



Strengthening evidence-based forest policy-making

Linking forest monitoring with national forest programmes



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ACRONYMS AND ABBREVIATIONS

CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
CITES	Convention on International Trade of Endangered Species of Wild Fauna and Flora
DETER	Detection of deforestation and forest degradation in real time
FIA	Forest inventory and analysis program of the USDA Forest Service
FLEGT	Forest law enforcement, governance and trade
FRA	FAO's periodic global forest resources assessment
GHG	Greenhouse gas
GDP	Gross domestic product
LULUCF	Land use land use change and forestry
MRV	Measurement, reporting and verification
NFI	National forest inventory
NFM	National forest monitoring
NFP	National forest programme
NGO	Non-governmental organisation
NLBI	Non legally binding instrument on all kind of forests
REDD+	Reducing emissions from deforestation and forest degradation, and the role of conservation of forest carbon stocks, sustainable forest management and the enhancement of forest carbon stocks
UNFCCC	United Nations Framework Convention on Climate Change

SUMMARY

Issues in forest policy-making are subject to differing interpretations, and agreed policies are the result of compromises among many different and sometimes opposing and changing positions and interests related to forests. At the same time, forest policy-making is expected to be based on proven knowledge and on up-to-date, reliable, transparent and accessible information. Managers tasked with providing national level forest information in this context face, therefore, both many political and technical challenges. National forest monitoring (NFM), as well as other large-area forest-related monitoring endeavours, such as national forest carbon accounting systems (e.g. monitoring, reporting and verification (MRV) systems for REDD+), must be able to specifically respond to these challenges. They must strive not only to be technically reliable and cost-efficient but also to generate and provide information that stakeholders view to be legitimate.

Many countries have experience with national forest programmes (NFPs) and make use of the concepts and practices of NFPs when structuring and articulating their forest-related processes, including policy and strategy development. NFPs around the world use a variety of procedural and institutional instruments that facilitate a collaborative environment for consensus-seeking and conflict resolution aimed at agreed and coordinated planning and action in forestry.

This paper proposes an approach to assist countries in ensuring that NFM planning more strongly meets the needs and demands of forest-related national policy processes. The approach is based on an understanding that there is a multiplicity of issues and legitimate interests related to forests that require multipurpose information systems. The approach is also based on the following two assumptions: 1) that the technical, financial and administrative design of an NFM system is based on the information needs and user requirements of various policy processes and stakeholders; and 2) that strong stakeholder involvement is needed at all stages of NFM planning and implementation.

The proposed approach is built on six guiding principles – relevance, strategic orientation, reliability, efficiency, accessibility and sustainability of information provision – which cover general technical as well as procedural aspects useful for NFM planning. These principles are applied in five key action areas for developing and implementing a planning process for new or recurrent NFM: participatory planning; information needs assessment; survey and data collection design; data management/access to information; and communication and capacity development.

Countries address these principles during the NFM planning process in ways adapted to their needs and contexts. This paper presents an approach that should allow countries to systematically consider the choices for NFM designs with a view to strengthening evidence-based policy- and decision-making. Countries need solutions to the challenge of monitoring their forests that satisfy the purposes and information needs of decision-makers and stakeholders; stay within the boundaries of budgetary capacities; achieve acceptable levels of reliability; and adapt operational procedures to national capabilities.

Regular feedback among key participants at all times during the planning and implementation process of the NFM is essential, as well as their active involvement in the interpretation of results and the use of NFM outputs. National forest programme structures and practices or similar policy dialogue platforms are well-suited to support efforts to this end.

1. INTRODUCTION

Forest policy-makers operate in an increasingly complex environment. They must take into account the interests and needs of a great variety of actors. Forests are biologically varied and provide many groups of people with multiple and diverse benefits. In addition, sectors outside forestry, such as agriculture, energy, tourism and water, may have strong interests in forests or land covered by forests. National forest monitoring (NFM) systems, therefore, need to generate an increasingly diverse range of information (FAO 2008). Policy issues such as REDD+, forest law enforcement, governance and trade (FLEGT), wood energy, and poverty reduction continue to add data requirements to NFM systems.

Making effective use of scientific and technical information in public policy processes requires meaningful communication among actors and a collaborative environment within which discussions are held and opinions exchanged on alternative courses of action. National forest programmes (NFPs) provide useful platforms for both communication and decision-making. They can assist in developing or revising forest related policies, strategies and action plans and facilitate their implementation.

Forest information provision must respond to the increased inter-institutional, multi-issue and multilevel reality of forest governance and its related political and administrative decision-making requirements. Existing sectoral information provision is often insufficiently prepared to meet these challenges and therefore is unable to respond adequately to the specific information needs of stakeholders and political actors.

This paper is targeted mainly at senior-level strategic and operational decision-makers – that is, those people who will prepare or make decisions on scope and design of new or revised NFM systems, such as the heads or deputies of forest administrations and agencies, their senior advisors, and other key stakeholders.

The aim of the paper is to help improve national information provision in a broad sense, so that it is better-gearred towards providing evidence and serving information needs at the strategic and managerial decision-making levels affecting forests and forestry. The proposed approach aims to adapt existing forest-related information provision through participatory processes and to link it to existing or incipient NFP structures and processes (either formal or informal) in countries. If the approach is implemented well, the information generated by the NFM system will hopefully be more relevant, of better quality, more consistent and used more frequently in forest-related policy and administrative processes, thus strengthening evidence-based policy-making.

2. FOREST-RELATED POLICY PROCESSES AND IMPLICATIONS FOR INFORMATION PROVISION

Policy-making is often depicted as a structured, rational problem-solving process that follows a logical set of steps to arrive at the best possible outcome. In reality, policy decisions are more often the result of multiple advocacy and negotiation processes going on at the same time among multiple stakeholders on multiple topics. Decisions are compromises between the competing interests of different interest groups. Therefore, policy processes are rarely linear and progressive but rather iterative and incremental. When making decisions on forest resources, the degree of uncertainty about the outcomes of alternative choices is often relatively high. This allows a wide variety of opinions on different options and sometimes makes it difficult to agree on a clear way forward. There is usually agreement on general objectives such as sustainable forest use, biodiversity conservation and the alleviation of rural poverty, but conflicts among stakeholders over the best course of action for achieving these objectives will almost always arise. New issues or new actors may appear and influence discussions. External events may unexpectedly require the revision of agreed policy proposals. Deadlocks can exist for long periods – until pressing circumstances lead to settlement and decision.

The availability of good-quality, relevant and timely information improves insights and may make decision-making easier. Even more valuable is information on trends. Trend analysis has direct implications for NFM systems because it requires recurrent data collection and the comparability of data over time. While even the best available information may not resolve fundamental differences among actors about priorities and policy directions, accurate, up-to-date information on the situation can promote evidence-based discussions, reduce speculation and facilitate agreement.

In any given country, many forest-relevant decision-making processes take place at the same time. For example, there are likely to be on-going, simultaneous policy discussions on food security, climate change, poverty reduction, wood fuel policies, illegal logging, biodiversity, the decentralization of forest administration, and the environmental services provided by forests, among others. All these processes have specific data collection and information needs. Different stakeholder groups require information for different purposes; the private sector, for example, needs information to assist in decisions on investment and management. Given the diverse needs for and uses of forest-related information, the analysis of data on the various aspects of forests – biophysical, socio-economic, governance and other land uses – should be integrated to the extent possible.

Deforestation and forest degradation often occur due to pressures from outside the forest sector, such as those exerted by population movements, the expansion of agriculture, or mining. This multisectoral dimension of forest-policy processes means that the provision of forest information must have the scope to look beyond forest data and to coordinate with bodies and information systems in other sectors. Rules and standards should be set for data use and exchange where feasible, to ensure that data collected by disparate bodies can be shared and used efficiently.

