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SPREP Information Management Requirements
EVALUATION AND RECOMMENDATIONS

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1 Introduction

Background

The South Pacific Regional Environment Programme (SPREP) is an organisation that plays a specific and significant role in the management, conservation and improvement of the environment of the South Pacific region. It has been recognised at SPREP that the availability of quality and timely information on all aspects of the business is vital for achieving business objectives. In addition, there is an increasing requirement within the member countries to access and effectively use environmental information held by SPREP or channelled through the organisation from various sources and using a variety of mechanisms.

This report was commissioned to look at the Data and Information Management at SPREP. Its aim is to be used as a reference document for the overall management of SPREP information resources. The document will provide a unified perspective of SPREP data and information requirements, that is a perspective that looks across key outputs (business areas). As such, the document should serve as a high level plan for the further development and integration of the SPREP corporate database and the more wider SPREP clearinghouse mandate.

Approach

Preparation of this report was done during the course of twelve working days and was organised into two phases:

1. **Information gathering** - The focus of this phase was to collect relevant information which was primarily done through a series of sessions and interviews with SPREP business specialists, management and other staff. Additional sources of information were a number of key documents such as: SPREP Action Plan 1997-2000, Annual Report 1998, Work Programme and Budget 2000 (draft), as well as Design Specification for Corporate Database (Operations and Administration), and Information System Overview.
2. **Analysis and report preparation** - The second phase was to analyse and organise the results of the first phase and prepare the final document with findings and recommendations.

Document Scope and Organisation

The scope of this document is determined by the terms of reference and the timeframe set out for its preparation. This means that the analysis of the current situation and information requirements is not at a very detailed level. This however does not impede the main objective which is to identify the key issues and provide specific recommendations on these issues and the overall strategy for data management.

The document is organised into three main Chapters (including this Introduction) and two Annexes.

Chapter 2 is the Executive Summary and is "a must" reading for all intended audience. Chapter 3 provides description of information needs by Strategic Outputs with a review of the current issues. The second part of this Chapter (section 3.2) looks at future directions and identifies main strategies (or initiatives) for SPREP IT. It is not very technical and is aimed at both business and IT audience.

Annex I is an introduction to SPREP Information Model. It provides basic definitions on two modelling techniques for process and data modelling and also includes few sample DFD and E-R diagrams. This material has both technical and business outlook but is not too technical and business staff is encouraged to read it (after all, models are intended to improve communication between those that are specialists in certain area and those that are not). Annex II is a list of interviews conducted and SPREP staff that attended the interviews.

Target Audience

The intended audience for this document are:

- SPREP Management (particularly Chapter 2)
- SPREP business area specialists as well as Corporate Services staff
- SPREP IT staff and other professionals that will be involved in data and information management and systems development
- Other interested parties in member countries and associated institutions and organisations.

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2 Executive Summary

2.1 Information Management - Business Rationale

Information Technology has had an extraordinary pace of change in this decade including hardware and software advances and most of all, the adoption and use of the Internet. However, some fundamental principles about Information Systems remain the same and are even more important because of the fast changing, more demanding and much more global environments in which business organisations operate today.

One of these principles is that the essential purpose of Information Systems is to support the business in pursuing its vision and achieving its goals and objectives. The other principle is simply that Information Systems are about information and data and how to best manage it in order to maximise its value for the organisation.

Many organisations have now recognised, or begin to recognise, that data and information represent one of the key corporate assets. As much as it is not possible to succeed without having people and financial resources, the same can be said for data and information as another critical resource. In addition, the demand for complete, timely and quality information at all business levels (strategic, tactical and operational) has become greater than ever before.

For SPREP and its role in assisting the Island Countries of the South Pacific in preserving and improving their natural environment, there is an even greater complexity and diversity of data and information to be used internally or provided to other parties for their use. It can be concluded therefore that one of business objectives for the South Pacific Regional Environment Programme will have to be:

"To continuously and strenuously manage data and information resource in such a way that will maximise its quality, timeliness, useability and overall value for the organisation itself and for all its member countries."

Let us refer to this objective as the "SPREP Corporate Information Management (CIM)" objective, where the term "corporate" refers here to any environmental, management, operational or other information that is of significance to SPREP and its regional role.

This document looks at the current situation with data and information management at SPREP and recommends the approach that SPREP should adopt in pursuing the "CIM" objective.

2.2 Information Management at SPREP - Findings

Interviews with business area specialists, management and other staff, and the analysis of relevant documents have provided an understanding of the business information needs and have also identified certain issues and problems.

As a general conclusion it has be said that the current level of Information Management at SPREP can not be categorised as adequate given the size, and more importantly, the nature and role of the organisation. There are of course aspects of the IT requirements that are currently well covered by the use of appropriate systems and technology. These include: desktop office applications (word processing, spreadsheet, desktop publishing, e-mail), financial system, library system and, to a certain degree, Internet and Web requirements. Hardware and networking is also kept at adequate levels. Notwithstanding this, it is found that information management issues exist at practically all levels of organisation: operational, tactical and strategic.

The main issues and problems identified for SPREP information management can be classified into following groups:

- There is no defined methodology and standards in place and no overall plan for the development of databases and applications. To use an analogy, what is missing is something comparable to the Action Plan and Work Programme defined for SPREP as an organisation - in other words, a guiding framework and a long term plan.
- Inadequate or non-existent integration of data and applications. This often leads to uncontrolled redundancy of data, potential data inconsistency, and overheads in using both human and machine resources. To use another parallel, like the cooperation that is promoted in the South Pacific region in order to protect and improve the environment, a cooperation and integration must be established between the little "islands of data and applications" if the "CIM" objective is to be achieved.
- Insufficient applications support for some SPREP business processes (for example Strategic Planning and Work Programme management, Operations and Administration, and various specific areas such as Training, etc.).
- No clear definition and understanding of information flows and information use. The roles of "data owners" (those that are responsible for the timeliness and quality of information) and "data users" are not defined. One of the implications is under-utilisation of existing applications and decreased process efficiency.

- The staffing of IT department is inadequate considering the magnitude and diversity of information management requirements.

The recommendations on how to address these issues are provided in the next section.

2.3 Information Management at SPREP - Recommendations

There are seven key recommendations resulting from the findings. The attempt was made to make the recommendations as specific as possible, and to estimate the required effort where appropriate, however it should be noted that this is intended only as a rough guide. An indication of priorities is also provided.

Recommendation 1: Develop an Information Management Strategy and Foundation

This recommendation aims at recognising and establishing Information Management at SPREP as a business process that is well founded and based on a defined methodology and standards. One of the key tasks in building this foundation is to define an overall plan for understanding the information needs and for designing required databases. This plan is called a "Data Model" and equates, for example, to an architect's plan for a building. The more complex the building is, the more important the architect's plan is (and we have already mentioned how complex data and information needs at SPREP are).

