UNECE Food and Agriculture Organization of the United Nations

POLICY BRIEF

INFORMATION SYSTEMS - TOOL FOR BETTER FOREST POLICY AND MANAGEMENT

SUMMARY

For a forest policy to be effective, decisions about management of forest resources must be well-informed. In reality, forest policy and management are complex and multifactorial, so good information can be hard to extract.

Information Technology (IT) advances, and the ease of modern information exchange, have opened opportunities for better management of forest ecosystems and their services. Forest Policy and Management Support Information Systems (FPMSIS) help to gather forest information, making it accessible, informing decisions, monitoring results and modifying current policies. They can increase operational efficiency, reduce cost, and supply better information, thereby improving forest ecosystem services and State governance. They can also be a strategic tool for economic growth and provide the increased transparency and participation expected by modern society. This policy brief outlines how their use can improve forest policymaking and management.

THE SCOPE OF FOREST POLICY AND MANAGEMENT SUPPORT INFORMATION SYSTEMS (FPMSIS)

FOREST POLICY IS A COMPLEX, MULTI-DISCIPLINARY SUBJECT

An effective forest policy needs informed decisions about the maintenance, protection and use of forest resources. Politics itself can be viewed as an exchange of information and opinions connecting all stakeholders in a dynamic system. It requires modelled processes and computer programs, based on current information. Information technologies help retrieve information, process it, and provide it to political institutions in an optimal way, leading to effective administration of resources.

Evolving forest policy is a complex process, anchored in sustainable development. It is influenced by forest economics, ownership, management planning and law, climate change, bioenergy, afforestation, biodiversity, rural ecosystem services, land use policy, and infrastructure. Forest policy is strongly related to other sectors and, especially nowadays, to public participation and scrutiny on many levels.

Forest Policy and Management Support Information Systems (FPMSIS) aid forest policymaking by gathering forest information to support informed choices, monitoring results, and refining policies.

THE MAIN FUNCTIONS OF FPMSIS

There are four types of FPMSIS functions used in forest policy and management:

DSS (decision support systems) – computer programs intended to assist finding and making efficient decisions. DSS process information to provide decision-makers with options, and with information necessary for informed decisions. They are used at different levels of forest management and policymaking and can include information-visualization tools for policymakers and forest professionals, growth models, systems supporting forest management planning, and forest disturbance models.

RMS (resource management systems) – utility programs for resource accounting and distribution. These are commonly used in business, but political institutions use them to control resources on a continuous basis. Examples include human resources, private investment in public projects, and advanced budgeting and reporting. In forestry, they help the operation of forest administration agencies, forest management enterprises, and forest operations enterprises.

ISS (information-sharing systems) – programs to arrange the internal structural operations of political institutions and encourage information-exchange within and between public authorities, economic, research and engineering corporations, forest management bodies, private corporations, and other organizations. An ISS platform may contain variable databases with strategically useful information. Specialized ISS programs can therefore structure political administration more effectively, moving it from individual to system-based actions. Information sharing about forests can range from a centralized data-sharing hub – a 'forest data bank' – through data repositories divided thematically or geographically, to highly distributed systems with strong consistency and interoperability.

CSS (communication support systems) – specialized software for online use, plus web resources providing interactive political processes to increase social engagement, thereby evolving a 'network society'. CSS are used to publicize strategic information, monitor political information, and make the law-development process transparent, thereby adding legitimacy. CSS enable individuals and citizen groups to be involved in different levels of forest-related matters, and to know the latest trends. They create transparent public communication from the forest sector

Distribute functions efficiently

Sometimes, several solution types can be implemented in one system. Poland offers two example ICT solutions supporting the forest sector:

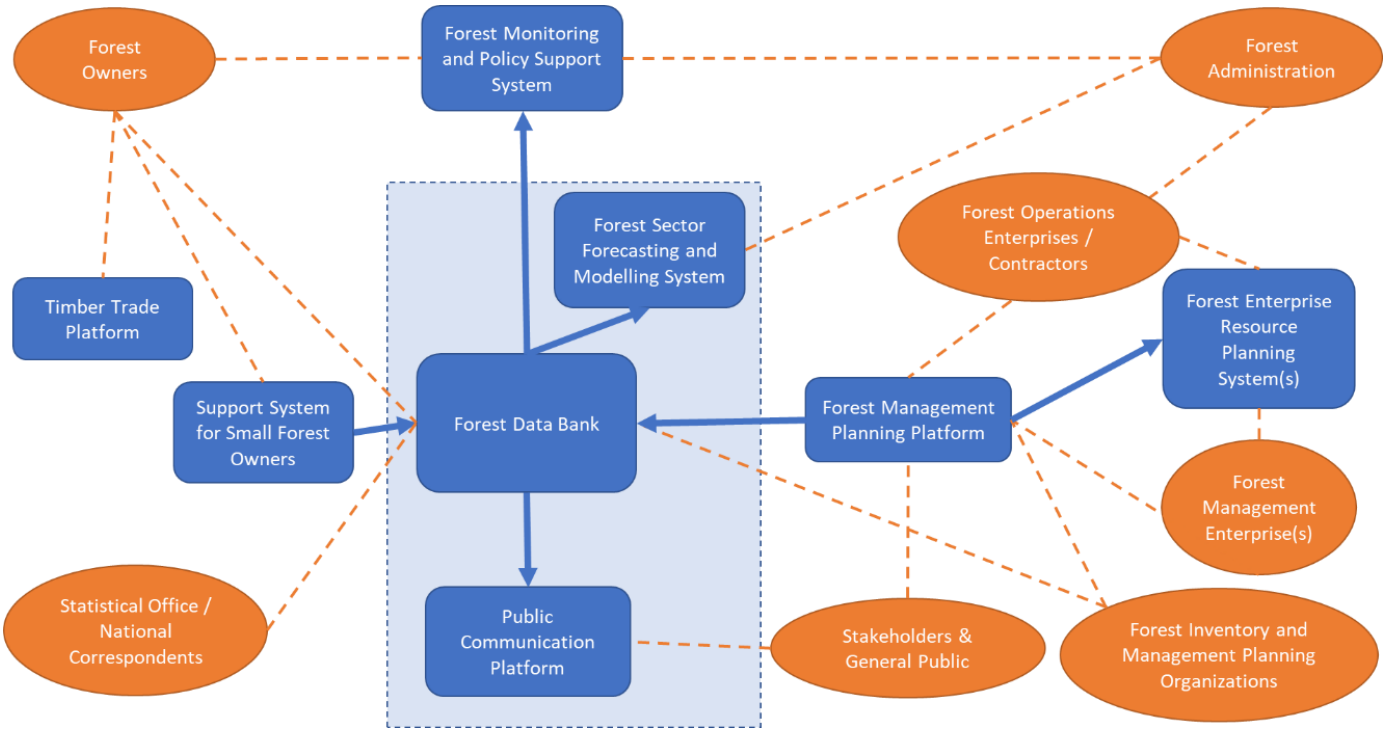
1. **Information System of State Forests Holding (SFH)** performs the roles of (i) **RMS** for all SFH operations, including workforce management, external services, silvicultural activities, fellings, timber trade and tax calculations and national reporting; (ii) **DSS f**or short-term management; (iii) **ISS** for communication within the holding, producing official documents and reports for government agencies and national statistical reporting.

2. **Forest Data Bank** – a national information processing system gathering information on all forests in the country from various sources which serves as: (i) **ISS** – providing source data to various organizations and government agencies, and (ii) **CSS** – running a forest information web portal available to the general public, providing data feeds about forests, compatible with the EU INSPIRE directive to other public and private entities, disseminating NFI results and reports on forest condition and resources in Poland.

COMPONENTS OF FPMSIS

Forest policy and management frameworks tend to be country-specific because of natural conditions, socioeconomics, political traditions, and other factors. Therefore, forest information systems should be based on the nation's current forestry policy, institutional landscape, organizational capabilities, administrative capacities, and societal needs. On the other hand, forest sector organizational functions are usually similar, even if carried out on different administrative levels. Identifying common elements in those frameworks helps to create effective forest policy and management processes (Figure 1).

Figure 1. Typical components of the Forest Policy and Management Support Information System.