It is no longer tenable for forest-policy processes to be dominated by traditional, hierarchical, top-down decision-making, and NFM systems must respond to the information needs of multiple levels of administration and managerial decision-makers. The requirements for information at decentralized levels are, in essence, no different from those at the central level. But a higher degree of precision may be needed for certain locally important parameters, or additional variables may be required in some areas of a country. Information systems need to provide easy access to information

at all levels and to facilitate both the uploading of collected data and the retrieval of information after data-processing. For example, the practical implementation of NFM systems, especially the field data collection, is sometimes carried out by decentralised government institutions in their area of jurisdiction. However, the feeding of processed data and results back to local or other subnational information systems, used by local decision makers, is not necessarily guaranteed. Thus, adequate facilities or approaches are needed to better link local demands of information with data provision from NFM systems.

Sometimes, data from local or subnational information systems, when aggregated, contradict data held in national systems; sometimes, different information systems store data on the same parameters with differing results. Thus, problems of consistency, comparability and interpretability of data will arise and can sometimes act as stumbling blocks in policy discussions generating avoidable argument. The NFM system should ideally establish a commonly agreed at different geographical levels to harmonize methods, concepts, definitions, scope and the use of forest-relevant data sources.

Forest policy-making is also characterized by the growing influence and participation of non-state actors, who require access to and involvement in the flow of forest information. Non-state actors at different geographical scales can also play important roles in data collection and analysis and generate substantial knowledge. Therefore, establishing effective and transparent communication channels among state and non-state actors and ensuring access to information by implementing agreed rules and formats for data exchange is important.

The global nature of many environmental and social problems and the recognition of shared responsibilities among industrialized and developing countries have created many forest-related international agreements that are helping to shape national forest policies. The highest-profile of these agreements arose from the 1992 United Nations Conference on Environment and Development and its follow-up processes: the UN Framework Convention on Climate Change (UNFCCC), the UN Convention on Biological Diversity (CBD), the UN Convention to Combat Desertification (CCD), and the Non-legally Binding Instrument on All Types of Forests (NLBI). International reporting frameworks and commitments, including criteria and indicators for sustainable forest management and FAO's periodic global forest resources assessment (FRA), have direct implications for the design of NFM system. The information needs of such frameworks and commitments influence decisions on the data to be collected, data formats and the required levels of precision and accuracy. For example, the application of coherent and consistent MRV to REDD+ measures and strategies is essential for fulfilling international commitments made by countries and for attracting international investors to support the implementation of such measures.

It is important that emerging trends and challenges are recognized and then adequately addressed in policy and managerial decision-making. NFM systems should therefore consider the need for data that enable the construction of past and present trends and the projection of future scenarios on important aspects of forests. NFM related data collection in many countries takes place irregularly and at wide intervals (e.g. every ten or more years), which reduces the capacity to recognize and analyse trends. In order to cope with the demand to also provide information on shorter term changes and trends, some countries have adopted annual panel based NFM designs (e.g. enhanced forest inventory and analysis FIA programme of the USA or the upcoming NFI in Peru). Others implement approaches where the use of remote sensing techniques reduces the cost of more frequent data collection (e.g. the multi-source NFI approach in Finland or the DETER programme of TerraAmazon in Brazil). These approaches can provide a greater amount of timely information and increase the efficiency of data collection, enabling policy-makers to react more quickly to forest-related change. Nonetheless such combination of data sources needs to be cautiously analysed and interpreted in terms of acceptable accuracy and precision of estimations of key variables.

In summary, four main conclusions can be drawn on the design of approaches to information provision that may help to better meet the requirements of national forest policy-makers and stakeholders:

1. The design of a new, or revision of an existing, NFM system should be linked explicitly to the country's main forest-related policy processes (e.g. NFPs), and not conducted as pure technical projects involving primarily technical experts.
2. A clear mandate is needed at the political and administrative leadership levels to secure adequate overall guidance on the objectives, scope, principles and results of the NFM system, as well as on decisions on proposals (e.g. design and data collection methods) and their implications (e.g. for budgets, capacity-building and investment requirements).
3. The starting point for NFM designs should be the purpose and use to which the information and knowledge will be put, and technical aspects should be viewed in light of what different users will need to know and how they will practically access and utilize the information.
4. Effective communication channels need to be established – and used regularly – between those responsible for the operational planning of the NFM system, political decision-making authorities, and the stakeholders involved in forest policy processes.

Approaches to information provision that take into account the policy-process environment in which they take place will likely improve the credibility of information and increase the inclination of actors to rely on and actually use the information generated. When interested parties realize that they are invited to play an active role in a process and when they directly recognize that their concerns and suggestions are taken seriously, they are more likely to trust the results of that process and to promote its outcome. The national forest programme concept can be useful in this context.



A. ODOUL

Rural people gathering wood in Peru

3. NFPS AND THEIR ROLE IN FOREST INFORMATION PROVISION

The concept of national forest programmes was developed in the follow-up to the United Nations Conference on Environment and Development. Chapter 11 of Agenda 21 (part of the Rio Declaration), on combating deforestation, identified the pivotal role of comprehensive, country-driven planning frameworks for the management and conservation of forest resources, which should be integrated with other land-use planning and coherent with global issues of sustainable forest development. The concept was further developed under the aegis of the Intergovernmental Panel on Forests and its successor institutions and draws heavily on the experiences of many countries in implementing tropical forest action plans in the 1980s and early 1990s. In addition, NFPs are seen as the main strategy for implementing the “Non-Legally Binding Instrument on All Types of Forests” (NLBI) adopted by the United Nations General Assembly in 2007.

NFPs are a generic concept encompassing a wide range of approaches to sustainable forest management applicable in all countries and to all types of forests. A NFP is generally understood as a comprehensive forest policy framework based on iterative processes, which include, ideally, all stages of planning, implementing, monitoring and evaluating strategic national level forest-related actions in countries. Conducting a NFP process successfully requires a more or less formal institutional set-up that facilitates discussions among stakeholders on forest-related issues and decision-making.