This recommendation should be addressed as a project with the highest priority since it is a prerequisite for all other information management initiatives. The estimated effort for the project is around six weeks and the deliverables should include: Data Naming Standard, Corporate Data Model and Data Ownership Model.

(Additional relevant details can be found in section 3.2.2 and Annex I).

Recommendation 2: Integrate the SPREP Clearinghouse role into the overall Information Management Strategy

The Information Clearinghouse mandate is one of key IT requirements at SPREP. It is also a complex one, both in terms of its definition, design and implementation. The aim of this recommendation is to emphasise the following:

- In designing the Clearinghouse mechanism (or system), a special attention must be paid to defining a detailed model for data, processes and technology components of the system.

- The Clearinghouse model should incorporate the requirements from all Strategic Outputs. The architecture should be structured in such a way to include a common element and specific modules for different Outputs.
- The Clearinghouse model should be developed under the umbrella of the overall information management strategy, in other words, using the same standards and methodology.

Design and implementation of the Clearinghouse System is likely to involve several related projects: (i) Modelling and Design, (ii) Common Module Implementation, (iii) Specific Module(s) Implementation. The effort can not be estimated at this stage (six to eight weeks is a rough guide for project (i)). The priority can be regarded as high and is also influenced by the GPA Clearinghouse requirements. It is worth repeating though, that this recommendation needs to be addressed in close connection with recommendation 1.

(Additional relevant details can be found in sections 3.1.1 and 3.2.4).

Recommendation 3: Develop a system to support "Performance and Output" based business model

This is a recommendation for the development of a specific application system whose purpose is to provide support for strategic and tactical business planning, implementation of outputs and projects, performance monitoring and internal/external reporting requirements. We can refer to this application by the code name "Work Programme Management System".

This recommendation can be regarded as a high priority one, giving that virtually all professional staff have identified the need for such a system. It should be targeted for implementation during the first half of year 2000, so that it can be used for at least one reporting cycle of the "2000 Work Programme". The estimated effort is around 12 weeks.

(Additional relevant details can be found in sections 3.1.1 and 3.1.6).

Recommendation 4: Re-develop the Operations and Administration System ("Corporate Database")

This is another recommendation that targets a specific application system. As described in more detail in sections 3.1.1 and 3.1.6, this system is currently not being utilised. It needs to be re-developed and put into production so that benefits identified in the above sections can be achieved. The system should be reduced to its core and common functionality, the current favourable features retained and all identified issues addressed. One of the issues relates to the effort required for the data entry. This can be resolved by engaging a part time data-entry person

for the initial population of the database, after which the Administration Department should take over this task.

This recommendation can be regarded as a medium level priority, but probably slightly higher than recommendation 3 (in terms of timing). The estimated effort is around 6 weeks.

Recommendation 5: Perform a detailed review of all "subject area" databases and re-develop or re-integrate them as appropriate

"Subject area databases" are the specific systems that reflect information requirements for topics such as: Conservation Areas, Turtles, Solid Waste Pollution Statistics, Environmental Laws, Agreements and Conventions, etc. Some of these databases already exist but are faced with problems, as illustrated in section 3.1.1. Resolving these issues, integrating the existing and developing new subject area databases can be addressed as a series of small projects. This can be regarded as a third level priority (but must not be viewed as insignificant).

Recommendation 6: Address IT staffing issue for adequate systems development and end-user computing support

One of the findings indicated in the previous section is that the current staffing of SPREP IT department is not adequate, which seriously undermines its ability to bring the IS systems to a new level required by the increased organisational and regional information needs.

Without repeating what is said before, let us indicate the type of skills necessary for SPREP IT department in performing its role and supporting the "CIM" objective:

- IT planning and management
- Database design and systems development
- Web, Internet and Intranet development
- Support (user support, hardware, communications)

At the minimum, SPREP IT department should have one experienced specialist (covering database and Web development). This is in addition to the IT Manager and one or two support people. (As a benchmark, the IT team of another similar regional organisation includes a manager at the HOD level and three specialists at the Project Officer level).

Recommendation 7: Incorporate the "CIM" objective into the new Action Plan

This is basically the only recommendation in this paper that is not very specific. The thinking is that the "CIM" objective (as defined earlier in section 2.1) has enough weight to be recognised in documents that define strategies for managing the environment of the South Pacific Region. We will not suggest here any particular way or format how to implement this recommendation. The recommendation is simply a result of the belief that in the current time, even simple business goals are hard to achieve without the right and timely information, let alone the vision and mission of an organisation such as the South Pacific Regional Environment Programme.

3 SPREP Information Management Requirements

3.1 Information Needs and Current Issues

This section looks at information needs and current issues by the six Strategic Outputs. It is based on user interviews and analysis of key documents (as indicated in the Introduction to this document).

3.1.1 Biodiversity and Natural Resource conservation

The focus of Strategic Output 1 is "Biodiversity and Natural Resource Conservation which reflects the Action Plan objective to protect natural heritage through the conservation and sustainable use of biodiversity".

Specific Information Needs

Data specific for business processes within this Strategic Output can be grouped into following categories:

- Data on Conservation Areas
- Data on endangered species including marine turtles, avifauna and marine mammals
- Data on invasive species
- Data on coastal habitats, including coral reefs and wetlands
- Data on regional and international conventions, agreements and strategies on biological diversity, etc.

The support for these requirements can be established by implementing various "subject area" databases. In fact, some of these databases are already in place, such as Conservation Areas (CA) database and Turtles database. However, there are certain problems that exist with these databases which is explained in the next paragraph.

Issues with existing Subject Area databases

We look here at the CA database as an example and analyse issues related to it.

- **Design**: There are some typical database design errors, such as the one where tables are not "normalised". This usually results in unnecessary data duplication and can also compromise data integrity. For example the table named "Budget 1994-2001" includes CA identification number (which is correct) and also CA name (which is not correct). It is possible to independently change CA name in this table and in another table ("IUCN Fields") that also holds CA name. The result can be that one and the same CA area will have two

different names (one can certainly ask - which name is correct ?). Another example is the table "Objectives and outputs" where the Project Component name is wrongly repeated for each CA.

- **Role and usage**: The application is principally aimed at SPBCP staff but it is currently not being utilised and the question can be asked on what is its true value to SPBCP staff. There is no doubt that it is important to have all data on Conservation Areas compiled in one place - the question again is how to make this database truly a central point of reference.
- **Integration**: An attempt was made to integrate CA database with the "Corporate Database" (described later in this document). This integration is however not properly defined and implemented and certain data is still repeated within the CA database.
- **Immaturity**: The application has program bugs and also a very crude user interface. It is not robust and in its current form it should not be distributed for the use by CASO's.

