near shore waters was increased nutrient loading caused by sewage disposal and soil erosion. Logging, land run-offs, construction of forest roads and poor agricultural practices were also degrading inland streams and rivers resulting in degradation of coastal waters and habitats. In particular, elevated nutrient loads were causing excessive algal growth and were potentially damaging to coral reefs (Mosley and Aalbersberg 2002). Large portions of coral reefs in the coral coast are becoming algal reefs. The socio-economic impacts of these changes on coastal dwellers are yet to be ascertained.

Currently, all municipal and solid wastes are disposed at sites located next to shores and coastal water bodies. Leachates from the dumpsites are constantly seeping into the environment significantly affecting water quality and compromising public health because of pathogens.

Freshwater shortage in outer lying islands and the western parts of Viti Levu and Northern parts of Vanua Levu, has been identified as a significant concern, serious wastages of freshwater reflect that lack of awareness on sustainable use, and lack of conservation practices in water management.

2.6.2 Coastal habitat and community degradation and modification

Coastal development causes a significant loss of habitats such as mangroves was expressed as a major concern by stakeholders as well as in the literature review. There is a general consensus that coral reefs in Fiji are being stressed from anthropogenic inputs such as sedimentation, eutrophication and over-fishing. With added pressure from the devastating effects from the crown of thorns star fish, coral bleaching and storms and wave action, Fiji's coral reefs are significantly threatened.

The tourism industry, although a major foreign exchange earner, has caused significant environmental problems in coastal areas. To make way for development of hotels, resorts and airfields, significant portions of coastlines are altered resulting in loss of numerous marine life forms, coastal habitats thereby affecting ecology, patterns and processes in coastal ecosystems. Once these developments have taken place further environmental arise through improper and irresponsible disposal of sewage and other solid and liquid waste. Tourists may also contribute to destruction of reef resources through ignorance such as boat anchors and trampling on corals.

2.6.3 Unsustainable use of living marine resources

The major concern highlighted in this area was over-fishing of commercially important inshore species. Reports suggested that over-fishing was more prevalent around urban areas and there is a perception that outer lying islands are under fished. This is changing however, as transportation improves (e.g. giving better access to commercial markets). The availability of ice improves either by the construction of new ice plants and by the incursions of "middlemen" with vessels equipped with ice. Any expansion of the live reef food fish trade will also increase fishing pressure in outer lying islands. In the near future

therefore almost all parts of the Fijian archipelago may be fished unsustainably in much the same way as currently occurs in major urban areas such as the Suva lagoon.

Associated with this concern of over fishing is a widespread destructive fishing practice – mainly the use of the derris root “duva” and fine mesh nets. These practices destroy the corals and eliminate even juveniles from the fish populations. This report has also identified that certain high value benthic species such as giant clams, lobsters, sea cucumbers, pearl shell and trochus are seriously endangered and there are localized extinctions. Some finfish also severely depleted e.g. humphead wrasses to the point of local extinction while others such as the groupers, emperors, snappers, and parrotfish are constantly being overfished.

3 Past, Present and Future Projects In IWP Focal Areas

3.1 Projects

The following tables list past, current and planned activities undertaken in the Fiji in the four broad focal areas of the IWP: freshwater quality; waste issues; coastal fisheries and marine protected areas. The table was drawn up by the Project Coordination Unit for the IWP, during their visit to Fiji in 2001. We have updated the table wherever possible based on our interviews with various stakeholders.

Table 3: Past present and planned projected relating to IWP focal areas: A. Freshwater B. Waste. C. Marine Protected Areas. D. Sustainable Coastal Fisheries.

A. Freshwater

Title	Lead Agency	Sourced Funds	Start Date	Status	Contact
Suva Nausori Water Supply and Sewage project	Ministry of Communication, Works and Energy	ADB	April 1998	Under implementation	E. Gordon Fox, Project Implementation Officer; Ph (632) 632-5510; gfox@adb.org
Cement Water Tanks – installed in a number of schools in the Northern Division	Partners in Community Development – Fiji (formerly FSP- Fiji)	*Jersey Aid UK *AUSAID (through Aust. High Commission in Fiji) to Save the Children Fund (Fiji).	1989	On-going	Roshni Chand, FSP-Fiji Phone # 3300392
DoW Rural Water Supply Project	Department of Works (Water & Sewage)	1/3 –Community 2/3 –DoW	1960’s	ongoing	Department of Works, Ram Shandil, Director Water and Sewerage.
Traditional freshwater ecological knowledge, food gathering and attitudes towards environmental degradation and the generation of an inventory of freshwater species in the Wainibuka, Dreketi and Waimanu Rivers, Fiji.	Fiji Institute of Technology	NZODA (Pacific Initiatives for the Env)	2002	Ongoing	Mrs. Winnie Nainoca Nainoca_w@fit.ac.fj Ph 3389286
Stream Watch: School and community water quality education programme to help raise awareness of the environment. Operating in 4 rivers in Fiji including Rewa River.	Live & learn Partner Stream watch (Australia)	NZAID River care project	2001	ongoing	Lepani Rabuli Phone # 3315467