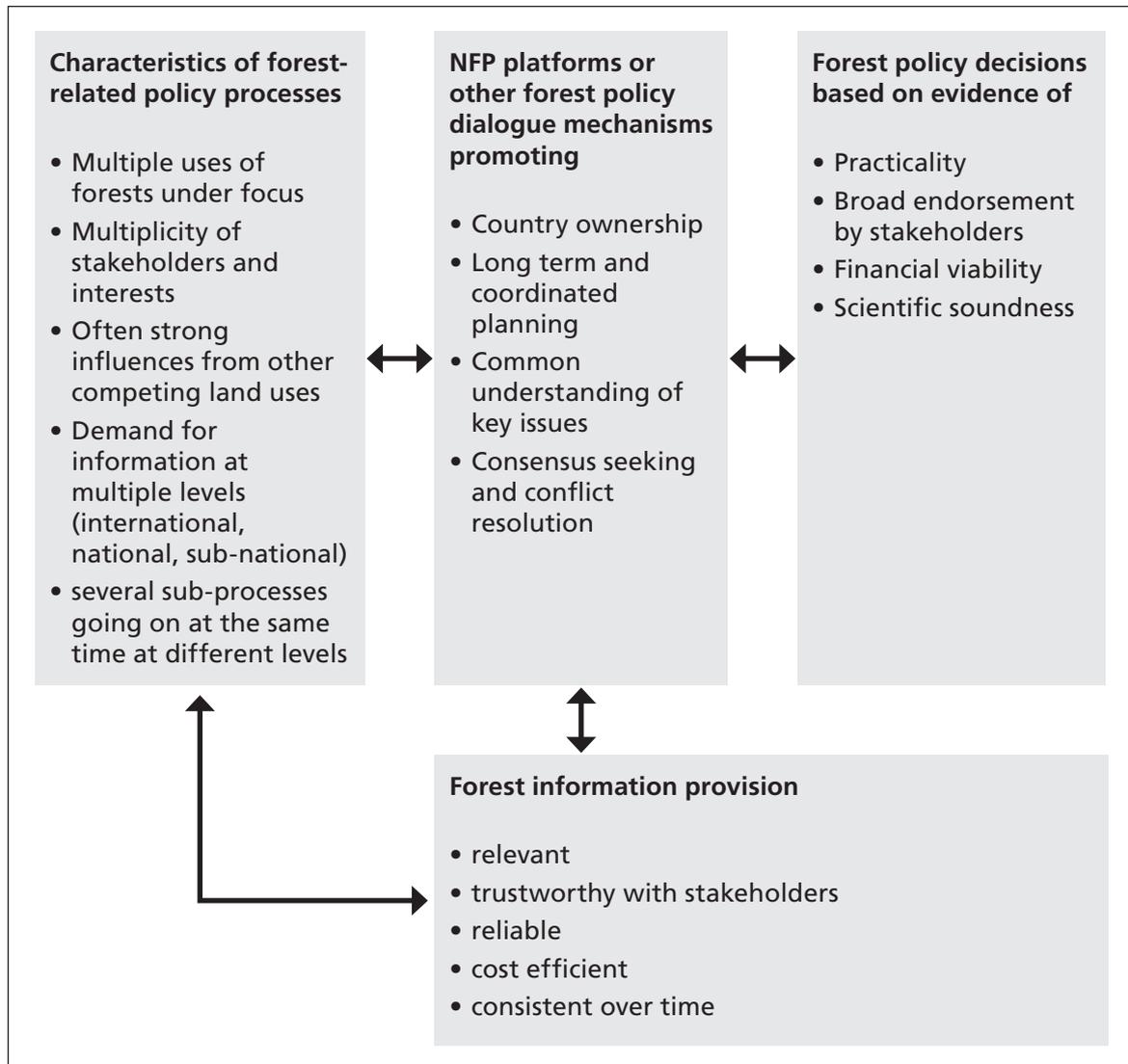
Worldwide, the uptake of the NFP concept in countries has varied considerably, ranging from the conceptually intended comprehensive policy and planning frameworks to a loose collection of processes, instruments, actions and events directed generally at policy reform in the forest sector. Motives for implementing NFPs in countries have also varied, from satisfying donor requirements or responding to international soft law, to addressing pressing needs for change in domestic forest policy agendas in new formats. Not all countries that implement NFPs start by formulating new policies or programmes, and in some cases there is no formal recognition of an NFP, even though many or all the elements of it are at work in national policy processes.

Regardless of the differences in how NFPs are implemented, the following common effects of NFPs relevant for the design of NFM systems can be identified:

- NFP-implementing countries have adopted the principle of strengthening country ownership and leadership, requiring more long-term and coordinated planning and actions on forests;
- More – and a wider range of – stakeholder groups are involved in forest-related policy discussions, thus helping to develop a common understanding of issues and perspectives among actors;
- Many NFP-implementing countries have created and are using institutional opportunities and mechanisms (e.g. platforms, round tables, working groups and task forces) for information-sharing, consensus-seeking and conflict resolution among stakeholders.

Where NFP platforms or other processes and mechanisms for regular participatory forest policy dialogue exist, these may facilitate better uptake and the broader use of the information generated by NFM and helping to steer discussions (see Figure 1). Broader “ownership” and use also facilitate the institutionalization of NFM systems over time, substantially strengthening the long-term provision of forest-related information. NFP processes should help planners and managers to orient NFM systems so that they meet policy needs and the requirements of information users. Specifically, forest policies, NFP documents or other forest-related multi-year plans of actions can help in guiding the discussion amongst different stakeholders on information priorities in a coordinated way.

FIGURE 1: NFPs as a platform for linking forest information provision with relevant policy processes and evidence based decision making



4. PRINCIPLES OF POLICY-ORIENTED FOREST INFORMATION PROVISION

Forest policy-makers require reliable information and sound evidence from their information systems on which to base their decisions. Nevertheless, the aim is to strive for decisions that are not only better informed but also have greater legitimacy. Those responsible for NFM or MRV systems will normally be confronted with the following:

- Important information is either unavailable or outdated;
- The information is there but not fully used or is incomplete;
- Arguments exist or arise about the meaning or interpretation of data and information.

All three situations, or a combination of them, pose challenges for NFM planning. These ideally respond by providing the most complete, precise, accurate, timely and relevant information possible in a transparent and participatory manner.

This chapter describes six principles intended to assist senior-level strategic and operational decisions-makers in addressing the technical and political challenges that are likely to arise during the planning and implementation of NFM systems or programmes.

4.1 THE PRINCIPLE OF RELEVANCE

Although one would expect expensive, nationwide data-gathering projects to collect and analyse only relevant and needed data, experience indicates otherwise. In reality, the data and results of many NFM projects worldwide have not been fully used by decision-makers or in decision-making. This may be due to many reasons, such as a lack of awareness that such data exist, the questioning of the credibility of the data or the methods used to produce them, difficulties in accessing the data, inadequate analysis and interpretation and so forth.

For information to be relevant it is crucial that, during the planning of an NFM system, the objectives of the exercise are linked as closely as possible to the requirements for information on the most relevant longer-term issues and interests of a broad range of stakeholders. To capture all relevant key interests, the process to develop objectives and assess information needs should involve all key stakeholders in a meaningful way. The information to be produced should serve the purposes of as many stakeholders as possible, meaning that NFM systems needs to be multi-purpose. Information should also be relevant over time, meaning that efforts should be made to achieve consistency with past data to show long-term trends and to ensure that data collected will also be useful in the future.

Key topics for NFM should be derived from strategic issues of concern to stakeholders in forest and other land-use policy. Equally, they should arise from the short- and long-term natural-resource goals of the country, its land-use strategies, and international policy commitments and reporting requirements (e.g. UNFCCC, CBD and FRA).

If stakeholders at different levels are given the opportunity to freely express their information needs, it may turn out to be too costly or technically too complicated to collect and analyse all the data necessary to fulfil the resultant long lists of data requirements. It is thus essential to carry

out, in a participatory way, priority assessments of such lists to ensure that the NFM focuses on the most important elements.

Closely connecting the objectives of information provision with major policy goals and issues will have consequences for the technical design and analysis phases of the NFM. For example, once information requirements have been determined, these need to be translated into data collection requirements. For each key topic identified, data will need to be collected for a number of variables, and different stakeholders may be interested in information at different levels of precision. This has a direct impact on the choice of data collection methods. The scope, methods and approaches to be applied should be discussed to the extent that stakeholders trust and understand the process as well as its eventual outcomes. The issue of relevance should also be considered in the design, development and implementation of computer applications for the NFM system: data management and analysis functionalities, for example, will need to be adapted to the information retrieval routines and requirements of users.

4.2 THE PRINCIPLE OF STRATEGIC ORIENTATION

This principle has two major elements concerning the ability of NFM systems to 1) provide information related to longer-term strategic development questions in the forest sector; and 2) develop the capability to integrate new issues and adapt to emerging needs over time.

Contribution to strategic development

By definition, NFM programmes and systems are designed for strategic purposes, as opposed to management or operational-level inventories. Forest policy-makers and decision-makers have to be able to integrate and analyse variables from different sources and be capable of recognizing forces and factors outside the forest sector that have an impact on forests. For example, the task of maintaining forest cover and forest quality is often affected by issues in rural and agricultural development or the subsistence needs of local communities. Equally, the occurrence of overexploitation and illegal logging may be influenced by unclear or disputed land tenure, or by conflicts over management responsibilities.