NB. We have of course to recognise that this database was designed by a post-graduate student in cooperation with non-IT staff (in other words by people not necessarily skilled for the task). However, this leads exactly to one of the points to be made: database and application design (and data management in general) require very specialised skills, the lack of which usually leads to unsatisfactory results.

The conclusions are that subject area databases have to be properly designed in the first place to eliminate problems within the database itself. In addition, they can not be looked at in isolation from each other or from any "corporate level" database. They require an integrated approach where common and overlapping data is identified and treated in a consistent way and the redundancy is either completely eliminated or firmly controlled.

Corporate-wide Information Needs

Several requirements identified by the specialists in this business area can be categorised as "corporate level" requirements that are common to most (if not all) of the Strategic Outputs. The main ones include:

- Support for Performance and Output based work programme management.

  There is a very strong need to assist business users in the process of planning, implementation, monitoring, evaluation and reporting on items from the Work Programme and individual Work Plans. There is currently a lot of "manual work" where the same information is either re-typed or "cut and paste" between documents. The significant

number of documents involved and variety of formats required make these tasks even more time consuming and the whole process less efficient and less effective. It can be concluded that a system to support this process will be greatly beneficial for the whole organisation. Such system will combine structured information that can be stored in a database (eg. objectives, actions, performance indicators and measures, etc.) with document templates and mechanisms to efficiently compile reports, both internal and external (eg. reports to donors). Streamlining the process and unifying the reporting requirements should be addressed at the same time.

- Support for the Information Clearinghouse role.

  This is one of the essential roles for SPREP across all strategic outputs. It can not be easily defined in simple terms, but in its essence it involves SPREP as an information provider (either as the primary source or as a conduit for other sources) on virtually all aspects and issues relevant to the environment of the South Pacific Region. The "Clearinghouse Mechanism" can be viewed as a complex system comprised of large amounts of structured and unstructured data and information stored on a variety of media and communicated to and from various parties. It involves databases, processes and information flows as well as enabling technologies for data storage, delivery and presentation. Biodiversity and Natural Resource Conservation strategic output does have its own specific requirements in this area. However, the overall clearinghouse mandate for SPREP will need a well founded and coordinated IT strategy and support. This is described in more detail in section 3.2.4.

- Support for managing data on People and Organisations ("Contacts Database")

  A very specific role that SPREP has as a regional organisation requires extensive contacts and dealings with numerous individuals and organisations throughout the region and elsewhere. It is essential to manage relevant data on these involved parties in an efficient way that is consistent across business areas and that at the same time enables contacts to be classified into various "roles" such as: official country contacts, donors, international organisations, consultants in various fields, country officers, etc. The "Operations and Administration Corporate Database" was intended to be used for this purpose (this being just one of its functionality). However, this database is currently not being utilised for reasons that are described in section 3.1.6.

3.1.2 Climate Change and Integrated Coastal Management

The focus of Strategic Output 2 is "Climate Change and Integrated Coastal Management and it reflects the Action Plan objective to understand and respond to climate change and variability (weather and extremes) through a coordinated regional climate change programme focussing on public awareness and education, capacity building, and strengthening of national and regional institutions dealing with climate change and variability".

Specific Information Needs

Data specific for business processes within this Strategic Output can be grouped into following categories:

- Data on climate change including climate modelling
- Various meteorological data
- Data on ozone depleting substances and their use, etc.

A significant proportion of this data is very high-volume and scientific by nature and as such is collected and kept at specialised facilities such as meteorological centres (Nadi) or atmospheric radiation and cloud stations (in PNG and Nauru). There is no requirement for SPREP to manage this specialised data, however there are certain activities within this business area that involve subject area databases. An example of this is the requirement for a database on climate change information which is part of PICCAP Programme.

Corporate-wide Information Needs

One of the Key Outputs defined within this Strategic Output is the "Clearinghouse for Information on Climate Change". Although it has a specific focus on climate change information, this again is a requirement with a broad perspective and significance as mentioned earlier in section 3.1.1.

3.1.3 Waste Management, Pollution Prevention and Emergencies

The focus of Strategic Output 3 is "Waste Management, Pollution Prevention and Emergencies and it reflects the Action Plan objective to minimise pollution and wastes and improve preparedness for pollution emergencies".

Specific Information Needs

Data specific for business processes within this Strategic Output can be grouped into following categories:

- Data on solid waste production and disposal

- Data on the management of chemicals and hazardous wastes
- Data on marine pollution caused by land-based activities
- Data on ship-sourced marine pollution
- Data on regional and international conventions, agreements and programmes on waste management and pollution prevention, etc.

Statistical data on waste is collected from countries and recorded at SPREP in various formats such as Microsoft Access database or Excel spreadsheet. This includes amounts of solid waste, oil waste and pesticides, weight distribution percentages across different materials, etc. Management of this data should be addressed through the use of subject area databases.

Corporate-wide Information Needs

As for Strategic Outputs 1 and 2, the clearinghouse role was also emphasised in discussions with business specialists within Output 3. It was recognised that the entire concept is yet to be clearly defined and that SPREP specific requirements for waste and pollution issues must be consistent with GPA clearinghouse definition.

3.1.4 Environmental Management, Planning and Institutional Strengthening

The focus of Strategic Outputs 4 is on "building capacity for island countries to integrate environmental management and planning in national development".

Specific Information Needs

Data specific for business processes within this Strategic Output can be grouped into following categories:

- Data on in-country expertise for environmental management
- Data on capacity building workshops and workshop facilitators
- Data on environmental legislation and country participation in various agreements and conventions
- State of Environment data
- Geographical data, etc.

A number of GIS databases that contain geographical information (maps) on various areas within member countries are held at SPREP in the format of ArcInfo package. There are currently no additional requirements for the support of this specialised data, except for the possible conversion into MapInfo format (to follow regional standard).

State of Environment data is expected to be collected from member countries in the format of Excel spreadsheets. It has been noted that countries are sometimes reluctant to provide information, which raises issues such as data ownership, custodianship, licensing, etc.
The key output to "Strengthen environmental legislation" could be supported by a subject area database that will record national and international laws and conventions and potentially include information on incidents where such laws were violated.

Corporate-wide Information Needs
There is a requirement for managing information on contacts (people and organisations) such as legal professionals and country legal officers, workshop facilitators and participants, etc.

3.1.5 Environmental Education, Information and Training

The focus of Strategic Outputs 5 is "Environmental Education, Information and Training and it reflects the Action plan objective to strengthen environmental education, training and information systems".

