



WCMC Handbooks on Biodiversity Information Management

Volume 2 Information Needs Analysis

World Conservation Monitoring Centre



**WORLD CONSERVATION
MONITORING CENTRE**

Series Editor J.H. Reynolds



Commonwealth Secretariat 1998

The **World Conservation Monitoring Centre**, based in Cambridge, UK, is a joint venture between three partners in the World Conservation Strategy and its successor Caring for the Earth: IUCN - The World Conservation Union, UNEP - United Nations Environment Programme, and WWF - World Wide Fund for Nature. The Centre provides information services on the conservation and sustainable use of species and ecosystems and supports others in the development of their own information systems.

The United Kingdom's **Darwin Initiative for the Survival of Species**, launched at the 1992 Earth Summit in Rio de Janeiro, aims to support the Convention on Biological Diversity by drawing on Britain's scientific, educational and commercial strengths to assist in the conservation and sustainable use of the world's biodiversity and natural habitats. Key tenets of the Darwin Initiative include collaboration and cooperation with local people, capacity building, distinctiveness and complementarity of project initiatives, poverty alleviation, and long-term sustainability. Through training, awareness raising, and research on undervalued areas of biodiversity, Darwin support is particularly aimed at strengthening links between Britain and those countries rich in biodiversity but poor in financial resources.

Under the auspices of its **Environmental Training for Sustainable Development** initiative, the Management and Training Services Division of the **Commonwealth Secretariat** supports short- and long-term training, internships and institution development for environmental policy makers, environmental 'operatives', and environmental information professionals in the Commonwealth, in various areas of the environment including biodiversity and gender. Funding support for training, institution development and publications under the aegis of the Management and Training Services Division is provided by the Fund for Technical Co-operation (CFTC).



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219 Huntingdon Road, Cambridge, CB3 0DL, UK
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ACKNOWLEDGEMENTS

The generous support of the *United Kingdom's Darwin Initiative for the Survival of Species* has provided for the development of a comprehensive programme of training in biodiversity information management. This programme comprises an international training team, drawing on expertise from collaborating organisations around the world; the preparation of a training resource in the form of a handbook series and related materials; and the development of computer-based demonstration tools. Training is being promoted through the delivery of post-graduate modules, and through regional and national workshops which have received additional support from The British Council, British Airways Assisting Conservation Scheme, and contributions from participating organisations. The programme has been appropriately titled *Darwin Initiative Training in Biodiversity Information Management*.

Development of the handbooks has also benefited from experiences gained through the Biodiversity Data Management (BDM) Project, administered by the United Nations Environment Programme (UNEP) and funded by the Global Environment Facility (GEF), and related initiatives supported through the European Union (EU) and European Environment Agency (EEA). Indeed, Volume 6 draws extensively on one of the key outputs of the BDM Project, the *Guide to National Institutional Survey* (UNEP/WCMC 1998), developed in consultation with participating countries, the BDM Advisory Committee and the UNEP management team. The concept of an information cycle was developed in collaboration with the International Institute for Environment and Development (IIED) with support from the UK Department for International Development (DFID). The handbooks have been published through the generous support of the Commonwealth Secretariat.

Fundamental to the development of this programme have been the partnerships established with training organisations around the world. These organisations have worked collaboratively in hosting workshops, in reviewing the handbook materials, and in providing guidance on how regional and national training needs can be met most effectively. The training programme has significantly benefited from the input of numerous individuals working in the field of biodiversity information management. Among these individuals, particular mention goes to Professor Ian Crain and Gwynneth Martin of the Orbis Institute, Ottawa, Claire Appleby, an independent consultant, and to Drs Jake Reynolds and John Busby of WCMC for their insightful work in developing the handbook series. Thanks are also extended to Laura Battlebury for her tireless administrative and logistical support. The series

editor for the handbooks was Jake Reynolds, while Donald Gordon managed the overall project.

To the many individuals, both within and outside WCMC who have contributed to the development of materials and the delivery of training in biodiversity information management, a profound debt of gratitude is owed. It is through this collaborative effort that a service is being developed to contribute to the conservation and sustainable use of living resources.

BACKGROUND

The purpose of the *WCMC Handbooks on Biodiversity Information Management* is to support those making decisions on the conservation and sustainable use of living resources. The handbooks form part of a comprehensive programme of training materials designed to build information-management capacity, improve decision-making and assist countries in meeting their obligations under Agenda 21 and the Convention on Biological Diversity.

The intended audience includes information professionals, policy-makers, and senior managers in government, the private sector and wider society, all of whom have a stake in the use or management of living resources. Although written to address the specific need for improved management of biodiversity-related information at the national level, the underlying principles apply to environmental information in general, and to decision-making at all levels. The issues and concepts presented may also be applied in the context of specific sectors, such as forestry, agriculture and wildlife management.

The handbooks deal with a range of issues and processes relevant to the use of information in decision-making, including the strengthening of organisations and organisational linkages, data custodianship and management, and the development of infrastructure to support data and information exchange. Experience suggests that some of the greatest challenges in information management today are concerned with organisational issues, rather than technical concerns in the delivery of information which supports informed decision-making. Consequently, topics are addressed at management and strategic levels, rather than from a technical or methodological standpoint, and alternative approaches are suggested from which a selection or adaptation can be made which best suits local conditions. Nevertheless, in adopting this framework approach, we have tried to adhere to recognised conventions and formalisms used in information management and trust that in producing a 'readable' set of handbooks the integrity of the materials has not been compromised.