To provide adequate support for strategic land-use decisions, therefore, NFM systems are increasingly required to complement traditional biophysical data with population, socio-economic, biodiversity, governance and general land-use-related information. This means that NFM systems should also collect or be able to process and use quantitative and qualitative data on relevant socio-economic and governance issues. This can be done by either integrating data from other existing information sources into the NFM or by adding non-biophysical data collection components to the NFM system, or a combination of both. It is important to ensure that key non-biophysical data or variables are spatially referenced in order to allow their multi-layer analysis in geographic information systems. In this way, biophysical characteristics of the resource can be linked with socio-economic and governance characteristics, which may provide insights into, for example, the underlying causes of forest loss or degradation. This would enable decision-makers to focus their policy measures geographically and thematically and devise strategies for sustainable forest management that are more embedded into the respective rural development settings.

It is useful to cooperate and coordinate with central statistical offices and other national or subnational planning departments with the aim of streamlining methodologies and sharing information for data collection and analysis. Such cooperation requires the standardization of data definitions, as well as of maps and the spatial units of data analysis; as far as possible, it should also involve the mutual recognition of monitoring or census results.

Many countries perform regular public policy evaluations and have developed social, economic and environmental indicators for this purpose. Where this is the case, NFM systems should take these into consideration in their data collection and analysis, aiming to generate information that can be fed into relevant public policy indicators. This may contribute to an overall perception among stakeholders that the NFM system is relevant and useful, and it could also encourage investment in NFM by appropriate decision-makers.

Capability of projecting trends

New and emerging issues, as well as possible future opportunities and threats, are important aspects to be considered by policy planners in strategy development. Examples of such issues are growth in population and consumption (e.g. increasing demand for food and energy); technology developments (e.g. new value chains for wood); business opportunities (e.g. tourism); and new finance mechanisms (e.g. payments for environmental services, such as carbon sequestration). New issues, threats and opportunities may arise unexpectedly, or trends may be visible now. Traditionally, NFM systems have tended to focus on past or, at best, ongoing change, but the challenge for contemporary systems is to anticipate future change.

Evolving issues can partly be captured in an information needs assessment (see section 5.2) by inquiring relevant stakeholders explicitly about expected future developments in the wider context and their implications for forests (and for future information requirements). In countries where institutions exist that are charged with predicting future sectoral trends and challenges (e.g. standing committees, platforms or “future forums”), it will be useful to include these in the information needs assessment.

Planning with a view to the future is also important because NFM systems themselves require longer-term commitments by stakeholders in terms of time, financial budgets and capacity-building. It normally takes several years from the start of an NFM program before its results become available. Once the full set of data is available, it will usually take a minimum of five years and often more than ten years before a new full NFM cycle begins. Thus, the periods between initial design, first data availability and re-measurement can be rather long. By the time a new NFM cycle begins, the previous design and set of information needs are often at least partly outdated. NFM systems therefore face the challenge of achieving consistency in data collection over time and maintaining the flexibility to adapt to future needs.

From a planning point of view, the following points can help in responding to these challenges:

- Ideally, the national NFM system should be designed as a permanent rather than a periodic or ad-hoc survey. In permanent systems, it is generally easier to adapt data collection designs to new requirements and to add additional attributes to measurement procedures;
- In the planning phase of an NFM system, the whole country – not just forested land – should be identified as the area or population of interest for data collection, independent of the actual distribution of land uses. This approach allows the inclusion of new sample plots and areas of interest in a country or the creation of subsamples without changing the survey design, and thus helps ensure consistency over time;
- If periodic survey systems are preferred, reassessment cycles will ideally follow the cycles of the periodic revision of national forest policies or national forest management planning cycles, with the effect of reducing discrepancies between the time when policy-makers need updated information and the time it becomes available.

4.3 THE PRINCIPLE OF RELIABILITY

The principle of reliability refers to the quality of data and processing procedures and their acceptance by stakeholders. The information produced by an NFM system should be as precise and accurate as possible for a given budget and be in line with the corresponding expectations / requirements by the mandating institution. Field measurement and remote sensing techniques are best based on standardized, generally accepted, proven methodologies. Quality assurance of the workflows of data collection, processing and analysis is also important because errors caused by, for example, the mishandling of field instruments, faulty image interpretation or the incorrect execution of technical procedures in general can be significant sources of inaccuracy. Extensive training and a rigorous selection of personnel for field and office work, especially in the early stages of a large-area NFM, are therefore essential. Quality control should be carried out in such a way that all significant and avoidable errors are detected and minimized to acceptable levels.

Nevertheless, increasing the precision of information comes at a cost – through either higher budgetary requirements or technically more complex data collection and estimation procedures, or both. The more complex a design or the statistical estimation procedures, the more difficult it is for stakeholders to understand them and possibly also to trust the results. It is advisable, therefore, to weigh advantages and disadvantages of different design options, precision targets and technical procedures against their ease of comprehensibility by stakeholders. It is important that stakeholders understand and accept the methods because this will increase the credibility of the results.

4.4. THE PRINCIPLE OF COST-EFFICIENCY

Establishing and maintaining an NFM system requires substantial investment. Field data collection takes up the largest share of the total cost in many NFMs. The added value of specific variables and the cost of collecting the corresponding data should be assessed carefully. In addition, accuracy and precision targets should be weighed against the cost involved and the technology and capacity required. Likewise, data collection and analysis are best based on generally accepted and proven technical approaches.

In general, three main elements determine the major part of the cost of NFM programs:

- Sampling design (sample size);
- plot design (type and size of plots and number of variables to be tallied);
- the integration of data sources (mainly field sampling and remote sensing).

Optimization exercises, including pilot inventories can be carried out to find the optimal combination of those three elements for a given budget, or the lowest cost to obtain the required data.

It is also important to ensure that cost calculations for the overall budget account not only for data collection and processing but also for quality assurance, supervision, administration, capacity-building and data management (including storage, information retrieval and reporting), as well as the steps that need to be taken to institutionalize the NFM system. NFM exercises that are too costly or technically sophisticated to be institutionalized will end up as one-offs and unable to be maintained into the future.

The relationship of the costs versus the benefits of NFM systems is a sensitive topic. It is essential, therefore, that stakeholders are involved in all stages of discussions on NFM trade-offs. Decision-makers in ministries and higher administrative levels must be clear about the financial and budgetary implications of all technical decisions that they or their representatives take during the process.

Managers responsible for planning and executing NFM, and their technical advisors, must make sure that they are explicit and transparent about all the major technical decisions made in the exercise, their cost – and about the trade-offs involved in such decisions. The questions and criticisms that will inevitably arise during this kind of large-scale and long-term project can then be better answered and collaboratively solved.

4.5 THE PRINCIPLE OF ACCESSIBILITY

The extent to which policy-makers and stakeholders use information depends on its availability and accessibility. Experience has shown that one of the limitations to information use in policy processes is a lack of access to information among stakeholders and relevant institutions. While it is vital for all stakeholders to have access to information, this is often not the case, particularly if NFM programmes do not explicitly emphasize access to information in their initial phases.

Often, various units in a forest administration, other administrative and planning units, decentralized offices and local stakeholders lack adequate access to information provided by an NFM system. The reasons for this are plentiful, varying from the absence of computer systems, other systematic storage systems and suitable internet connections to an unwillingness to share information. Limiting access to information might be seen as a way of maintaining power over decision-making. However, if a country is to move forward and formulate policies based on sound information, there is no substitute to the wide sharing of information and providing as many stakeholders as possible with access to information. Clear and effective communication, comprehensive, open access to information, and user-friendly information retrieval and visualization tools will help ensure that NFM data are used appropriately and widely. The timely and transparent flow of information between relevant institutions at different administrative levels and other stakeholders also helps to build trust among parties.