Specific Information Needs
Data specific for business processes within this Strategic Output can be grouped into following categories:

- Data on environmental education materials
- Data on training needs, training courses conducted, training participants
- Data on traditional environmental knowledge around the Region
- Comprehensive library data with references to internal and external publications and catalogues on environmental information
- Data on production and distribution of publications, etc.

The specific role of Information Resource Centre is supported by the InMagic library package and database. A capability exists to export library data which is important for making this data available to the wide audience of users (either via the clearinghouse mechanism or by utilising some corporate wide database).

There is also a scope for putting in place several subject area databases to address the above needs.

Corporate-wide Information Needs

There is a requirement for managing information on contacts and "networks" such as teachers and environmental educators, consultants in various fields, government and non-government environmental organisations, volunteer placement organisations, etc.

The implementation of Environmental Information Clearinghouse is one of key outputs defined for this business area. This will require that the clearinghouse data and process models be developed and maintained, which includes "metadata" definition and management. There is a strong case for certain components of metadata to be made available to business users, for example, definitions of business data entities, sources and recipients of information, data owners, custodians and users, etc. (more on information modelling is provided in Annex I).

3.1.6 Management and Corporate Services

The focus of this business area is "Management and Corporate Services and it reflects the Action Plan guiding principle that the Secretariat will work through governments, existing institutions and expertise in the region".

Data and information requirements for this Strategic Output are essentially relevant for the entire organisation. There are three main groups of business processes within this area as described in the following paragraphs.

Administration

Business administration at SPREP has to deal with large variety of data which is a consequence not so much of the size, but primarily the role and dynamic nature of the organisation. Some of the data categories involved are:

- Personnel data, including staff personal details, contract terms, leave entitlements, etc.
- Staff travel, including data on visa requirements, country holidays, hotels, etc.
- Various events either organised by SPREP or attended by staff
- Data on people and organisations
- Registry and archives, etc.

It was recognised at SPREP that support from an IS is needed to manage this diversity of data. For this purpose, a database system named "SPREP Operations and Administration" (also known as "Corporate Database") was designed and implemented in 1997. Its aim was to support not just administrative but some management processes too, and as such it was

supposed to be an important tool used "across the board". However, for a number of reasons, this application is currently not being utilised. It is important to look here at why is this the case. There are essentially two main types of issues with the Corporate Database:

- Non-technical issues

  The main problem seems to be that the maintenance of the database (ie. the data entry) is perceived as a time consuming activity for which the responsibility is not clearly defined and consequently people are reluctant to add this "extra work" on top of their other tasks. In other words, the ownership and the role and value of data is not determined. What this really means is that the system is basically not recognised by business users as a useful tool. The reasons for this are indicated as: user interface is not easy enough to use, no user manuals, insufficient training in the system use, some required data not available, query capabilities are inadequate, system has "bugs", etc. This brings us to the next group of issues.

- Technical issues

  There are several design issues with the application and the database and we will look at few of these here.

  The application's scope was probably too broad in the first place and therefore the functionality includes too many components "under the same roof". This makes it more difficult for users to navigate to the required data. For example, if you are looking for environmental laws, you have to know that this is found under "General Menu" and then "Lookups" (which is not very intuitive). A set of smaller applications focused on well defined functional areas (but still based on the common database) will work much better.

  In relation to the database design, there is an inconsistency in defining table keys. For example, "PeopleEtc" table has a user-defined code as its key, "County" table has country name as key, while "Event" table has system-generated key. A very specific problem indicated by users is that they are forced to create "PeopleID" (the table key) although that does not guarantee that data will not be duplicated. Another issue is that people and organisations data is kept in the same table. Although this can not necessarily be regarded as a database design flaw, it is certainly a user-interface problem when the distinction is not made between the two categories.

  The last thing to mention here is that the system has numerous "bugs" (well documented by SPREP staff) and in that respect, it is not really ready for production.

One of the recommendations given in this report is that a need very much exists for SPREP to have a system like the Corporate Database. It is not useable in its current form, but can be re-designed by making use of all the good elements and eliminating the identified problems. In the meantime, it is inevitable that isolated local databases and files will be created and used without the capability for a consistent and integrated management and use of such data.

Finance

This business area is supported by the accounting package ACCPAC which consists of several modules. The system is available to finance staff (as read and write access) and also to staff within other business areas. This means that project officers for example can directly query financial data. This raises the need for appropriate training on the use of the package. The user manual is regarded as good which is certainly a plus.

There are no major issues identified in relation to the financial system. The few ones that were indicated are:

- System performance - this could be due to several reasons and the measures that are expected to improve the performance include conversion to the latest version (4.0) and utilisation of a more powerful server machine
- Complex coding within the Chart of Accounts - there are nine segments in the account code so the more simple structure would benefit users. However, it appears that the coding system works well in terms of reporting requirements.
- Report design - the system allows for "user defined" reports which is a useful feature. It was indicated by users that designing and creating a new report is a time consuming exercise and not a simple one too. However, the two main users have already acquired skills in this area.
- Consolidated budgets can not be directly produced within the system.

One aspect that can be looked at in the future is interfacing the financial system with other applications so that financial data can be available to users as part of other systems.

Management

Data and information required for management functions can essentially be identified at two levels: operational/tactical and strategic.

- Operational/tactical data requirements

  At this level, management processes are concerned with running the organisation on a daily basis including short term tasks and objectives.

There is a need for information such as: staff records, staff leave details, staff travel and other activities, etc. In addition, certain financial data and extensive data on people and organisations (contacts) can also be related to this level.

- Strategic data requirements

These requirements are related to the long term goals and strategies that organisation aims to achieve in order to fulfil its mission. More specifically, we need to look at the "performance and output" based business model that SPREP has adopted. Under this model, the entire organisation is focused on achieving defined outputs at various levels. From the discussions with executive management team and specialists from various business areas it has become clear that additional support is required to manage the information on strategic and key outputs, projects, tasks and activities, performance measures and performance reports. It is important to realise that this data is inter-connected and that it needs to be fed back into the planning-implementation-monitoring loop so that timeliness and quality of outputs can be achieved and improved.

The conclusion is that there is a strong case for implementing a system for Strategic Planning and Work Programme management.

3.2 Current IT System and Future Direction

The purpose of this section is to first give a brief overview of the current SPREP Information Systems and then to look at what is the suggested direction for the future. We have identified four areas that the IT department can focus and concentrate its efforts on. These four "initiatives" are based on findings and recommendations described in Chapter 2. (It should be noted here that this is only one possible way of looking at future directions and that SPREP IT should explore their own alternative views).