B. Waste

Title	Lead Agency	Sourced Funds	Start Date	Status	Contact
Implementation of a National Programme for Recovery and Recycling of Refrigerants	DoE	UNDP	2001	Ongoing end date 2004	Epeli Nasome, DoE
WaiBulabula Living Waters Project 1999-2001. Aims to restore coral reef mangrove and stream health through the management and treatment of discharges of effluent and waste in Tikina Cuvu. Establishes systems of treating waste-water using plants, artificial wetlands, composting and vermiculture as a demonstration and training project, in coral coast area to assist reef recovery from pollution and human activity.	Partners in Community Development – Fiji (formerly FSP- Fiji); also Fijian Shangri-la’s Resort	Darwin Initiative	1999	On-going	Floyd Robinson, Partners in Community Development – Fiji (formerly FSP- Fiji) Phone # 3300392
Waste Education & Awareness Project	DoE	PICCAP & DoE	1998	Completed 2001	Eleni Tokaduadua DoE
Integrated Watershed Management Study (Agricultural Wastes)	Drainage and Irrigation and other govt depts	JICA		1 st study completed	
International Coastal Clean-up	International Marine life Alliance - Fiji	IMA seed funds	2003	Currently being planned	Iliape Tuwai Phone#3300708
Water Supply and Sewage Project, Fiji	ADB; Gov’t of Fiji	ADB/N/A	N/A	N/A	Waste and Water Department
Waterless Composting Biological Toilet, Vatuyalewa Settlement, Tovata (Nasinu).	Mr. Isimeli Masi, former Health inspector with Fiji Health Ministry			N/A	Mr. Masi c/ Wainimate.

C. Marine Protected Areas

Title	Lead Agency	Sourced Funds	Start Date	Status	Contact
Ulunikoro Marine Reserve, Waisomo village, Ono Island, Kadavu Province, Fiji	WWF Fiji Program	WWF	1997	Ongoing	Etika Rupeni, WWF
Nakasaleka, Naceva, Sanima Districts, Kadavu.	(WWF, IAS Fisheries)				Etika Rupeni, WWF. Alifereti Tawake
Coral Gardens Initiative, Tikini of Cuvu Focuses on cleaning up and restoring the reef, removing crown of thorns; replanting coral, setting up tabu areas, protecting coral from harvesting, training traditional owners to restore reef for their own use and to protect it from abuse. Community training is a major component. Began in Tikina Cuvu & replicated in other areas of Fiji.	Partners in Community Development – Fiji (formerly FSP- Fiji)	NZODA MacArthur Fund Packard Fund Shangri-la’s Fijian Resort Hubbard Fund	1999	On-going	Dr Austin Kerby, FSP-Fiji
Coral Reef Conservation & Management. To be based on the Coral Gardens Initiative, a pilot project currently implemented by FSP-Fiji. At Motoriki and Yaduataba	Partners in Community Development – Fiji (formerly FSP- Fiji)			Still in planning stages	Partners in Community Development – Fiji (formerly FSP- Fiji)
Existing Fisheries MPA Projects: Makogai, Namena, Naitaiuba (Hare Krishna) Motoriki	Fisheries Department	Fiji Government	Varying dates since 1970	Ongoing, progress slow	Fisheries Division
Motoriki (Tikina Province)	IMA, Fisheries, MSP		2000		IMA
Naboutini/Navutulevu/Namatakula, Nadroga province	IAS with Fisheries and MSP	Packard	2001	On-going	Alifereti Tawake Phone # 3212653
Vanuaso, Gau.	IAS		2001	On-going	Alifereti Tawake Phone # 3212653
Muaivuso, Rewa; Waiqanake, Nabaka communities, Rewa Province Tailevu.	IAS	Packard	2001	On going	Alifereti Tawake Phone # 3212653