In many countries, mobile phone networks, which often have broad coverage, provide internet access even in remote areas. The wide availability of the internet should allow the digital exchange of information between national and subnational offices and access to stakeholders virtually anywhere. Several such approaches and systems now exist or are developed, including e.g. FAO's OpenForis initiative. Access to databases stored elsewhere can be facilitated by internet portals. What is required is an understanding of the need to provide access; the willingness to provide such access; and investments to create the necessary infrastructure, such as reliable internet connections, appropriate software applications, and the processing of data in ways that generate useful, easily understood information to support policy processes; in some cases and for some stakeholders, additional hardware and software may need to be supplied.

Sharing and access are equally important for inter-institutional cooperation, which is needed to tackle complex land-use policy issues with economic, social and environmental impacts on forests. Decision-making in forest policy often requires analyses and interpretation of data that are collected and stored by information systems other than those of forestry institutions (for example environmental and agricultural agencies and general social and economic planning institutions). Mutual access to both raw data and processed information stored in different information systems and databanks is necessary for this purpose. Sometimes, the same types of forest-related data (e.g. forest area and deforestation rate, among others) are collected and analysed by different agencies, often with different methods and definitions. Consequently, results about forest extent, composition and values may differ and may even be contradictory, creating problems in the comparability and consistency of national databases. Improved coordination among agencies and information systems that collect, analyse and store forest-related information is therefore essential, as are efforts to harmonize methods and definitions.

In summary, data management arrangements for NFM systems will ideally have, at least, the following:

- a data management policy with open-access rules ;
- flexibility to make use of reliable existing data (i.e. reduced data redundancy);
- built-in capacities for the use of data from different sources and information systems (data-exchange capacities with other units and systems);
- multiuser access capabilities (for updating and retrieval, with access and security rules);
- user-friendly output screens and presentation tools.

In many countries, work is under way to develop systems with these characteristics, not least as a consequence of programmes and action related to the role of forests in climate-change mitigation (i.e. REDD+), which call for increased consistency among national forest databases and common frameworks for forest monitoring and reporting. In Brazil, for example, the national deforestation monitoring system TerraAmazon and its work programmes for monitoring of forests is governed by comprehensive open-access policies that allow anyone to access and download raw and processed data. Interested users can either use the outputs of the system, or carry out their own analyses.

The adequate presentation of information is fundamental. Policy-makers need information but usually do not have the time, patience or skill to retrieve it from complicated computer applications. Technology development increasingly enables the design and development of user-friendly web-based applications, including e.g. Global Forest Watch. If information requirements are known, and if adequate reporting functions are pre-programmed into the applications, policy-makers should be able to retrieve information themselves when they need it, with very little training.

4.6 THE PRINCIPLE OF SUSTAINABILITY

Ability to update information periodically

National forest inventories or other large-area forest monitoring activities are usually carried out at a frequency of every five, ten or more years. However, users and decision-makers increasingly require updated information on forests at shorter time intervals. They also need information for an increasingly wide range of purposes, such as the analysis of relevant issues and trends in national forest and land-use policy-making and for fulfilling commitments to international conventions. For example, the intervals for reporting to the UNFCCC on national greenhouse gas (GHG) emissions are annual or biennial (depending on the status of the country); other international conventions (e.g. the CBD) also request information on progress towards national and international goals at least every 3–4 years.

NFM planning can react to these requirements by developing or introducing design elements, within the framework of permanent NFM systems, that allow increased frequency in the updating of information (e.g. annualised or panel systems or enhanced application of remote sensing). An additional benefit of more frequent and permanent monitoring of forests is the improved ability for priority-setting in annual government action plans and for more focused budget allocation at the national and regional levels.

Recurrent data collection requires durable information systems that can store large quantities of data in structured and logical ways. Such information systems should also have built-in functionalities for trend analyses and allow the flexible inclusion of changed data types and their processing.

Institutionalization of NFM systems

A majority of NFMs, especially in developing countries, have been one-off projects, often implemented through international cooperation programmes. Given the need for the continuous availability of updated information, many countries are working to institutionalize their project-based NFM systems. This requires action to embed the system in legislative and administrative settings but, often, this issue has received little attention.

Once an international cooperation project supporting an NFM project has phased out, national institutions will have to rely on national budgets and work with reduced or no technical expertise from abroad. An institutionalized NFM system requires adequate financial and human capacity to do so. Decision-makers need to be able to mobilize the necessary funds and to maintain and improve the technical capacities of in-country personnel. The former may be best supported by ensuring that NFM is mandated by national laws.



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A local farmer in Tanzania practices eco-friendly farming methods, pruning a coffee crop along the foothills of Kilimanjaro

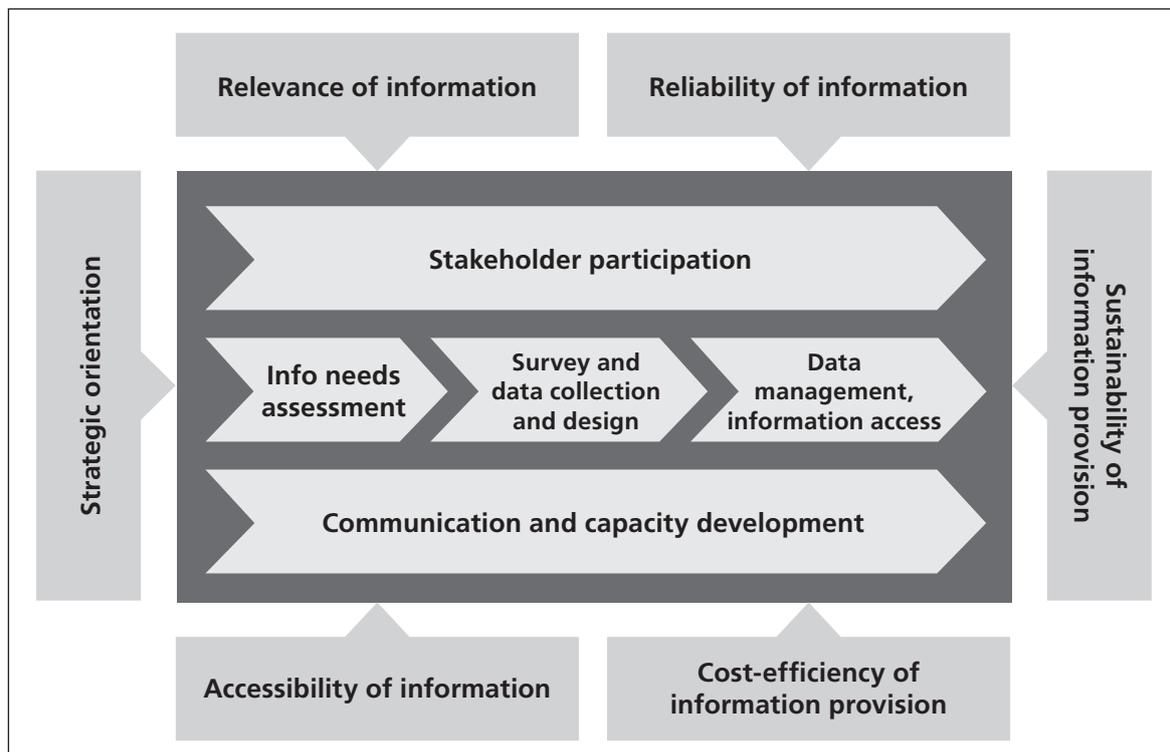
5. IMPLICATIONS OF PRINCIPLES OF POLICY-ORIENTED INFORMATION PROVISION FOR NFM DESIGN

When designing a new or adapting an existing NFM system, the responsible managers will be challenged to find optimal solutions for the four main recurrent general aspects of NFM planning:

- satisfying the purposes and information needs of stakeholders and decision-makers;
- accommodating total and annual costs over (at least) one complete measurement cycle to the realities of budget availability, now and in the foreseeable future;
- designing the monitoring system in such a way that pre-defined or commonly accepted levels of precision estimation are achieved for a defined set of prioritized variables, given the country's financial and technical capacities or constraints;
- organizing / customizing the procedures for data collection and processing (which refers to all data sources used, including remote sensing imagery), as well as the analysis of data and the dissemination of results along the existing operational and institutional conditions.