Overall, the handbook series comprises:

Companion Volume

Volume 1 Information and Policy

Volume 2 Information Needs Analysis

Volume 3 Information Product Design

Volume 4 Information Networks

Volume 5 Data Custodianship and Access

Volume 6 Information Management Capacity

Volume 7 Data Management Fundamentals

Collectively, the handbook series promotes a shift from tactically based information systems, aimed at delivering products for individual project initiatives, to strategic systems which promote the building of capacity within organisations and networks. This approach not only encourages data to be managed more effectively within organisations, but also encourages data to be shared amongst organisations for the development of the integrated products and services needed to address complex and far-reaching environmental issues.

The handbook series can be used in a number of ways. Individual handbooks can be used to guide managers on specific aspects of information management; they can be used collectively as a reference source for strategic planning and project development; they can also provide the basis for a series of short courses and training seminars on key challenges in information management.

The companion volume provides the background to the handbook series. It also assists readers in deciding which handbooks are most relevant to their own priorities for strengthening capacity.

A second series of handbooks is planned to provide more detailed guidance on information management methodologies, including the areas of data and technology standards, database design and development, application of geographic information systems (GIS), catalogues and metadatabases, and the development of decision-support systems. The current series deals only briefly with formal system development methodologies, and for more detailed treatments the reader is encouraged to access the wide range of published and electronic resources available in libraries and on the Internet, some of which are alluded to in individual handbooks and reference sections.

A number of computer-based training tools have been developed to accompany the handbook series and are used in the training programme. These are based on a protected areas database, a tree conservation database, a GIS demonstration tool and a metadata directory. They aim to demonstrate key aspects in the collection, management and analysis of biodiversity data, and the subsequent production and delivery of information. They also illustrate practical issues such as data standards, data quality-assurance, data access, and documentation. Each training tool is supported by a user guide, together with a descriptive manual which traces the evolution of the tool from design, through development to use.

1 INTRODUCTION

Solutions to environmental concerns are usually complex and it is not always obvious how to determine what information is needed to achieve conservation goals. This is particularly true when decision-makers have only a hazy idea of their requirements. The price for not pursuing this challenge is heavy. Without the ‘right’ information, there is a risk that stakeholders in environmental decisions will select inappropriate options, with potentially damaging consequences for living resources. Information needs analysis is the process whereby needs expressed in a variety of ways — narrow, broad, technical or bureaucratic — are guided into a **consistent, mutually agreed set of information priorities**. It focuses on a series of basic questions concerning information usage, such as:

- Who are the intended users of the information?
- How will it influence living resource policy or management?
- Over what time-scale is it needed?

In the rush to implement technology or shed light on natural phenomena, answers to these questions are sometimes neglected. Information needs analysis addresses this challenge by stimulating a dialogue between the researchers, data managers, analysts and publishers (i.e. information professionals) who are involved in producing information, and the target audiences (users) who need — or are perceived to need — information to improve the quality of their decisions.

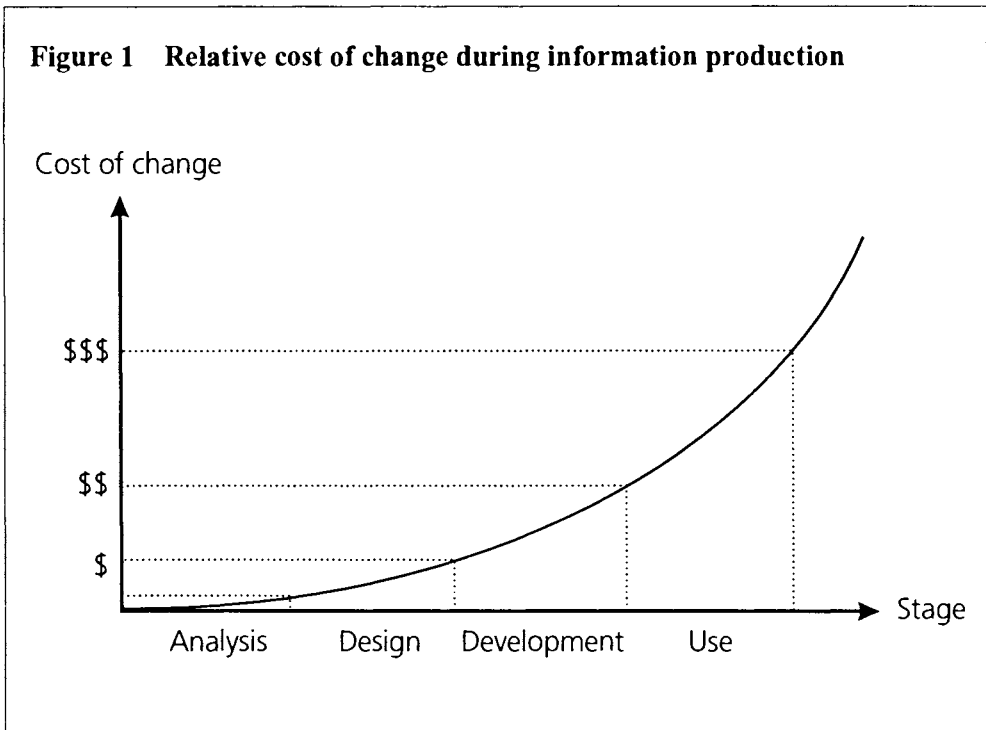
In the interests of cost-effectiveness, it seems obvious that such a dialogue should take place. However, the frequency of comments such as ‘the government never uses my data’ or ‘the information arrived too late’ or ‘was too detailed to understand’ are testament to this not being the case. The basic questions of **what information is relevant** at a specific time, and **when, how and to whom** it should be delivered, are vital to avoid time and money being wasted on information or information systems which are not used — or usable — by decision-makers.