D. Sustainable Coastal Fisheries

Title	Lead Agency	Sourced Funds	Start Date	Status	Contact
Votua Community Marine Resources Conservation Development project, Ba province. Community-based sustainable fisheries management & AIGA	USP-IAS	UNDP	2001	Under implementation	USP Bill Aalbersberg Phone # 3212245
Tailevu Province Natural Resources Program. Major comm.-based forestry and marine initiative in Tailevu province, which includes sustainable use of natural resources including development of management plans.	Partners in Community Development – Fiji (formerly FSP- Fiji)	EU	1995	completed	Roshni Chand, Partners in Community Development – Fiji (formerly FSP- Fiji) Phone# 3300392
Fiji Locally Managed Marine Areas	IAS- WWF- Fiji Fisheries, etc	Packard Foundation	1995	On-going	Bill Aalbersberg Phone # 3212245
Integrated Coastal Zone Management	IAS	Packard Foundation	1995	On-going	Bill Aalbersberg Phone # 3212245
Marine Awareness Workshops	Fiji Dive Operators Ass; other NGOs and the GoF	N/A	N/Amid 1990s	Completed	USP
Marine Aquarium Initiative: Coral Reef conservation through market incentives and certification for sustainable use of marine aquarium organisms	Partners: NGOs, industry reps and public aquaria	GEF, Packard Foundation, private sector, WBMMTI			
Mangrove Replanting	OISCA	N/A	N/A	N/A	N/A Nausori, Fiji
Live reef fish exports from Fiji – monitoring at collection sites, marketing.	IMA	IMA seed funds	2000	Ongoing –to end in 2003	Iliape Tuwai Phone # 3300708
Boat Building Project	Fisheries Division	FAO	1980s – 1993	completed	/
Giant Clam Surveys and Mariculture	N/A	ACIAR	1982-1992	Completed	N/A
Sustainable fisheries survey of Viti Levu	Fisheries division & CSIRO	ACIAR	1993	Completed	N/A
Coral Farming. Investigate and assess exiting pilot projects established in Fiji to see if appropriate model can be replicated as a community enterprise – AIGA	N/A	N/A	N/A	N/A	N/A
Seaweed Culture (private sector)	Fisheries Division	NZODA	1984	N/A	N/A
Coral reef and lagoon rehabilitation project	IMA			Currently in planning stages	Iliape Tuwai Phone# 3300708
Dept. Fisheries currently doing fisheries resource survey in Motoriki.	Fisheries	Fisheries		current	Maciu L, Fisheries
USP/WWF collaborative study – Lomaiviti & Kadavu	USP/WWF/Naia	*MacAurthur	April-May	Completed	WWF – Fiji

scientific expedition to survey status of coral reefs in Fiji; also to establish monitoring; assess extent of coral bleaching	cruises	Foundation *WWF	2001		
<p>‘Drugs From The Deep’. Natural Products Development And Conservation in Tikina Verata, Fiji. 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; 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</p> <p>The people of Verata, led by their chief the Ratu mai Verata, have developed a marine resource management plan which includes:</p> <ul style="list-style-type: none"> • 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 <p>SPACHEE worked as part of the BCN project in 7 villages in Verata.</p>	IAS-USP	<p>*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.</p> <p>* Packard Foundation</p>	1995	Ongoing	Alifereti Tawake, IAS, USP Phone # 3212653
<p>USP projects: CSPODP-II</p> <ul style="list-style-type: none"> • Aquaculture – research and capacity building: corals, live rock, shrimps, seaweeds, tilapia, <i>Macrobrachium sp</i>, <i>P. monodon</i>, etc • Postharvest fisheries – research and capacity building – improving quality of marine products, HACCP issues etc • Coral reef monitoring network (7 countries including Fiji) – data collection at long-term permanent monitoring sites, awareness, capacity building, assist member countries in coral reef management plans. <p>Surveying Ciguatera in Fijian Waters</p>	<p>MSP – aquaculture</p> <p>MSP- Post harvest fisheries</p> <p>Inst. Marine Resources</p> <p>Inst. Marine Resources</p>	<p>CIDA</p> <p>CIDA</p> <p>CIDA</p> <p>USP research grant</p>	<p>2000</p> <p>1999</p> <p>Oct 2001</p> <p>2002</p>	<p>On-going till 2003</p> <p>Just completed</p> <p>On-going till 2004</p> <p>Ongoing till 2004</p>	<p>Dr Tim Pickering Phone #3212883</p> <p>Mr. Tony Chamberlain Phone#3212876</p> <p>Dr Cameorn Hay Phone# 3212888</p> <p>Dr Cameorn Hay Phone# 3212888</p>

3.2 Discussion on past, present and future projects

During the short time frame for preparing this report, the IMR did not have access to all details pertaining to the projects listed in Table 2. Therefore we are unable to make a complete evaluation. However, the list does identify the topics and locations where projects are occurring and serve to highlight any areas where there may be duplication.