The components of the FPMSIS are of various types, as outlined earlier, and perform different organisational functions (Table 1)

The relevance of these components depends on individual country conditions. For example, if the forest sector has limited capacity due to physiographical or historical reasons, there is no need to implement all the Figure 1 components. Some functions can be simplified and combined in multipurpose units.

Some components are commonly used because they support 'traditional' functions of the forest sector, such as systems which help run forest management operations. Others have appeared only recently – for example, communication platforms, and monitoring and modelling systems. These have become relevant with the development of information technologies, climate change awareness, certification requirements, and changing societal attitudes. Some modules can also be country-specific, addressing management structures. Every module requires information, which sometimes cannot be secured, for political, economic or organizational reasons.

Decision support | Resource management | Information sharing | Communication support

Table 1: Common elements of FPMSIS (blue) and their role in executing various organisational functions (brown) of the forest sector.

FMPSIS component / Organizational function	Forest Data Bank	Forest Sector Forecasting and Modelling System	Forest Monitoring and Policy Support System	Forest Management Planning Platform	Forest Enterprise Resource Planning System	Support System for Small Forest Owners	Timber Trade Platform	Public Communication Platform
Forest administration / service	Supply of information to decision-making processes.	Timber resources forecasts. Forest damage and fire models. Economic models.	Real-time monitoring of removals and SFM compliance. Information for decision-making.	High-level information for policy decisions about forest management planning.				
Forest management / use				Medium- to low-level information and data for decisions about forest management planning in a forest enterprise.	Operational support and control of all processes of a forest enterprise.	Assistance with decisions about forest property.	Operational support for timber trade processes. Access to timber market for all forest owners.	
Forest operation performing					Operational support and control (if not done by contractor).	Operational support and control. / Knowledge base & information exchange with other owners.		
Forest operation supervision / control					Operational support and control of supervision processes over forest operation contractors.			
Forest supervision (including timber supply chain supervision)	Data gathering and integration about fellings, timber trade, forest condition, and calamities.		Providing up-to-date information for supervision of forest condition and forest-related processes.			Data and tools for proper supervision of forest estate.	Operational support for timber supply chain supervision.	
Timber consumption and trade	Gather and share data about economic aspects of forest utilization, including timber trade and consumption.					Easy access to timber market for small forest owners.	Providing easy and equal access to timber market.	
Social dialog / participatory processes	Provide all necessary background information for participatory processes on various forest-related topics.			Provide transparent information about forest planning process and facilitate feedback and discussion. / Facilitate information exchange between stakeholders of forest management planning process.				Provide the public with the means to interact with political and administrative bodies in forest and forestry matters.
Public communication	Provide extensive, detailed, accurate and transparent public data about forests, as a feature of open society. / Provide extensive, detailed, accurate and transparent public data about forests for other purposes.							Provide transparent and accurate information for the public about forest ecosystems, including real-time information (fire danger, entry bans), forest sector policies and legislation.

BENEFITS OF HAVING FPMSIS

Information systems can improve operational efficiency, reduce costs, provide decision-makers with better, more complete, information, and thereby improve forest ecosystem services and state governance. They also bring additional benefits, such as reducing information processing errors, increasing its efficiency and facilitating integration of information. They can provide:

- Custom data for a specific task or decision-making process.
- Custom formats which can be tailored to the needs of their users, for example lists and charts.
- Real-time data - particularly useful when rapid action is needed, like dealing with illegal logging or calamities.
- Data about the past, which are particularly useful for reports, analysis and business planning.

From a temporal perspective, FPMSIS gives users the following advantages:

1. Better understanding of the current situation. Information and communication technologies (ICT) knowledge-management systems store data about the current state of a topic and provide tools to help acquire it. Examples of this include forest inventories and monitoring. They can also offer statistical analysis of this data.
2. Predicting changes. ICT tools can use existing information to provide predictive statistics, expert-based heuristics, and various modelling approaches.
3. Formulating solutions. ICT tools help manage knowledge on why things happen. They can analyze data and help decision-making on various levels: landscape, forest, project/management unit, and forest management planning.
4. Implementing solutions. There is evidence that properly used ICT tools increase operational efficiency, for example by automating standard operations. They also improve process quality, promote synergy of actions, and help manage information flow. Therefore, they can optimize costs and improve results.

They can also be a strategic resource for economic growth and a solution for the increased transparency and participation modern societies expect.