3.2.1 Summary of the Current SPREP IT System

More detailed information on the current SPREP IT, including hardware, networking, software and resources can be found elsewhere, for example, the internal document titled "Information Systems Overview". For this reason we will only give a summary here for the purpose of quick reference.

Computer Hardware

There are four servers running Windows NT operating system and around 35 desktop and 35 laptop computers using Windows 95/98 operating system (future PC's will be NT based). Networking is done via

10Mbs 10BaseT network with HP hubs and a ThinNet backbone. There is a dedicated line between the ISP and SPREP for the Internet connection. Networking will be reviewed when SPREP will move to its new headquarter (May 2000). Printing is done using HP black/white and colour printers. Most printers are networked but there are also few personal ones connected to individual PC's. In addition, there are two scanners and one plotter. Backup is done using Surestore DAT, CD writer and ZIP drives.

Software (office tools, utilities, connectivity)

Office suite used is Microsoft Office Pro 97. There is a number of publishing and graphics packages: Adobe PageMaker, PhotoShop, Acrobat, Visio, etc. Utilities used include: McAfee VirusScan, Undelete, Backup Exec, PCAnywhere, Partition Magic, etc. E-mail is based on Microsoft Exchange Server and the client software is Outlook 97. Netscape Navigator is the preferred web browser but Microsoft Internet Explorer is also supported. Access to the Web is controlled from the firewall.

Databases, Applications and Web

Finance system is using ACCPAC package (version 3.0 to be upgraded to version 4.0). Information Resource Centre is using library package InMagic. The database contains about 13,000 records. It is planned that Samoa national records are incorporated which will bring the total number of records to about 25,000. A "Corporate Database" application has been developed but is not currently utilised (as described elsewhere in this document). The GIS system with several databases and a few FoxPro and MS Access databases are also in place (this too is described elsewhere in this document). SPREP website is very important. It is operational and currently provides information such as: SPREP background info, news releases, vacancies, publications produced by SPREP, feedback page, calendar of events. The website will be developed further and is expected to play essential role in the implementation of the Clearinghouse role. There is also an Intranet initiative with the system currently being in the prototype stage.

IT Staffing

The current IT staff include IT Manager and one IT Assistant. The second IT Assistant will join in December 1999 on a one year contract.

3.2.2 Initiative 1 - Information Management Foundation

This initiative will focus on establishing and maintaining a strong data and information management foundation. It will include tasks such as:

- Introduction of data modelling methodology including modelling techniques and data naming standards.
- Development of the Corporate Data Model.
- Development of the Data Ownership Model to defined the roles of data owners, data custodians, data users, etc.
- Support for the development and integration of specific Application Data Models, etc.

One of the key deliverables is the Corporate Data Model. It can be viewed as an architecture which is clear, comprehensive, flexible and independent of the actual computer database technology to be applied. It serves several purposes, the main ones being:

- To identify and describe business data
- To specify business rules (these are captured via various "data relationships")
- To provide for a good understanding of business data and information needs
- To serve as a road map for the subsequent database design
- To serve as a reference point for other data management activities (eg. definition of "data ownership", etc.).

Part of this initiative will also be to look at relevant software tools and how they can be utilised at SPREP. Such tools include information modelling tools, metadata management tools, etc.

The outcome of this initiative should be an environment that will support design and implementation of quality and adequate information systems, systems that satisfy current business information needs and are at the same time flexible enough to cater for possible future requirements. It will also provide a corporate view of data and information, not limited to individual departments or programmes. This is very important - data is a shared resource. It is owned and managed by a certain business area or business process (or external organisation), but must be shared and made available, in a controlled manner, to all the relevant stakeholders, both internally and externally.

3.2.3 Initiative 2 - Business Applications Development

The focus of this initiative is the development or acquisition and subsequent implementation of applications required to support specific business processes and objectives. It will include tasks such as:

- Defining the overall system architecture that identifies main functional and technological components for information management (ie. a "picture" showing main systems, interfaces between systems, information sources and sinks and key technologies to be used, such as local and remote databases, Internet, etc.).
- Defining the Applications Development Framework. This will address issues such as: development standards and tools, database design and naming standards, security standards, etc.
- Development of individual applications' Process and detailed Data Models and database designs.
- System implementation, support and maintenance. The importance of these tasks is very high since they aim at ensuring that applications **are actually used** (and used effectively) to deliver the value of data and information.

The current need for applications development was described earlier in this document and specific recommendations are given in section 2.3.

The outcome of this initiative should be a collection of systems and databases that have an established role in supporting various business processes, either specific for a particular Outcome or common for the entire SPREP.

3.2.4 Initiative 3 - Information Clearinghouse Mechanism

The focus of this initiative is the SPREP Clearinghouse mandate. In other words, its objective is to define, develop and implement a system that can be called: "Environmental Information Clearinghouse". This initiative can be viewed as part of the previous one. However, it has a specific perspective which is briefly described in this section. The main aspects and elements are:

- The clearinghouse is aimed at a wide community of users, many of those being external to SPREP. This means that various user types, roles and groups have to be defined. Some users will actively search for information while others will rely upon having information delivered to them. There will be casual users and regular ones, knowledgeable and those less familiar with the system, etc. These are

just few examples of issues to look at in relation to the clearinghouse user community.

- Data and information will come from many different sources and will have many different owners. The aspects of ownership, copyright, security, restricted or unrestricted access and use, etc. are very important.
- Information will be stored, transmitted and delivered using various formats. It will require extensive reference database(s) and "search engines". In other words, the technology aspect is critical. In the view of this, it is expected that SPREP website will have tremendous role and will have to be developed accordingly.

All these aspects (and probably a few more) need to be analysed and addressed to achieve a successful implementation of the Clearinghouse Mechanism.

3.2.5 Initiative 4 - IT Support, Staffing and Skills

The focus of this initiative is basically on providing effective IT support to SPREP users, including all aspects of hardware, networking and desktop software. It also includes database administration and support for business information systems. The systems acquired from third parties are usually supported by vendors, and those developed internally by the IT group (although this can be outsourced too).

In order to achieve these tasks, SPREP IT department has to be adequately staffed with permanent team members (a recommendation on this is given in section 2.3). Developing and enhancing required skills of the IT team is a permanent component of this initiative. This is normally achieved through professional training courses, skills transfer and other means. Any specialised skills not found within the team can be complemented by the use of external parties.

Annexes

Annex I An Introduction to SPREP Information Model

Thorough understanding of business data and business information needs is the first and often the most important stage in achieving the "CIM" objective defined in Chapter 2. For this reason it is essential to introduce the Information Model of SPREP as a business organisation (business system).