A significant amount of effort has been expended by various organizations and institutions to address issues in each of the IWP focal areas. Most of these projects are still on-going and a lot of work remains to be done. It is evident that there is collaboration and partnership between the communities, non-government organizations, the Government, and intergovernmental organizations (e.g. USP). Such collaboration and cooperation should continue.

Projects on freshwater have varied objectives including improving water supply and sewage systems in urban areas, supplying of tanks to rural areas and protecting catchments. More effort is however, still required. Of particular concern is the urgent need to prevent water shortages because of inadequate storage, polluted supplies, salinity incursions and poor reticulation.

Most of the projects on waste management are mainly within the government sector. Partners in Community Development-Fiji (PCD-Fiji) have also undertaken an ambitious initiative to involve the business sector (Shangri-la's resort) and communities to address the waste problem. More effort is still however, required in addressing the issue of waste disposal in urban areas. Efforts should also be directed at rural communities to address the waste disposal problem before it gets out of hand and contaminates water resources.

Projects on MPAs and sustainable fisheries are inter-linked and they seem to have a wider representation and community participation than do the projects on freshwater and waste management. Much work is however, still required on establishing MPAs around the country and managing them effectively.

Almost all of the projects have a community component although this needs to be strengthened in the area of waste management. The only project, which still required more community participation, is waste management

4 Conclusions and Recommendations

This review highlighted several important environmental concerns in Fiji that have arisen because of developments in coastal areas, increase in population, urbanization and economic pressure. These problems have been of concern for at least the last decade. While they may not be as severe as in Asian and other developing developed countries, Fiji is a small and vulnerable country and these problems must not be ignored. Several projects have been implemented to address these concerns; however solutions are being outpaced by the rate at which Fiji's water and coastal resources are being depleted and degraded. There is a serious need for baseline studies to monitor environmental problems in Fiji.

Most of the environmental problems overlap and they require a holistic and cross-sectoral approach if they are to be addressed. An integrated approach is essential. It is important to consider the following points in any cross-sectoral approach:

- Political will and commitment
- Public community awareness on the issues
- Community involvement
- Relevant and effective legislations and enforcements
- Collaboration between stakeholders (including government ministries, NGO's, IGO's, communities, donors and the general public).
- Education at primary and secondary levels

Based on the review and consultations with stakeholders, and as requested in the TOR, we have provided the primary (1) and secondary (2) concerns as follow.

- Marine and Freshwater quality:
 - (1) Excessive nutrient loading and sedimentation in rivers and coastal waters due to poor land use practices
 - (2) Marine pollution from sewage and industrial effluents.
- Habitat and community modification and degradation :
 - (1) Loss of marine habitats and disruption of coastal processes caused by coastal developments
 - (2) Land and coastal-based pollution – poor disposal of liquid and solid waste
- Unsustainable use of living marine resources
 - (1) Over-exploitation of marine resources and inadequate means to monitor over fishing.
 - (2) Use of destructive fishing practices

Obviously several of these problems are at a national or international level e.g. urbanization of lagoons. Clearly such issues cannot be adequately addressed by focusing on a single village or small community unless the concept of community is widened to encompass an entire urban area, e.g. the greater Suva City.

Several problems are equally important and interlinked and it is exceedingly difficult to recommend a single project in just one focal area. Pollution of coastal watersheds poses a threat to the very fabric of coral reefs and over-fishing may render certain species locally and ecologically extinct. Perhaps the most urgent problem is the perceived rapid decline in coastal fisheries for a variety of reasons. This problem is identified throughout Fiji and is not unique to any given community. What is lacking are reliable statistical data to support the perception.

We therefore recommend to the national task force to consider projects focusing on managing and conserving coastal fisheries for the pilot project. Such a project may fall under the focal area 'coastal fisheries' or 'marine protected areas'.

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