To assist in these tasks, this chapter describes five key areas of action to be considered in planning or revising NFM systems, taking into account the principles of policy-oriented information provision, as described in Chapter 4. All the principles come into play in all action areas, but with differing emphases and prevalence according to the stage of the planning process (Figure 2). Each principle may also have differing importance and meaning in different countries and thus will need to be critically evaluated and adapted to the country context and needs.

FIGURE 2: Implications of principles of policy-oriented information provision for NFM designs



5.1 PARTICIPATORY APPROACH THROUGHOUT THE PROCESS

The relevance, added value and sustainability of information produced by a NFM system will be greatly increased if stakeholders have a sense of “ownership” of the system and participate in each of its various stages. Involving stakeholders in the process will also help in making decisions on the various components of the system, in line with overall needs. It can also help increase the potential for institutionalizing the NFM system, and it can assist the design and implementation of the associated information systems needed to ensure that the data collected are actually used.

When planning and implementing a new or recurrent NFM system, the responsible managers will face many different and sometimes interwoven technical and political challenges. Many technical aspects of NFM systems are likely to be unclear to stakeholders and decision-makers. This is especially the case when some of the more complex design alternatives and estimation procedures are to be used; for example, the notion of sampling is often poorly understood. Methodological questions of data collection and processing are also frequently subject to time-consuming discussions involving a variety of actors with different interests, experiences and opinions.

To facilitate adequate stakeholder involvement in the process, three main activities should be considered: multistakeholder inception workshop(s); the use of existing NFP platforms or other structures for forest policy dialogues; and the establishment of complementary arrangements for structuring the process if deemed necessary.

There are three reasons for convening multistakeholder inception workshops: 1) to get a first overview of the multiplicity of perspectives on and interests in forests; 2) to identify and establish the basic foundations for early and effective communication among key actors; and 3) to facilitate clear mandates from the relevant political and administrative leaderships.

If a formal and recognized NFP structure is in place, such as an NFP platform or another formal policy dialogue structure (e.g. forestry round table, standing or ad-hoc working groups, or relevant steering committees), the processes of discussion, consultation and validation of the relevant elements of the NFM can easily be integrated with it.

If no formal NFP structure exists –that is, if national forest policy processes are an array of formal and informal instruments and processes – it might be useful to establish a specific structure involving the main policy decision-makers and stakeholders. The composition of the working groups should reflect the wider political and administrative environment within which forest-related decision-making and the related information use are located. Key actors in major forest-related policy processes and initiatives, including actively involved public and private institutions and networks, should be represented in either the technical working groups or the advisory bodies. Decision-making may be considerably more time-consuming than in projects that concentrate on technical aspects only, especially in the early stages of the exercise. However, the investment in time and the consideration of all relevant interests may pay off in terms of more reliable, more generally accepted outcomes.

5.2 A FOCUSED INFORMATION NEEDS ASSESSMENT

When planning a NFM system, significant time will need to be invested in an information needs assessment, which will serve two purposes: 1) determining the data to be collected; and 2) helping to structure the analysis and information retrieval functions of the information system. A good information needs assessment is therefore crucial for the usefulness of the results and outputs of a NFM and also familiarises stakeholders with the monitoring programme already at an early stage of planning.

The information needs assessment establishes the kind and nature of information required for political and strategic as well as operational decision-making that can reasonably be provided by a NFM. Within given operational and financial limits, the assessment should canvass the information needs in all thematic areas that affect or drive the use of forests, including biophysical, biodiversity, socio-economic and governance aspects. All are important for monitoring the implementation and effects of forest-policy actions and will be useful in the context of climate-change programmes and strategies (e.g. REDD+).

At the start of the information needs assessment, it is especially important to consider the principles of relevance and strategic orientation, as well as some aspects of the sustainability principle (periodicity of data collection). Consequently, at least the following aspects and their related information requirements should be covered:

- the formal goals, objectives and targets of forest or forest-related environmental policies;
- the main issues discussed in forest-policy processes;
- national and international accounting, reporting and communication commitments;
- emerging issues, as perceived in interviews with stakeholders;
- the formal goals, objectives and targets of key other sectoral policies affecting forests, such as agriculture, energy, mining, tourism and rural development.

An information needs assessment should identify the essential priority issues for which information is needed, with a view to identifying which attributes should be observed for each priority issue. It is essential to focus on distilling a manageable amount of key variables to be collected, rather than creating long wish lists of information needs.

An information needs assessment requires the active involvement of high-level executive and managerial staff or their advisers involved in all major policy and strategy processes in the country that affect forests and their use, such as forest products and services, agriculture, energy, rural development and poverty reduction. It should include not only ministries and public agencies at different levels but also relevant private and civil-society organizations with a recognized stake in forest issues, including representatives of indigenous groups. It is important to create realistic expectations of the types and amounts of data that can be collected, given budgetary and technical restraints or conditions.

Information needs assessments could contain the following steps:

- ***Preliminary assessment of existing information*** – a desktop study at an early stage of the NFM design should provide a first overview of the kind, quality, availability and usefulness of existing forest-related information in the country. It should produce a first overview of information gaps and any problems with the quality of information collected in previous large area forest inventories or monitoring projects;
- ***Preliminary definition of information needs*** – a study should be carried out to develop a preliminary list of key information needs. It should include a review of the most important policy and strategy documents (e.g. national development strategy, international commitments, national forest programme or policy, and rural development policy), as well as interviews with key actors and advocacy groups in public and private institutions. The result of this step should be a list of essential topics and main related attributes on which data should be collected, along with other key aspects (e.g. periodicity and precision). The results of this more in-depth study will serve as inputs for detailed discussions with stakeholders;
- ***Cross-check of information needs with existing data, and identifying data to be collected*** – a more detailed assessment of existing information against the identified strategic information needs should yield a list of data requirements for key issues. This step often unearths data sources and data that have not previously been known or used by forestry decision-makers

and can help avoid the duplication of data collection, thus increasing the cost-efficiency of the exercise;

- **Multistakeholder consultation and validation of information needs** – the documented preliminary information needs and associated attributes should be subjected to consultations and validations by a wider audience reflecting the spectrum of interests in forests. These consultations can be carried out through national and regional workshops or focused meetings with stakeholder groups. During these workshops or meetings, the further prioritization of information needs should be conducted by applying additional criteria of technical, financial and operational feasibility.

The results of the information needs assessment will have far-reaching technical and financial implications for the data collection and the design, development and usability of the corresponding system for data analysis and storage. It is therefore advisable to obtain formal endorsement of its results by the appropriate authorities.

The time required to determine information needs is frequently underestimated, and protracted needs assessments can be frustrating for government officials and donors. From the outset of project planning and during its implementation, it is crucial, therefore, to explain clearly to all stakeholders the importance of information needs assessments and the time required to implement them.

A properly performed information needs assessment will produce the following:

- a list of essential information needs (key topics and main attributes), how precise the estimations needs to be, how frequently it needs to be updated;
- a list of user groups to be supplied with information;
- an agreement on where and how to collect data and information from third parties;
- an identification of information gaps (thematic and geographical);
- a definition of the types of data to be collected under the new or recurrent NFM project.