An Information Model is a representation of business processes, business data and business rules. Like any other model its value and purpose is twofold:

1. To reduce the complexity of the system being modelled. This is achieved by showing only the relevant characteristics of the system and hiding those not being required.
2. To serve as a communication vehicle between business users and developers of information systems. This communication is absolutely essential for achieving an accurate and comprehensive specification of business information needs that can subsequently be satisfied through adequate information systems.

Note: The Information Model presented in this paper is only a sample model whose purpose is to illustrate what the intended SPREP Process Model and SPREP Data Model would look like. This is appropriate for the scope of the document and the full development of these models has to be a separate exercise.

1.1 Process Model

Purpose

The purpose of the SPREP Process Model is to represent:

- Main business processes (functions),
- Main information flows between these processes, both internally within SPREP, and externally, ie. to and from the parties involved with SPREP.

The technique introduced in this report is known as DFD - Data Flow Diagrams. This is a widely accepted and well structured methodology for the top-down analysis and representation of business systems. A system is represented through a set of diagrams that show the "big picture" first (context diagram), and then progressively introduce as many levels of

details as appropriate. One of the main strengths of DFDs is that they represent **both functions and data** in a simple yet comprehensive manner. Business participants can easily relate to the DFD relevant to their level and scope of work and at the same time they can also examine more generic or more detailed DFDs as required.

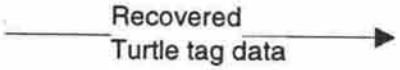
DFD Method

A brief introduction to the DFD technique will be given here at the level which should enable reader to understand the sample Process Model.

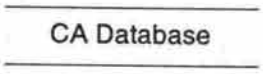
There are four main concepts (and associated graphical symbols) used in DFDs and they are:

Process - This is a function (activity) performed in the course of business. It is depicted by the following graphical symbol (circle):

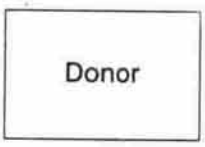
Data Flow - This is the data and information used by a business process or generated by a process. It is depicted by the following graphical symbol (arrow):



Data Store - This is a database or a file (either manual or computer based) used to store data and information. It is depicted by the following graphical symbol (two parallel lines):



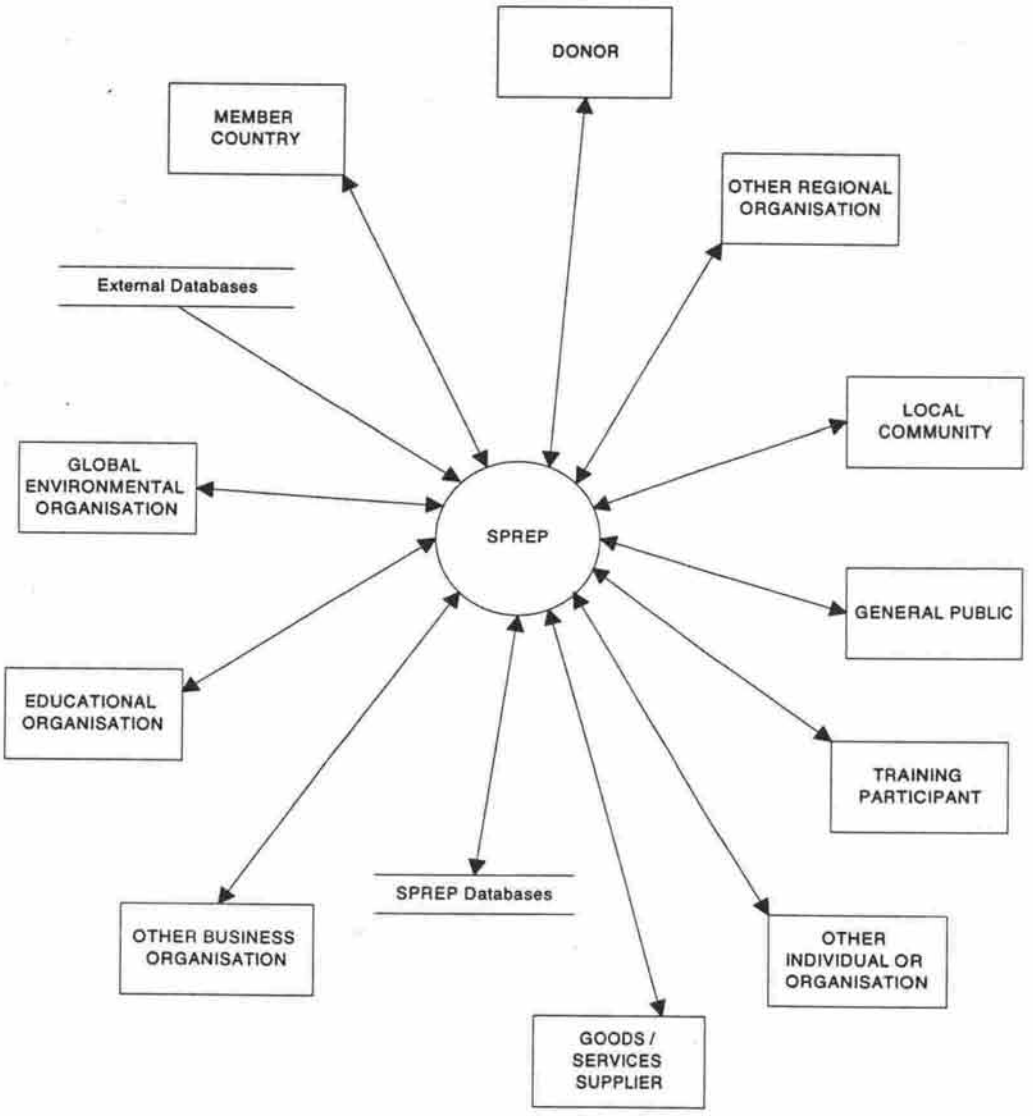
Information Source and/or Recipient - This is any party related to the business process, but is essentially not part of it. In other words, it is either a source or a user of data and information related to the process. It is depicted by the following graphical symbol (rectangle):



DFD Example 1

This example illustrates the top level diagram (ie. the "context diagram") where the whole SPREP business is represented as a single process. The main purpose is to show the organisation's "context", in other words, the main parties outside the organisation that SPREP interacts with in terms of input and output information flows.