2 WHY IS THE ANALYSIS NECESSARY?

Information needs analysis is an important early stage of the information cycle introduced in Volume 1. The analysis provides an opportunity for methods of collaboration to be established between information providers and users. If it is conducted in a consultative, inclusive manner, numerous benefits are gained as follows:

- **Cost-effectiveness**

The earlier that information needs are identified the easier, and cheaper, they are to build into the information production process (see Figure 1). Changing focus during the design stage of an information product is a frequent cause of delay and cost over-run; changing focus during the development stage costs even more, especially when multiple organisations are involved; and changing focus after information has been delivered to its users is yet more costly. At each stage, consultation with users is essential to make sure that the information will satisfy or exceed expectations.



● Efficiency

The underlying needs of different groups often overlap, enabling substantial efficiencies to be made in information production. For example, an official in a ministry of agriculture may require a map showing the distribution of wild relatives of crops in a specific location. This need differs greatly from that of a forest officer wishing to know the sustainability of logging operations in the same area. However, much of the baseline data required to build the maps (e.g. administrative boundaries, rivers, vegetation and topography) may be the same. Thus, analysis of information needs can save costs by pinpointing areas of overlap and ensuring that attention is paid to the development of frequently used datasets.

● Cooperation

One of the key spin-offs of the analysis is **improved cooperation between information providers and users**. The process of identifying information needs leads to a greater understanding of decision-making processes by the former, and a greater understanding of the practicalities of producing information by the latter. For example, it may come as a surprise to some scientific groups to discover that there are many factors other than content which determine how information impacts on decision-making. Amongst these are timing, clarity, and the method by which the information is delivered (see Volume 3).

Similarly, users are better able to articulate their needs when they understand the challenges faced by researchers, data managers and publishers, many of whom are constrained by lack of human resources and facilities. The analysis process provides a good opportunity for both sides to learn more about each other's working patterns, leading to more confident, cost-effective working partnerships in future. The overall aim is to encourage the view that information is integral to the decision-making process, not an external luxury or threat (see Volume 1).

An indication of the importance of user (information) needs analysis is provided by Richardson (1994), who claims that this step “took 80% of the time of the start-up phase” of the Environmental Resources Information Network (ERIN) information system in Australia, and that “great self-control was needed not to be ‘busy’ purchasing hardware, software, and data until these matters were settled”.

3 HOW ARE INFORMATION NEEDS DETERMINED?

3.1 Overview

Much background work may be necessary to review the **legal and regulatory framework** affecting an environmental issue before beginning information needs analysis. Important aspects to review include the historic progression of policies and practices leading to the current situation; the need to accommodate, not conflict with related policies and plans; and the degree of mutual confidence and cooperation amongst the stakeholders concerned. Such knowledge injects realism into the information needs analysis, and helps identify what information may be needed for practical policy changes. Once this review has been conducted, the process of identifying specific information needs can begin. For simplicity, this process is divided into three parts: stakeholder analysis, policy analysis and policy support.

3.2 Stakeholder analysis

The aim of this analysis is to determine which groups of people have the greatest interest in an issue, or will be affected by its outcome to the greatest extent. These people — the so-called stakeholders — will usually be the **primary users of the information** which is later developed. For example, if the issue was ‘drainage of wetland Y by farmers and housing developers’, a broad range of stakeholders might potentially exist, including the farmers and developers themselves, plus representatives from the local authorities, interested non-governmental organisations (NGOs) and community-based organisations (CBOs), the national agency responsible for environmental protection, and politicians.

Inviting too many stakeholders to participate in the process of information needs analysis can lead to high overall costs, prolonged consultation periods, introduction of extraneous issues, and the possibility of conflicts arising. Inviting too few stakeholders could imply that some groups have been overlooked or excluded, leading to resentment and increased likelihood of non-cooperation. Stakeholder analyses can be conducted for many purposes and at any level of detail. Table 1 illustrates a simple structure for recording the **relevance and special constraints** of a set of stakeholders faced with the issue of landscape degradation from intensive agricultural practices.

Table 1 Stakeholder analysis

<i>Stakeholder</i>	<i>Relevance to issue</i>	<i>Constraints</i>
Farmers' interests body	Unsustainable agricultural practices root cause of issue	Meets only twice a year
Local authority	Makes final decisions on land use; influential in promoting best-practice	Very busy; few resources
NGO	Represents local people's interest in protecting landscapes and biodiversity	Represents only a minority of the local population; few resources
National resource management agency	Encourages compliance of local authorities with national-level policies and standards	Natural resources policy framework under review
Politician	Pushing for economic development through intensification of the agricultural industry	Not briefed on environmental consequences
...	...	...

3.3 Policy Analysis

The information needed to address an environmental concern can be determined by asking stakeholders a series of basic questions to discover how decisions relating to the issue are made and how, if at all, objective sources of environmental information are employed. A variety of questions which could be asked of these groups are outlined below:

- **What are your main goals with respect to the issue?**

This question goes straight to the root of the analysis. It aims to uncover what policy and management goals stakeholders are driven by, so that information of the right kind to assist them can be determined. Information which simply augments the existing pool of knowledge, but is not relevant to stakeholder goals, is unlikely to support decision-making effectively.