HOW TO DEVELOP A NATIONAL FPMSIS INFRASTRUCTURE

CHOOSE THE RIGHT APPROACH AND SIZE

Begin by designing the information systems around the forest management strategy, following from existing forest policy, the institutional landscape, organizational and financial capabilities, and administrative capacity.

The first step is to analyze how the forest sector is organized and determine need and opportunity for improvements, especially those which would have the greatest effect. A cost-effectiveness analysis should ensure the correct project scope has been chosen.

The most important stakeholders should be involved early in this analysis, especially key process participants. They understand their business better than external consultants and have practical experience to evaluate

needs, opportunities and potential drawbacks. The analytical process should be coordinated by a moderator equally distant to all stakeholders, proving neutrality, balance and fairness.

Achieving a consistent, effective system within forest sector financial and organizational constraints can be a problem. Processes must be analyzed to determine which should be changed and which replaced. It is advisable to determine funds available for building and maintaining FPMSIS components.

Sometimes, a country may have some FPMSIS components already functioning. These should be analyzed to determine how well they fit current expectations. If they fit well, they should be improved rather than replaced as users will be accustomed to them. However, sometimes, for technical efficiency and compatibility with other components, the old system must be completely rebuilt while keeping its user interface and process structure.

The total cost of changes should be evaluated against potential gains. An often-overlooked aspect is hidden cost of business processes not suiting how people and organizations see their role, and the ease with which they can operate processes.

Think of alternatives

Recently developed ideas in adaptive management show it may not be feasible or cost-effective to have complete solutions for problems in a complex multi-dimensional system like the forest sector. It is better to spend less on finding optimal solutions and more on monitoring to detect and correct failures as early as possible. This approach may need new FMPSIS elements to provide data about new needs, and to limit the scope of other elements with high costs and limited benefits.

THE ROLE NATIONAL SFM CRITERIA & INDICATORS CAN PLAY IN THIS PROCESS

Forest management and policy are complex domains, so they must be conceptually streamlined for efficiency and communication. Useful tools in this context, include criteria and indicators for sustainable forest management (C&I for SFM). These have several functions:

1) Outlining a country's area of competence or interest in SFM.
2) Providing a tool to measure SFM progress.
3) Providing a structure for forest inventory and national forest reporting.
4) Optimizing the number of parameters measured.
5) Facilitating the process which communicates information to the user.