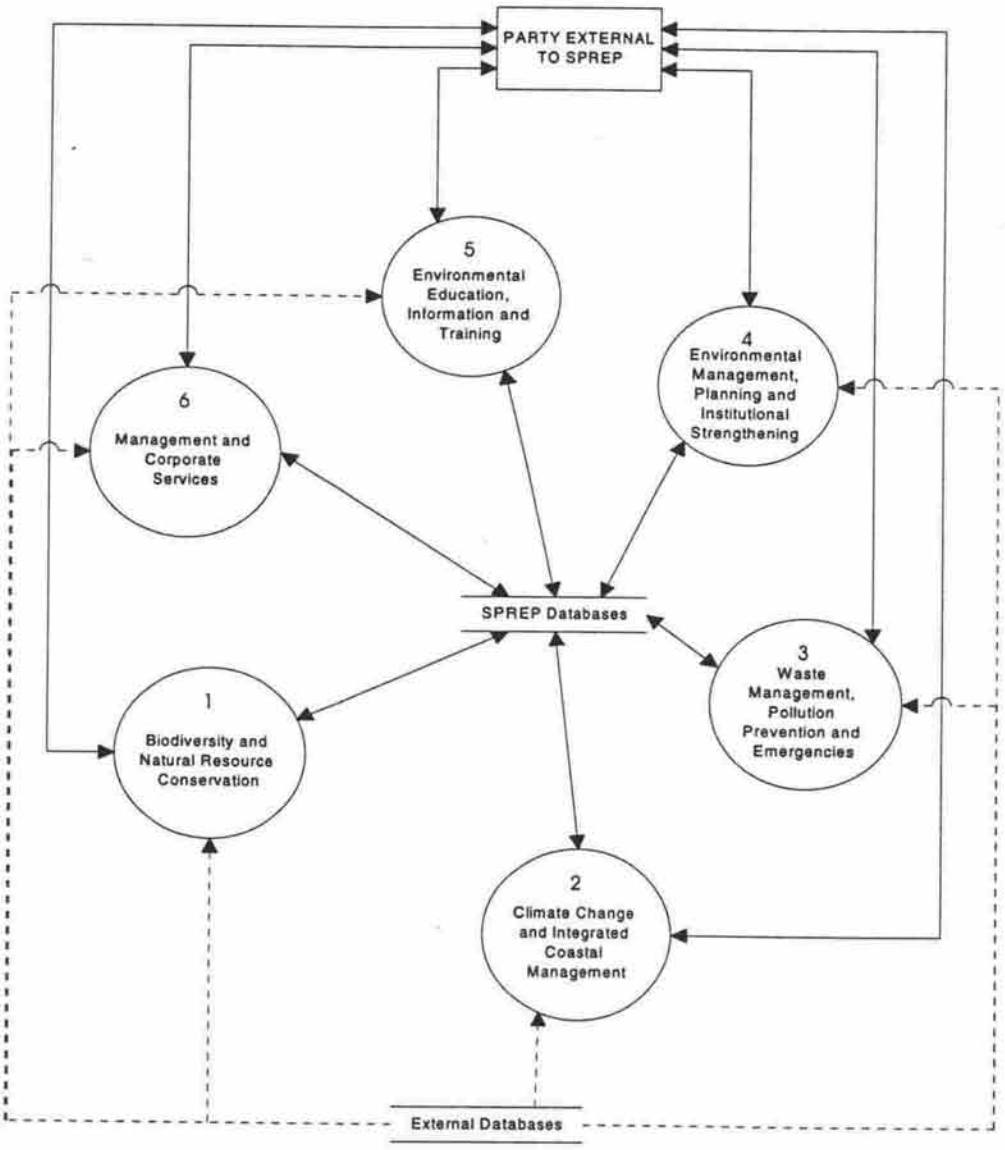
SPREP - Context Data Flow Diagram



DFD Example 2

This diagram "breaks" the single business process that represents SPREP as an organisation into several processes representing main functional areas. The information flows between these areas (that obviously do exist) are omitted for clarity.

Diagram 0 - SPREP Business Areas



1.2 Data Model

Purpose

The purpose of the SPREP Data Model is to represent:

- Main business data entities (objects),
- Certain business rules expressed as the relationships between data entities.

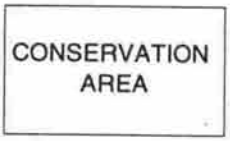
The technique introduced in this report is known as Entity Relationship Modelling (E-R). This is a widely accepted and well structured methodology for the analysis and representation of business data. (Note: It should be noted that there are other techniques that could be used, however the terms of reference specifically indicate E-R Modelling as a proven and adequate method. In any case, the end result in terms of the significance of having a data model in place is the same regardless of the technique applied).

Entity-Relationship Method

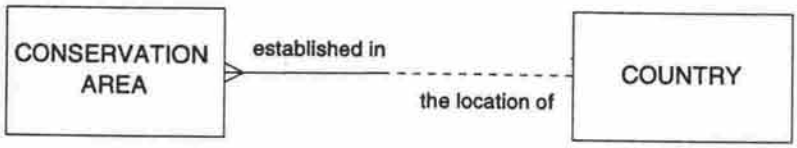
A brief introduction to the E-R technique will be given here at the level which should enable reader to understand the sample Data Model.

There are two main concepts (and associated graphical symbols) used in E-R diagrams and they are:

Entity - This is an object for which SPREP have an interest in keeping data about. Each Conservation Area, Endangered Species, Turtle, Country, Donor, Strategic Output, Performance Measure, etc. can be viewed as an entity. All entities of **the same type** are depicted on the E-R diagram by the following graphical symbol (rectangle or "box"):



Relationship - This is an association that exist (in a business sense) between two different entities. This association essentially represents a certain business rule. Relationships are drawn as lines that connect entities on the E-R diagram. Two important features of each relationship are "cardinality" and "optionality". Cardinality is expressed as either "**one and only one**" or "**one or more**". Optionality is expressed as either "**may be**" or "**must be**". This is illustrated in the following example:

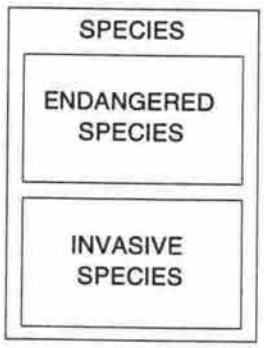


This relationship between CONSERVATION AREA and COUNTRY entities is interpreted in the following way (in other words, it represents the following business rules):

- Each CONSERVATION AREA **must be** established in **one and only one** COUNTRY, and
- Each COUNTRY **may be** the location of **one or more** CONSERVATION AREAs.

The graphical notation used here depicts "**must be**" as a solid line and "**may be**" as a dotted line. If a line ends with a "crows feet" symbol that means "**one or more**", otherwise the cardinality is "**one and only one**".