- **How do you currently make use of information?**

Objective information on the environment may or may not play a large role in determining how decisions are made. For instance, farmers whose lives depend on good yields may feel there is no alternative to clearing vegetation or draining wetlands in order to survive, despite the fact that research suggests that the land has only limited fertility. Similarly, the demand for housing may prove irresistible to developers who, in the full knowledge that irreversible damage to the environment is being done, continue to clear and build. Politicians, too, may be driven more by financial and social necessities, political ideology or international pressures, than by objective scientific evidence.

In most cases, the rational argument for conservation and sustainable use of living resources is clear. What remains is to raise awareness of this argument amongst those who perceive themselves as having few, if any, options but to degrade the environment, and to offer insight and alternatives, not criticism, on how to proceed. Knowing how information on the environment is currently used — if at all — helps to decide what kind of information is most needed by stakeholders to embark on more sustainable practices. For example, a housing developer may be grieved to find that their proposed development would ruin the livelihood of a threatened species, but may do nothing about this unless presented with a series of convincing alternatives. The same is true for unsound or damaging technologies, which cannot be phased out until information on cleaner alternatives is available.

- **What constraints do you work under which might affect your use of information?**

Naturally, there is a variety of ways in which stakeholders may be constrained in their ability to absorb and use information. For example, a farmer who works long hours in the fields will have neither the time nor background to interpret the latest research results on agricultural biodiversity loss. Unless the information presented is brief and simple, there may be little chance that farmers will take up any recommendations which follow, for example, low-impact farming techniques. Even when legislation is passed or government incentives for best-practice are applied, associated information may still be needed to build new skills and awareness. An effective technique is to identify and sensitise opinion leaders within the farming community, and then support them in the wider dissemination of technology and practices.

Similarly, busy politicians and decision-makers in government may not see the value of additional information, particularly when this is presented in too much detail or at the wrong time. They may feel that they have more urgent priorities to attend to. Clearly, there is little benefit in delivering information to decision-makers unless it reaches them at the right time, in an easily interpretable form, and with reputable scientific credentials and sources. For example, if a meeting is scheduled to review and update a national policy on conservation and sustainable use of wetlands, then supporting information must be delivered well in advance and, also, through appropriate governmental channels. If it arrives late, is deemed to be too complex for busy people to comprehend, or it emerges from an unfamiliar source, then it may have no impact at all. Such constraints on information usage are exceedingly common and underline the need for information professionals to understand the decision-making strategies and procedures of those whom they wish to influence.

- **What laws, regulations and related policy initiatives affect your activities?**

Stakeholders at all levels — in government, the private sector and society at large — have varying degrees of knowledge about the policy and legislative framework affecting their lives. In some cases, the way in which decisions affecting living resources are taken is conditioned more by what the law allows, rather than the nation's or the community's, let alone environment's, best interest. Thus, it is important to assess what laws, regulations and related policy initiatives are in place (including, as appropriate, traditional customs, taboos and sanctions) which might affect the issue being addressed, since a refinement of these may be the most effective solution.

Many environmental issues have come to light so recently that current policies are inadequate to deal with them. Thus, one of the most important target audiences for information are government policy-makers who, amongst other stakeholders, are responsible for reviewing the performance of current policies and preparing strategic plans for the future (Miller and Lanou 1995). Some laws can be so out of date that they positively encourage citizens to damage the environment. A good example is the practice of clearing public land of its vegetation to demonstrate ownership, which is permissible, even encouraged, in some countries through the existence of outmoded economic incentives. Even modern laws may contain unanticipated loopholes which, unless closed, threaten careful living resource planning.

Where formal policy-review mechanisms are in place, it is important to investigate these carefully since they may be operated on tight, inflexible time-scales which must be satisfied. Where no policies exist to address a particular concern, one solution is to identify the decision-making bodies most likely to develop appropriate policies and empower these with relevant information.

3.4 Policy Support

Thus far, the analysis has attempted to reveal stakeholder's goals with respect to an issue; their current use of (and constraints on using) information; and the strengths and weaknesses of existing policies. The next step is for stakeholders to **integrate their various perspectives into a common vision** of the way forward. Clearly, this vision may not suit all stakeholders perfectly, but the aim is to find a policy solution to the issue which combines as many social, economic and environmental goals as feasible, given the diversity of views which exist. A key element of this process is consultation, which can be structured using the tools and methods described in Section 4.

Stakeholders may require specific information to help them cope with the implications of the agreed policy, particularly where they are expected to adopt new working methods or embrace notions of conservation and sustainable use of living resources. Further information may be required to monitor the performance of the policy, and to assist with its progressive review and refinement (see Section 4, Volume 1). To fully define information needs, therefore, it is helpful to ask a final, direct, question of stakeholders:

- **What information do you require to implement, monitor or review the agreed policy?**

It remains to determine what specific information is needed by whom and in what form to enable stakeholders to implement the policy and ensure that it remains responsive to their needs. The content, complexity, structure, timing and method of delivery of this information all determine the speed with which stakeholders will accommodate the changes required (see Volume 3).

The questions outlined in this section — relating to policy analysis and support — aim to uncover what information is needed to support conservation and sustainable-use goals. The team responsible for undertaking this analysis should consider distributing their findings to stakeholders for review and comment. Once agreement has been reached on information needs, the next step is to design information products and services to meet priority demands (see Volume 3).