5.3 SURVEY AND DATA COLLECTION DESIGN

Once it is clear which kinds of data are to be collected, a detailed technical discussion is needed on how to collect them. In this action area, the principles of reliability of information, sustainability and cost-efficiency become prominent.

The discussion is best organized in a hierarchical manner, beginning with decisions on general design alternatives (e.g. continuous–permanent versus periodic assessment systems) and moving progressively to questions of:

- survey designs, including sample designs, considering both quantitative and qualitative data collection methods;
- plot type and plot design;
- the precision and accuracy of data collection and the data collection approach.

The discussion should produce several design alternatives for which, by applying the above-mentioned principles, the advantages and disadvantages can be weighed in terms of the:

- adequacy of information provision (feedback to needs assessment and the defined purpose of the NFM);
- reliability of data collection and calculation methods (e.g. precision targets and estimation procedures);

- periodicity of recurrent data collection (e.g. considering reporting requirements, the known change dynamics of forests and issues for trend analysis);
- costs and financial implications for annual budgets and for longer-term financial planning (including considerations about the use of data from other existing sources, if reliable);
- institutional and organizational aspects of establishing the administrative structures for the NFM, where a permanent system is being considered.

Decision-makers increasingly need information about non-biophysical aspects affecting forests, especially on socioeconomic factors and governance. Non-biophysical data can be included in an NFM by making use of data from other existing information systems or by adding non-biophysical data collection components (socioeconomic and forest governance), or by a combination of both.

Non-biophysical data collection can be linked to biophysical data collection in different ways, both in terms of sampling design and logistics arrangements. When deciding on the design of and approach to non-biophysical data collection, the same principles apply as for the biophysical component. Discussion about objectives and information needs, design alternatives, the method of data collection and organization and logistics will ideally weigh the same five aspects mentioned above for the biophysical NFM component. Choices made need to balance the technical, financial and operational criteria in order to come up with a feasible and robust NFM design that is well-adapted to the realities on the ground and can be maintained and developed in national conditions without an overreliance on technical and financial input from abroad.

5.4 DATA MANAGEMENT AND ACCESS TO INFORMATION

The data need to be processed and analysed to provide information, and adequate facilities are required to allow access to this information to all stakeholders. The importance of these steps, as well as the time and cost needed to prepare and implement them, is often underestimated, as is the technical expertise which is required. Data management should conform particularly to the principles of accessibility, sustainability and cost-efficiency.

When planning the data management system, many technical questions on software and hardware and institutional and organizational requirements have to be answered. Options should be developed suited to the country's legal, administrative and financial conditions. Regardless of those conditions, however, the main challenge is to derive practices and arrangements for the adequate storage, availability and accessibility of forest information in forms that are useful for policy-makers, stakeholders and interested people in general. The following questions can be used as a guide by planners tasked with developing or adapting databases and information systems in this context:

- how can access rights be promoted and secured to facilitate access by governmental organizations and stakeholders at different levels (strategies and rules of access);
- how can available information be made technically accessible to users at all relevant administrative levels (processes and technical requirements);
- in which forms should information be presented to best suit the requirements of different users (user-friendly information retrieval tools, output screens and reporting formats).

Providing open access to information to as many government agencies and stakeholders as possible is an adequate basic strategy because it will enable transparent and effective communication. Open access to information to policy-makers and advocacy groups in a comprehensive and timely manner helps generate trust and avoid resentment among actors (at least such resentments that can arise from differential information management). Important in this context is also a complete transparency about definitions and methods used for the estimations on which the information is based on.

There may be several reasons why data and information are not shared between central and decentralized offices of forest administrations: there may be technical difficulties, a lack of delegation of authority, insufficient capacity at the central and decentralized levels, or a lack of funds. However, data access by decentralized offices is crucial for solid decision-making in practice. Decentralized administrations also play a key role in local data-gathering, input, and data quality assurance, including for MRV activities under REDD+.

Although open access to data and information is essential for increasing the use of relevant information in forest policy-making, it is likewise necessary to set rules and guidelines that adequately regulate the disclosure and sharing of data and information, both within the organization responsible for the NFM and with other parties. When preparing such rules and guidelines, it is important to check existing national and international policies and regulations on the exchange of data and information. Ideally during the planning phase of a NFM, specific data- and information-sharing rules should be agreed. Issues of access to sensitive information or raw data can be addressed by providing different levels of access to different users (e.g. through electronic privileges and password protection). Benefits of agreeing on rules for data- and information-sharing include better protection of raw data and sensitive information, increased and faster information-sharing, a reduced number of complaints and disputes, maximized transparency and accountability, and contributions to the scrutiny of research results.

The technical approaches adopted to facilitate access to data and information will depend on existing arrangements, institutions and data registries and the experiences of national actors in forest information management. Most countries have some form of information system or database in place, usually within their forest administration or other environmental institution, as well as experience with data-processing tools and methods. A quick assessment of the information technology systems and forest-related databases that are available and functional in the country is recommended, with the aim of determining:

- whether and to what extent existing information systems at the national and subnational levels can be adapted or amended to include new or recurrent NFM information ;
- the prevailing rules, conditions and policies of accessibility and availability to both raw data and processed information;
- whether linkages exist among key information systems that store or manage forest-relevant data.

It is also useful to check with stakeholders to determine how they are likely to access data and how information should be presented to them to be most useful and user-friendly. At this stage it is helpful to identify the desired information output formats, which helps further clarifying what data needs to be collected. With this information, data management arrangements can be further developed. The following general considerations may be useful in technical discussions and decisions:

- As far as possible and technically advisable, make use of existing processes, methods and tools (to reduce costs and capacity-building requirements).
- Consider the potential to integrate NFM data in overall land-use and environmental information systems (capacity for data exchange in multiple directions).
- Build in easy-to-manage access facilities for all relevant administrative levels (e.g. internet portals and user-friendly information retrieval applications).
- Consider information-sharing capacities from single sources across systems (for greater cost-efficiency and to avoid data redundancy).

NFM systems are increasingly planned to serve multiple purposes, make use of multiple resources and provide data management facilities that generate information at multiple levels, including the local scale. The use of data for multiple purposes also requires management systems capable of handling multiple kinds of data, sources and outputs. A data input application should be designed

and developed for the input and storage of field data into a database, and an information retrieval application should be designed to allow information output in the best format. Numerous kinds and shapes of reports and maps can be produced easily from the same set of data in a database or series of databases by simply pre-programming queries and storing these as logical menu options in different screens of the application. The corresponding output screens, maps and reports can be designed to suit the stakeholder's preferences. Functionalities can be added to allow advanced users to build and run additional queries to derive specific, non-pre-programmed information from the database(s).

Data- and information-sharing will also require interaction with other government departments and institutions and non-governmental and international organizations. It is useful to assess the benefits of coordination or even the integration of data and data management systems at an early stage. NFM planning and design could, for example, include options for coordinating or integrating NFM data with other data on, for example, land use, biodiversity, rural development, agriculture, population, poverty and livelihoods. In cases where NFM projects integrate biophysical and non-biophysical data (e.g. socioeconomic and governance data), data exchange and information-sharing with other than forestry institutions, and the mutual accessibility of databases, are especially important because policy decision support will benefit from the greater insight gained into the underlying causes of forest use that can be generated from multisource analyses. If the databases of different institutes, such as forest administrations and central statistics offices, are – or can be – interconnected, information retrieval applications can draw from these different sources. Once identified, such possibilities can be reflected in the functional and technical design of the application.

An important and sometimes underestimated component of a data analysis is the need to provide decentralized offices with hardware, software and connectivity and to ensure adequate levels of capacity among their staff to use information systems. Decentralized offices need (online) access to information available in national databases, including the NFM. The software in decentralized offices needs to be standardized and compatible with systems used centrally. Upgrading and using all potential capacity will strongly improve the efficiency and effectiveness of the whole organization.