In addition to these two main E-R concepts, it is also important to introduce the concept of **Supertype** (and **Subtype**) entities.
An entity X is said to be a "subtype" of another entity Y if X is a special case of Y. Graphically, subtype entity is represented as a box drawn within another box which represents the supertype entity. This is illustrated in the following example:



In this example there are three entities depicted:

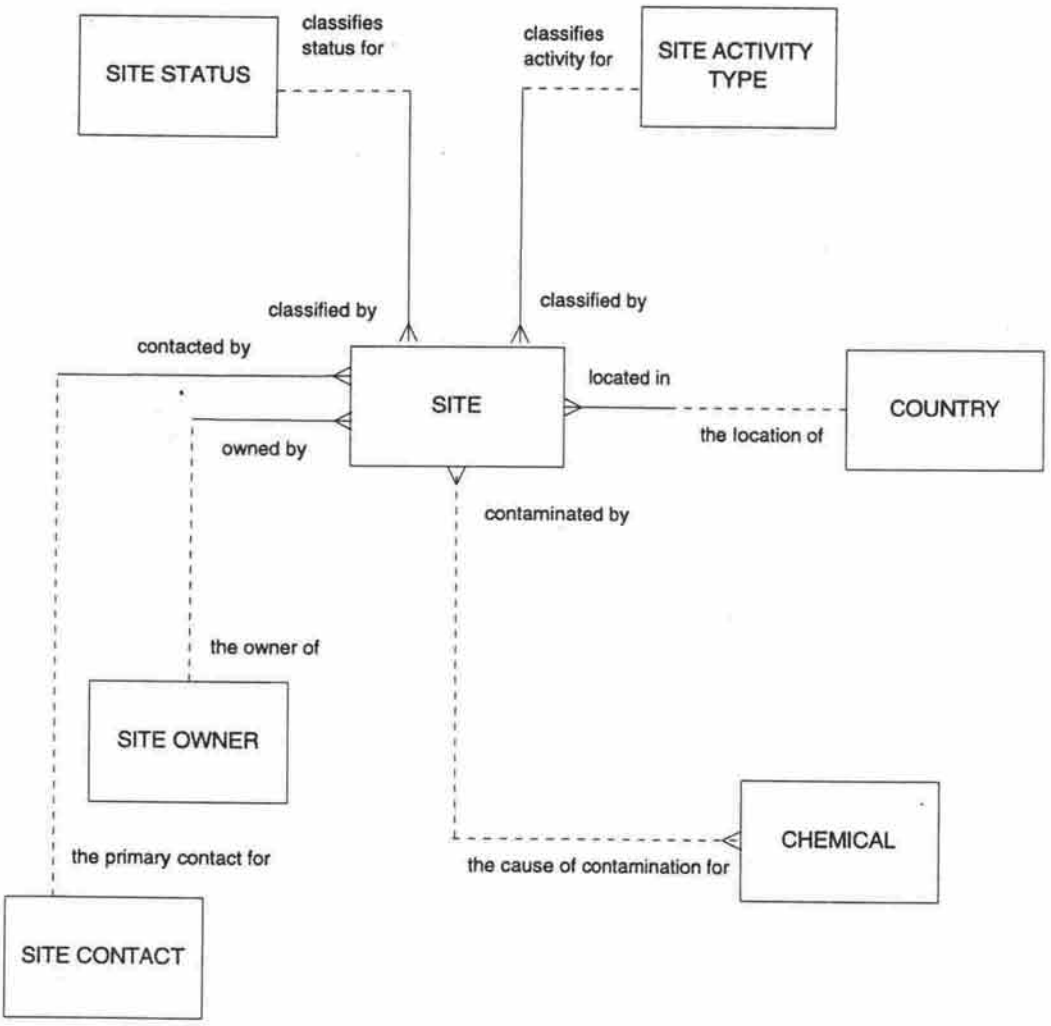
SPECIES
ENDANGERED SPECIES
INVASIVE SPECIES

We can see that the entity named ENDANGERED SPECIES is a special case of the entity SPECIES. Another special case of SPECIES is the INVASIVE SPECIES entity. We refer to SPECIES as a supertype entity, while ENDANGERED SPECIES and INVASIVE SPECIES are subtype entities.

Supertypes and subtypes add a new dimension to the basic Entity-Relationship modelling. They normally lead to richer and more understandable data models and also indicate possible alternatives for the database design.

E-R Diagram Example

Hazardous Chemicals Contamination



Annex II List of User Interviews

Interview 1
Strategic Output 6 (Executive Management)
Monday, 13:30 - 14:30
Attended: Ms Pisaina Leilua, Ms Dorothy Kamu
(Note: Mr Tia Masolo from Solomon Islands has attended most of the interviews as part of his attachment with SPREP)

Interview 2
Strategic Output 3
Monday, 15:00 - 16:00
Attended: Mr Pene Lefale, Dr Chalapan Kaluwin

Interview 3
Strategic Output 1
Tuesday, 8:30 - 10:00
Attended: Ms Sue Miller, Mr Francois Martel, Mr Greg Sherley, Ms Lucille Overhoff, Ms Anna Tiraa-Passfield (consultant)

Interview 4
Strategic Output 2
Tuesday, 10:45 - 11:45
Attended: Mr Andrew Munro, Mr Suresh Raj

Interview 5
Strategic Output 5
Tuesday, 15:30
Attended: Ms Neva Wendt, Mr Craig Wilson, Mr Fatu Tauafiafi, Ms Seema Deo, Ms Satui Bentin

Interview 6
Strategic Output 6 (Administration)
Wednesday, 08:45 - 10:00
Attended: Ms Malama Hedley, Ms Sina To'a, Ms Saunoa Mata'u, Ms Lupe Silulu, Ms Quandovita Reid-Tuala

Interview 7
Strategic Output 4
Wednesday, 13:00 - 14:00
Attended: Mr Gerald Miles, Mr Andrea Volentras, Mr Petelo Ioane, Mr Herve Dropsy

Interview 8
Strategic Output 6 (Finance)
Wednesday, 15:00 - 16:00
Attended: Mr Daniel Devoe, Ms Luapene Lefau, Ms Pisaina Leilua, Ms Dorothy Kamu

Interview 9
Strategic Output 5 – Information Resource Centre
Thursday, 08:45 - 10:15
Attended: Ms Satui Bentin, Ms Miraneta Williams, Ms Herve Dropsy

Interview 10
Management de-briefing (the main purpose was for the consultant to present the summary of findings)
Thursday, 15:15 – 16:00
Attended: Mr Tamari'i Tutangata, Mr Ray Wright, Mr Craig Wilson, Mr Francois Martel, Mr Herve Dropsy

Note:
Several other less formal sessions were held with individual users with the objective for the consultant to get a more detailed look at the applications and databases used by these users.