4 USEFUL TOOLS AND METHODS

4.1 Overview

There are a great many tools and methods which can be applied to information needs analysis. Any particular analysis may require only a subset of these, the most appropriate methods depending on its depth, the nature of the issues being addressed, the range of stakeholders involved, and the previous experience of the team. Most methods are designed to **clarify goals** and, in some cases, **achieve consensus** amongst stakeholders with widely differing perspectives.

Structured approaches are suitable in situations where information needs are already broadly defined, and the goal is to elaborate these in more detail. Questionnaires are particularly useful in situations where organisations are mandated to prepare information in a prescribed form, and feedback is required from users on the quality of the information supplied, or ideas for future improvements. Structured interviews provide an opportunity to engage users in free-flowing discussions, yet keep to an agenda with a fixed set of questions.

Where new information capacities are being developed, perhaps by a series of collaborating organisations, more sophisticated techniques may be employed to engage stakeholders in consultation. Less structure may be feasible during the analyses, leading to the use of alternative, participatory approaches, such as visioning exercises, brainstorming and problem tree analysis.

Finally, process models can be employed at any stage in the information needs analysis to illustrate the relationship between information sources and selected processes in an operation. They serve to simplify and consolidate otherwise complex flows.

4.2 Structured Approaches

- Questionnaires

Questionnaires are a highly structured method of data collection which can be used in one of two ways:

1. As a 'fill in the blanks' form, completed with supervision or in the respondent's own time.
2. As a checklist or aide-memoire during face-to-face interviews.

A well-designed questionnaire promotes the **systematic collection, cataloguing and evaluation** of data, which eases the process of summarising basic facts and trends. If applied to the right tasks, questionnaires can be an extremely inexpensive and efficient method of data gathering.

Questionnaires are best applied to the collection of facts or opinions on carefully specified issues. They enable information professionals to segment users into classes on the basis of their responses, each class possessing a characteristic range of information needs. They can also be used to 'screen' potential users for their relevance to an issue, or to enable identification of key groups for study in more depth. They can also be applied to wider tasks, such as the gathering of basic data on organisations to enable them to cooperate more effectively (see Volume 6).

Questionnaires have limitations for open-ended or general analysis of information needs and past experience has shown very low response rates are obtained from 'blind' distributions (mailings without advance warning or explanatory material). Response rates can be improved by including a supporting letter or brochure outlining the purpose of the study, together with a sample questionnaire completed as an illustration. Another technique is to have the questionnaire filled out to the maximum extent before it is distributed, to save recipients the bother of entering obvious data themselves (e.g. name and address of their organisation), while encouraging them to update entries that are inaccurate or incomplete.

Even with this level of assistance, respondents may leave some questions blank, misinterpret questions, or bias answers according to their own individual assumptions. The chances of generating 'true' information from a questionnaire are, therefore, relatively low compared with face-to-face techniques. Of course, response rates can be improved by following up questionnaires personally with telephone calls or site visits (see Volume 6 for a full discussion).

- **Interviews**

The structured interview involves obtaining views through direct questioning and discussion. The interview is 'structured' in the sense that there are particular topics and/or questions which are asked in all cases, and standard explanatory information is provided in advance. Interviews may be conducted **individually or as a group**. Individual interviews can be conducted formally (questions are asked and responses recorded on tape or written down), or informally (a questionnaire or checklist is used to prompt discussion on key topics). Naturally, interviewing techniques will vary according to the cultural norms of the organisations and individuals concerned.

Group interviews are useful where discussion and consultation are the preferred way to establish answers. As above, a questionnaire or checklist can be used to guide discussions and record answers from individual participants, following which the responses of the overall group can be summarised. As with other kinds of group approach, it is useful to have one person facilitating the discussions (chairperson or facilitator) and another recording what is said (rapporteur). Group interviews often benefit from a short presentation on the topic before opening up the discussion more widely.

4.3 Participatory Approaches

- **Visioning exercises**

Having determined which stakeholders need to be involved in discussions on a particular issue, the next step is to try and formulate a consensus on how to proceed. For instance, this could be through the development of new or refined policies, by means of specific projects, via changes to organisational structures and management systems, or by selected investments and capacity building measures.

Visioning exercises bring stakeholders together to develop, and sometimes negotiate, solutions to problems which satisfy many perspectives. The aim is to release ideas, viewpoints and needs from participants, and structure these into a common vision of the problem, its solution and how to achieve that solution. As

with any strategic-planning exercise, the exercise seeks answers to the following three questions:

1. Where are we now?
2. Where do we want to be?
3. How are we going to get there?

One of the key requirements of a visioning exercise is **experienced, objective, facilitation**. The job of the facilitator(s) is to solicit contributions from participants and bring order and clarity into discussions, not to lead participants to conclusions no matter how obvious these may seem to the facilitator. At the end of the exercise, participants should feel that the achievements are theirs alone.