Some countries make use of open-source software systems to build data management systems cost-efficiently. One such system is Open Foris, an FAO-led initiative to develop, share and support specialized software tools required to implement multipurpose NFMs. Open Foris tools are being built to support the entire NFM lifecycle – needs assessment, design, planning, field data collection and management, estimation analysis and dissemination. Some countries opt instead for database and software development tailored specifically to their needs or integrated with their overall land-use data management systems. Electronic communication media such as interactive websites, e-networks and mobile applications can be applied for a range of purposes. User-friendly information retrieval applications over the internet allow easy access to information by all those interested parties with internet access.

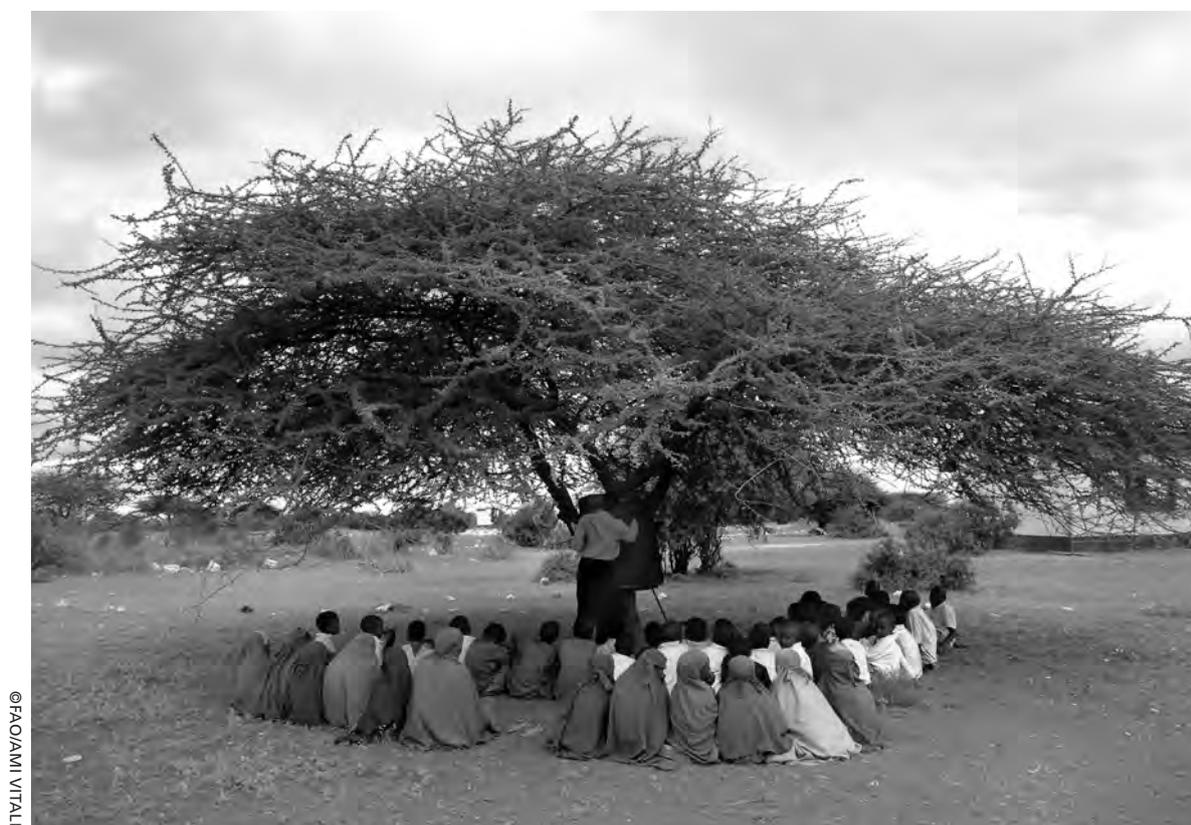
5.5 COMMUNICATION AND CAPACITY DEVELOPMENT

Pro-active communication is necessary to ensure that all stakeholders at different levels are adequately aware of the existence of an NFM system and the ways in which it can be accessed and used. This requires early consideration and development of a communication plan to reach different stakeholder groups and different levels, and the provision of a budget for its implementation. Too often, there is a lack of awareness of the existence of NFM data collected in previous years, even within the forest administration that collected the data. Data that are not communicated actively to stakeholders can quickly be forgotten.

Capacity development is an integral part of planning and implementing NFM systems. Institution-strengthening is often required including internal organization, inter-institutional organization and the organization of stakeholder involvement. Training on a broad range of subjects may also be required during the implementation of NFMs, from how to manage participatory processes to how to interpret satellite images. At the start of a new NFM project or programme it is always useful to assess the specific training and capacity building needs. Some countries, for example, may have a high existing level of technical knowledge but require more training on organizational and managerial aspects, while others may lack more technical capabilities, etc. Thus, identifying training needs carefully during the early planning stages of NFMs will assist in the effectiveness and efficiency of capacity building programmes as well as the overall success of the NFM system.

An important element of internal organization is defining and strengthening the role of decentralized offices and providing these with the means, authority and capacity to implement their tasks. Such capacity-building can be broad, ranging from increasing computer literacy to improving management and planning and even supporting decentralized policy-making. Improving capacity at decentralized levels and optimizing the distribution of tasks between central and decentralized offices will improve the relevance of information as well as its reliability and its contribution to national strategic development. It will also have a positive impact on cost-efficiency. Many other stakeholder groups at different levels will require capacity-building and training to become familiar with the NFM.

Improving the inter-institutional organization of overall data and information systems is usually beyond the reach of forest administrations. However, where forest data and information exchange is concerned, some strengthening of awareness and capacity on forest-related data management is often achievable. If other institutions have a better understanding of forest-related data they are more likely to cooperate to harmonize and integrate such data in their data collection routines.



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Children attend a lesson in the shade of an acacia tree at a school for pastoralist communities in Kenya

6. CONCLUSIONS AND OUTLOOK

New and recurrent NFM projects and NFM systems will have to respond more than in the past to the policy environment in which they are to be developed and implemented. Therefore, NFM planning processes must look beyond purely technical considerations. Adequate process management and meaningful stakeholder involvement is essential, replacing the exclusive discussions of technical specialists. It is equally important to think through the entire planning and implementation process from the perspective of the potential users of the information. Both the involvement of stakeholders and the production of user-relevant information are crucial for promoting the wider use of NFM data in forest-related decision-making.

To meet the contemporary objectives of forest policy, the technical criteria used traditionally to plan NFMs must be complemented by political criteria. However, there is no real blueprint for doing this. The situation is different in each country, and the approach presented in this paper provides only a general orientation. In each situation, responsible planners and managers must carefully weigh the many options and develop a process that decision-makers are prepared to endorse and finance.

Perhaps more than in the past, new and recurrent NFMs must take into account the wider information management environment existing in the countries in which they are to be implemented. Pursuing the approach presented here should help to embed NFM-related information systems into the existing landscape of information providers and their information technologies and databases. This may help to overcome at least some of the difficulties faced by data users when trying to bring together information from disparate sources and institutions on the same subject or area of interest. Unfortunately, consistency and harmonization among data and information, methods and definitions related to forests administered by different public and private actors and institutions is still a major issue in many countries.

The expanding commitments of national governments to international policy goals and the increasing need to demonstrate good governance internationally also call for greater forest-related data consistency and the ability to integrate different sources of data. Efforts are needed to harmonize NFM approaches and methods, at least within areas with similar natural conditions or common policy frameworks.

The general approach presented here may be of assistance for this purpose, responding to and working towards a set of guidelines on national forest monitoring as ratified during FAO's Committee on Forestry in 2012 (FAO 2013).

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