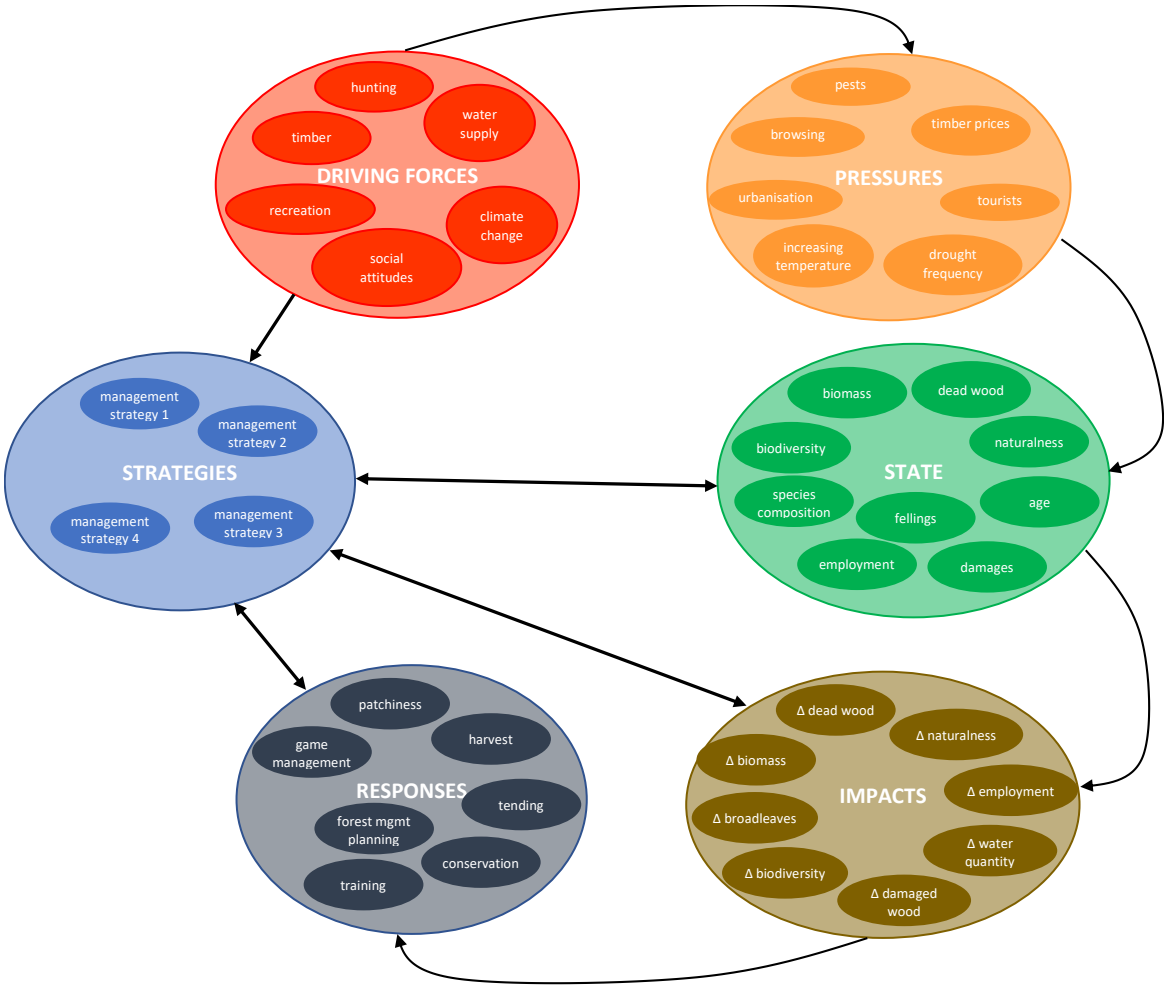
They can therefore be meaningful representations of real conditions in forest ecosystems and the forest sector.

The country's criteria and indicator framework are a point of reference for forest policy monitoring and communication and should be connected to a general model of the forest sector. This should integrate political strategies and forces present in the sector, as well as plans for management action and feedback on outcomes. Supporting tools can be arranged around it.

A good example of this approach is the driving force–pressure–state–impact–response (DPSIR) framework used by the European Environment Agency for reporting activities (see Figure 2). In this, social and economic developments exert pressure on the environment, causing changes in environmental parameters. These can have impacts on human health, ecosystems, materials, and ecosystem services, which may lead to social responses. Indicators are an easy-to-grasp way of describing and monitoring these processes.

Having a C&I system for SFM linked to knowledge-management systems as well as modelling and planning platforms, enables managers and policymakers to make informed decisions based on a comprehensive, easy-to-grasp view of the current situation and its dynamics. It should be a central element, defining the scope and structure of the information system and linking major stakeholders, including professions such as surveyors and the general public.

Figure 2. A driving force–pressure–state–impact–response (DPSIR) framework example (after Vacik et al., 2007).



THE MAIN ACTORS THAT NEED TO BE INVOLVED

The main actors needed will vary depending on how forest administration is organized in a country, as well as factors such as forest ownership structure, natural conditions, level of economic development and social attitudes towards forestry.

They should include:

- Public administration – ministries responsible for forests and forestry (usually environmental or agricultural sector).
- Government agencies.
- Forest management organizations.

- Forest owners.
- National statistical offices and national correspondents for international reporting processes.
- Forest inventory and management planning groups, and research institutions.

For FPMSIS development, specialists outside the forest sector should be included wherever possible. These should include business management experts and ICT strategic designers. They can provide options and insights from different perspectives.

GRADUAL PROGRESS USUALLY WORKS BETTER

Even after careful analysis and identification of intervention areas and expected results, all FPMSIS elements should not be all implemented simultaneously. Implementation of new ICT tools must fit organizational and procedural changes. This is usually difficult, as it requires modifying human behavior. It is advisable to use an iterative development approach, which brings the additional benefit of distributing cost over time.