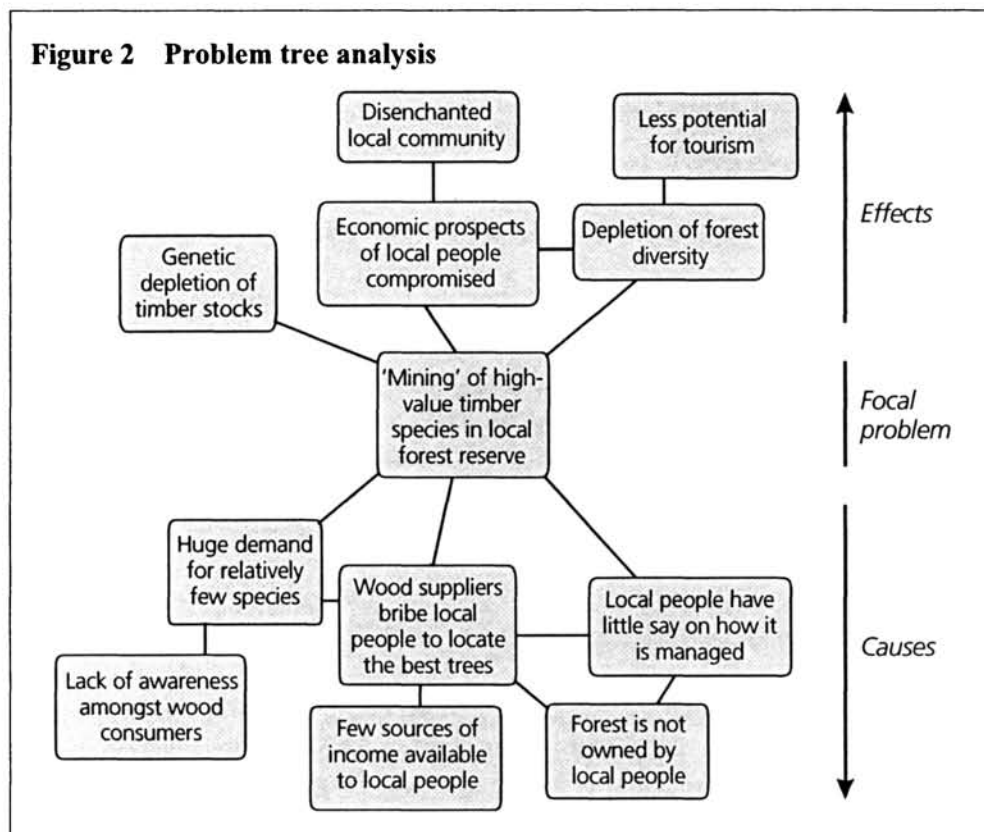
● **Brainstorming**

Brainstorming is similar to a visioning exercise, except that the goal is to **accumulate ideas** on a topic in a short space of time, rather than attempt to develop a consensus. A facilitator is needed to initiate and steer the session, as well as to create the right conditions for creative thought. In a brainstorming session, all individuals are free to speak and there is particular encouragement to put forward unusual and new approaches. All inputs are recorded. The ideas are then sorted and used where applicable in the context of the topic under discussion. Brainstorming is most useful when defining the initial scope of a policy or plan, when a change in strategy is required, or simply for an infusion of new ideas and inspiration. For example, brainstorming may be useful in trying to identify the key datasets in an organisation, or new forms of information products to influence decision-making.

● **Problem tree analysis**

Problem tree analysis is a useful method for enhancing problem definition so that policies and plans can be formulated to address their underlying causes. The analysis works by inviting those gathered to identify the key problems associated with a shared issue or concern. These are displayed on a flipchart or similar display device in group sessions, or simply noted down on paper in smaller gatherings. With the help of a facilitator, the group then decides which of the range of

Figure 2 Problem tree analysis



problems identified is the **focal, or pivotal, problem** to address. This is placed at the centre of the display, whilst the remaining problems are separated into **causes and effects** of the focal problem, and are placed below and above it respectively. The problem tree is completed by clustering together similar causes and similar effects and noting the linkages between them.

The resulting diagram places an issue into its wider context, in terms of its underlying causes, indicative effects, and related issues. This enables policy-makers and managers to target their investments more efficiently, with consequent improvements in impact and measurability. Problem tree analysis is a general method which can be applied to any form of complex problem definition, including resource management and information management issues alike. Figure 2 illustrates a typical problem tree diagram as applied to the issue of depleting stocks of timber in a forest reserve. In this example, the focal problem is the illegal 'mining' of high-value timber trees by non-local wood suppliers.

- **Working groups/workshops**

Working groups (sometimes known as working parties or task forces) are small teams of individuals formed to address specific issues and return their results in a **specified time-frame**. Working groups usually have no further role after their assigned task is complete, and are composed of experts in particular fields rather than representatives of organisations. They are a particularly efficient way of developing plans on specific topics (e.g. a working group on environmental indicators, or application of GIS technology) or with coming up with solutions to difficult problems and uncertainties.

Workshops are similar to working groups in having the objective of addressing a particular, perhaps wide-ranging topic. They bring together relevant expertise for a short period (usually one-half to 5 days) with the aim of achieving **better mutual understanding of issues**. Workshops often incorporate elements of training and, where a wide spectrum of organisations are involved, facilitate sharing of knowledge and expertise. External facilitators may be brought in to keep the workshop to an agenda, maintain objectivity in discussions, and ensure that all participants have an opportunity to contribute. A technique often used at workshops is to divide participants into small working groups to develop specific sub-topics or workshop themes. The size and composition of the working groups may be fixed at the outset of the workshop, or adjusted as it progresses in accordance with individual and workshop needs. Working groups normally present their findings to a plenary session of the workshop after their work is concluded.

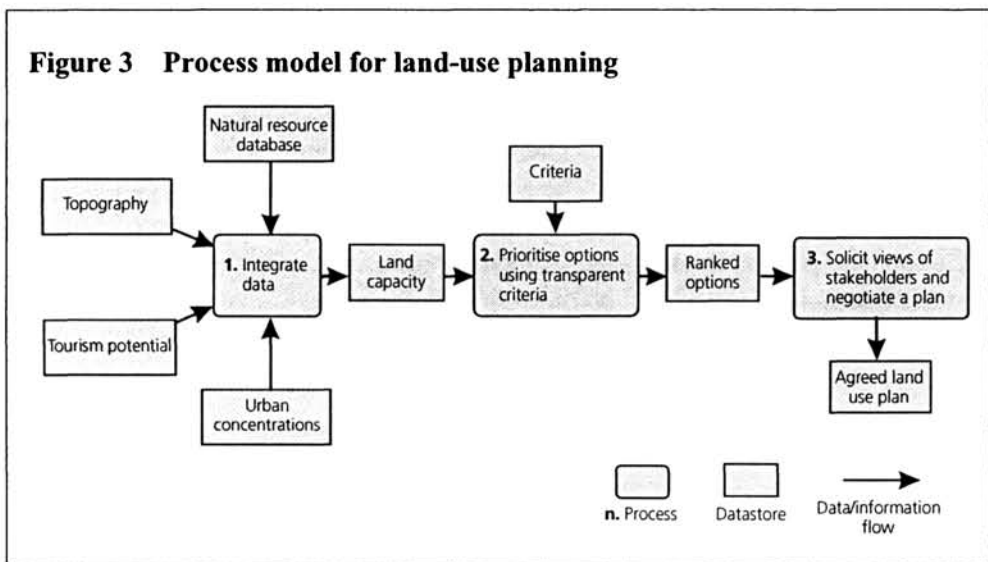
4.4 Process Models

Process models (also referred to as data-flow diagrams) can be used to illustrate how **information and data flow between the processes of an operation** (e.g. an organisation, business or project). The role of a process model is to describe the operation in terms of its elemental processes and to define the flows of data and information which are needed to make it work.

A consistent diagrammatic convention is often applied (useful models can also be developed without formal notation). In one common convention, operations can be expressed as a collection of numbered processes shown in rounded rectangles. Each process may be broken down into sub-processes, which in turn may be split further,

and so on, with appropriate numbering being applied at each level. Sources of data (and information) used in the process may be depicted using rectangles and may be referred to as 'datastores' (this term implies no physical implementation; the data in a datastore may be in one or more databases or manual files). Arrows between processes and datastores indicate the direction of data flow. For clarity, it is conventional that each diagram should contain only a limited number of process boxes (usually 4-6) and datastores. The process model may be used equally well to illustrate an existing or planned operation.

Figure 3 illustrates a simplified process model for a land-use planning operation. It is divided into three processes. Firstly, data on leading land-use options are integrated to assess the capability of the land in question. The information resulting from this process is considered by a decision-making body which ranks the options according to agreed criteria. This information is communicated to stakeholders for comment and, hopefully, an acceptable solution is negotiated.



5 CASE STUDY: INFORMATION FOR FORESTRY SECTOR DEVELOPMENT

In 1995, the British Department for International Development (DFID — formerly ODA) and the forestry commission of a country with a high proportion of tropical forest cover embarked on a five-year support project to strengthen the capacity of forestry sector institutions to manage the country's forest resources. In mapping out capacity building requirements, monitoring was noted as a priority area but strategic information for policy and planning was not explicitly included.

In discussion with the forestry commission, DFID officials noted the importance of strategic information to support the project's objectives and, as a first step, the International Institute for Environment and Development (IIED) and the World Conservation Monitoring Centre (WCMC) were invited to the country for one month to conduct an information needs analysis for the forest sector. The analysis was guided by a framework known as Forest Resource Accounting (IIED/WCMC 1996), which helps to determine what information is needed by forest managers to improve policy and management planning.

Based on extensive consultations with forestry commission staff, other government officials, members of a forest industry body, scientific research programmes and non-governmental organisations (including those representing indigenous peoples), a picture of the current status of forest information was revealed. This included the strengths and weaknesses of existing data, and the constraints on information usage exhibited by different stakeholders. The final stage of the analysis was a proposal for a series of information systems and information products which could be developed to address the immediate and longer-term information needs of key groups.

Many constraints were noted on the development of the country's forest sector, the most pressing of which are highlighted in Box 1. In this difficult situation, the analysis team decided to concentrate only on policy areas and related stakeholder goals of widespread concern, leaving further dimensions of sustainable forest management (SFM) to be addressed over the longer term. Clearly, cost-effective information should, in the first instance, help resolve the 'burning' issues.

Box 1 Main constraints on the development of the forestry sector

- Overall low productivity of forests.
- Low timber rents and low profitability of domestic forestry industry.
- Macroeconomic policy failures (e.g. creation of imperfect competition by subsidising foreign companies with tax breaks, etc.).
- Inadequate revenue structure and inadequate incentives for sound forest management.
- Market failures (e.g. unaccounted environmental externalities).
- Lack of infrastructure and trained personnel.
- Inefficient processing (due to lack of capital and investment incentives).
- Poor market access and relatively low export prices (e.g. due to low bargaining power).
- Low domestic purchasing power.
- Lack of tenure security.
- Lack of data on forest assets, capability and market value.

Although some of the detailed goals and needs voiced by stakeholders differed, there was a general convergence of ideas in key policy areas. Stakeholder goals were split into six groups, as illustrated in Box 2, each having implications for policy and monitoring. This was clearly a time when many stakeholders in the country were examining approaches to forest management carefully, with most acknowledging that major changes are required to meet the various objectives of SFM.

Box 2 Stakeholder goals requiring information and monitoring

Discussions with stakeholders, and analysis of recent documents on forest issues, reveal some key goals for future forest management. Information and monitoring is required for further development and implementation of many of these. Key supporters of the goals are indicated in parenthesis.