It is best to identify FPMSIS components most needed by stakeholders – these will be more readily accepted. For instance, if the highest-scoring impediment is accessing information, start by building a forest data bank which serves many stakeholders and processes. Or, if there is a major concern about illegal logging, a timber-tracking system should be implemented first.

After successful deployment, those involved in the project will acquire experience, practical knowledge of difficulties, and technical and organizational expertise. These can be shared and used in the next stages. There will also be satisfied stakeholders spreading the news about the successful solution, making it easier to convince others in future.

However, all of this should be within a general well-defined FPMSIS creation or extension programme. A coordinator with powerful prerogatives should be appointed; their task will be to ensure cohesion and interoperability between systems, processes and operating procedures, especially among different organizations. They can be based at the ministry responsible for forestry, the national forestry agency, or a dedicated inter-agency task force.

This coordinator must have strong support from decision-makers. People and institutions naturally tend to defend areas of influence and will resist change which directly affects them. Without proper coordination, this may distort the FPMSIS design and lead to suboptimal solutions.

AN EXAMPLE PROCESS FOR BUILDING FPMSIS

1. Political decision to build an FPMSIS.
2. Appoint coordinator responsible for the whole programme.
3. Identify and invite stakeholders.
4. Analyze the current situation, needs, requirements and opportunities, with the participation of all stakeholders.
5. Perform a cost-benefit analysis of options, considering resources available to develop and maintain FPMSIS components.

6. Create a master plan, defining a minimum viable solution, and options. This should identify desired FPMSIS components, their purposes, their positions in the organizational structure, expected outcomes and responsibility for operation and maintenance.
7. Build a roadmap, choosing what to implement first considering most urgent needs, available resources, and organizational capacity.
8. Carry out a single FPMSIS component project. This must be supervised by the coordinator to ensure compatibility with other FPMSIS components and avoid functional duplication.
9. Make necessary legislative and organizational changes. Provide prerogatives and ensure funding for component maintenance.
10. Evaluate results and modify master plan as appropriate.
11. Repeat steps 8-10 as necessary.

NEED FOR SUSTAINABILITY OF THE SYSTEM

FPMSIS development is a cutting-edge innovation, significantly advancing forest information management and bringing many benefits to policy-makers, stakeholders and society in general. However, to guarantee full functionality, users must construct the right technology and undergo organizational change. Success depends on those involved fully understanding both benefits and related requirements and accommodating them in action. Implementation of technical solutions cannot be separated from changes in, for example, procedures, guidelines and reporting formats. Sometimes, even legislative adjustments may be required. There is a need to invest in key-user training to create awareness of the system's capabilities and enable efficient use. It will only be successful if users are convinced it is a help, not a hindrance.

Successful FPMSIS implementation also needs continuous availability, updating, and adapting to meet changing conditions and stakeholder demands. When building the system, this requires installation of permanent information-updating processes, maintenance procedures, and periodic assessments of a good fit to current needs.

There must also be stable funding mechanisms to keep the system running and provide the returns on the investment in FPMSIS.

POLICY IMPLICATIONS

Building a successful forest policy and management support information infrastructure must be driven by a high-level political decision.

A strategic plan is needed, with a coordinator or coordinating body with adequate prerogatives.

All key forest sector stakeholders and actors must be engaged, assisted by technical experts.

A thorough analysis of the forest sector's current structure, tools, requirements and needs is necessary to identify the most effective interventions and to decide if key elements will be created or if existing elements can be improved.

The scope of the FMPSIS must fit a country's forest-sector financial and organizational constraints. Funding must be secured for creating and maintaining FPMSIS components.

CONCLUSIONS

Good policy-making and management require tools for acquiring and reporting information, monitoring outcomes and adjusting management. Information systems are an indispensable part of modern governance.

Forest sector information systems should be aligned to forest management strategy, institutional landscape, organizational and financial capabilities and overall administration capacities.

The development of an FPMSIS is a cutting edge innovation, which significantly advances forest information management and brings numerous benefits to policymakers, all stakeholders and society in general.

This policy brief was developed as a part of the United Nations Development Account (UNDA) project Accountability Systems for Sustainable Forest Management in the Caucasus and Central Asia

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ANNEX 1: SOURCES OF INFORMATION TO LEARN ABOUT DEVELOPING AND USING FPMSIS

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