1 Supply goals: integrated policy and planning for forest lands

- 1.1 Introduce a *planned approach to concession allocation and use*, including forests that are not currently state forests (government, industry)
- 1.2 *Rationalisation of forest/land-use law and regulations* (donors, government, industry, NGOs)
- 1.3 Exploration of *non-timber potentials* (ecotourism, bio-prospecting, conservation concessions) to be considered alongside timber potentials (government, industry)
- 1.4 Implementation of *EIA* in planning forestry activities (government, NGOs)

2 Demand goals: promotion of sustainable forest industry and trade

- 2.1 Understand *market and investment opportunities* for timber and other products/services (government, industry, international commercial/lending partners)
- 2.2 Sustainable development of *forestry, processing and forest products industries* (most stakeholders)
- 2.3 Understand the profiles of *prospective investors* (government)
- 2.4 *Improved bargaining position* in international agreements and trade (government)
- 2.5 *Level playing field* for all stakeholders (industry)

Box 2 (cont.) Stakeholder goals

3 Use goals: nurturing and monitoring of forest users

- 3.1 *Project/investment proposal* development and assessment (government, industry, donors)
- 3.2 *Developing new capacities in the forest industry* through training and other development support (government, industry)
- 3.3 Sustainable development of *indigenous communities* and their lands (indigenous groups, donors, international community)
- 3.4 Monitoring *forest condition* and setting standards for *concession management* (government)
- 3.5 *Control of chain-saw operators* (government, industry)
- 3.6 *Knowledge and control of foreign operations* in the country (government, industry, international community, NGOs)

4 Improving participation and accountability

- 4.1 Increase *transparency and accountability in decision-making* (general public, government, international community)
- 4.2 Developing *better dialogue and working relations* between government and other stakeholders (government, industry)

5 Continuous improvement

- 5.1 Incorporating *research results* into policy and management planning (government, research projects, university)
- 5.2 Strategic, step-wise approach to the transition to sustainability (most stakeholders)

6 Raising and sustaining government revenue from forest use (government)

The most important ‘development services’ for the forestry commission to deliver correspond to the first three¹ groups of stakeholder goals outlined in Box 2: integrated policy and planning for forests; promotion of sustainable forest industry and trade; and nurturing and monitoring of forest users. The forestry commission was exercising leadership in developing these services. However, the required information was not available at the present time. Thus, in its final report, the analysis team recommended that the commission develop the following information systems and products in collaboration with its private and non-governmental partners in the forestry sector:

1. ‘State of the Forest’ Review (updated annually)
2. Forest Assets/Capability Map (updated continuously)
3. Forest Investment and Marketing Handbook (updated annually)
4. Forest Concession Management Information System (updated continuously)
5. Forest Resource Balance Sheet-Stocks and Flows (updated monthly).

Consistent with a continuous improvement approach, each system or product was broken down into a series of small achievable steps to be implemented in phases. The intention was for the forestry commission to work these up into costed proposals for integration into the on-going support project. Although the team did not attempt to prioritise the products, many stakeholders recognised that the forest concession management information system (MIS) was needed most urgently to monitor the increasingly large areas of forest under concession.

The goals of the concession MIS, whose main audience is the forestry commission itself and individual concessionaires, are to:

- Ensure that forest managers produce the goods and services required by the economy, maintain an acceptable level of forest quality, and realise government revenue.
- Generate accurate, up-to-date assessments of the extent to which concessionaires are complying with agreed forest management guidelines/Code of Practice.

1 The second three groups of concerns correspond to the driving forces necessary to build and sustain the services.

- Ensure that essential data (such as forest inventory) are collected, processed and analysed to feed related information management activities.

The concession MIS consists of a set of principles, criteria, indicators and specifications; a set of assessment methodologies to determine indicators composed of field survey/validation procedures, interviews and document reviews; a set of reporting formats and communication paths; and a database regulating the storage, analysis and reporting of data into timely, relevant information for management and policy-making.

Without such an information system it would be difficult to monitor forest management quality for purposes of applying incentives/penalties for good/poor management practices, respectively. It would also be difficult to assess the needs and capacities of forest users, for purposes of nurturing good forest management practice. Thus, it would be difficult to evaluate progress towards sustainable forest management.

[Source: IIED/WCMC]

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These handbooks have been developed for use by senior decision-makers and mid-career professionals. They review the issues and processes involved in the management of biodiversity information to support the conservation and sustainable use of living resources. They also provide a framework for the development of national plans and strategies and for meeting reporting obligations of international programmes and conventions. Collectively, the handbook series may be used as a training resource or, more generally, to support institutions and networks involved in building capacity in information management.

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DARWIN INITIATIVE SECRETARIAT

4-A2 Ashdown House, 123 Victoria Street
London SW1E 6DE. United Kingdom

COMMONWEALTH SECRETARIAT

Marlborough House, Pall Mall
London SW1Y 5HX. United Kingdom

WORLD CONSERVATION MONITORING CENTRE

219 Huntingdon Road
Cambridge CB3 0DL
United Kingdom

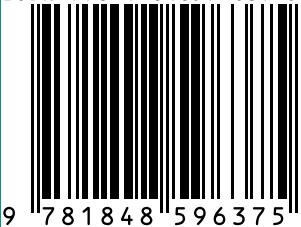
Tel: +44 1223 277314

Fax: +44 1223 277136

E-mail: info@wcmc.org.uk

WCMC Internet Home Page
<http://www.wcmc.org.uk>

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