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Reporting on the Committee's Programme of Work:
Forest information systems

Developing National Forest Information Systems

Note by the Secretariat

Summary

This document was prepared by the secretariat based on the results of the United Nations Economic Commission for Europe (ECE) project on "Strengthening cooperation and national capacities in selected ECE countries for sustainable forest management". It provides an overview of information systems in forest policy making and management and outlines their different types and functions as an introduction to the project's main products (to be released at the end of 2024): a study on developing national forest information systems, a practical guide and an online training course.

Delegates are invited to discuss the findings from the project and the possible continuation of the work.

The document is submitted according to A/78/6 (Section 20); ECE/TIM/EFC/WP.2/2024/2, para 48.

I. Introduction

1. An effective forest policy requires appropriate decisions on the management and use of forest resources. Forest policy and management, however, are often not well structured because of their high complexity. Recent advances in information processing technologies, as well as an unprecedent ease of information exchange, provide new possibilities to support better management of forest ecosystems and their services.

2. Forest information systems (FIS) can facilitate this through new tools to provide forest information for informed decisions, monitoring their results, and correcting existing policies. FIS can increase operational efficiencies, reduce costs, while contributing overall to the improvement of forest ecosystem services and forest governance. They can also be strategic planning tools for economic development, and a solution for increased transparency and participation.

3. The Economic Commission for Europe (ECE) project "Strengthening cooperation and national capacities in selected ECE countries for sustainable forest management", which was implemented in 2022-2024, worked on extending knowledge of information systems (IS) and their application in the forest sector and strengthening national capacities, for their development and maintenance.

4. The following document provides an overview of information systems in the context of their application in forest policy making and management. It outlines FIS types and functions as an introduction to the project's main products - the study on developing national FIS as well as the practical guide and an online training on their development (to be released at the end of 2024).

5. The study on "Developing Forest Information Systems. Capacity-Building Guidance" gives an overview of information systems, their roles and types. It analyses their application in the forest sector and outlines how these technological advances can be used to improve modern forest policy making and natural resources management.

6. The supporting document on "Developing National Forest Information Systems. A Practical Guide" outlines in more detail the needs, opportunities, and constraints of developing/improving forest information systems for the forest sector activities and sustainable forest management.

7. The practical guide served as the basis for the e-learning course, which guides users through the process of strategic analysis of national forest information systems for their development.

II. Information systems

A. Information technology

8. Information systems are integrated sets of components that allow users to collect, process, analyse, store, organize and distribute data for providing information, knowledge, and digital products, as well as to provide a feedback mechanism to meet an objective.

9. Information systems are critical enablers of organization's business/management processes and objectives. They facilitate communication and coordination among different functional areas, and allow easy exchange of, and access to, data across processes, especially in (i) executing the process, (ii) capturing and storing process data, and (iii) monitoring process performance. Information systems are tools helping to achieve goals set by organizations, decision-makers, politicians, voters etc.

10. Government officials must effectively handle information to minimize uncertainties and ambiguities related to objectives and cause-and-effect relationships in the decision-making process. The decision-making process transcends organizational boundaries and government levels, encompassing citizens, interest groups, the media, and elected officials. This underlines that the utilization of information technology in government decision-making

processes will be substantially influenced by the external environment surrounding the government.

11. Information technologies help retrieve information, process it, and provide it to political institutions in an optimal way, leading to effective administration of resources. The rise of adoption of information technology (IT) in decision-making aligns with the growing demands for impact-driven management. This shift aims to enhance government efficiency by reducing administrative costs and improving service delivery.

B. Types of information systems

12. Information systems used in business and public administration can be classified into the following four types:

(a) **Decision Support Systems (DSS**) – computer programs intended to find and execute efficient decisions. DSS process information to provide decision-makers with options, and information necessary for well-informed decisions. They include data visualisation tools, computer-assisted models and integrated solutions to present decision alternatives and possible decision outcomes/impacts;

(b) **Resource Management Systems (RMS)** – 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 management of publicly owned resources, private investment in public projects, and advanced budgeting and reporting;

(c) **Information-Sharing Systems (ISS)** – programs to arrange the internal structural operations of political institutions and encourage information-exchange within and between public authorities, economic, research and engineering corporations, 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;

(d) **Communication Support Systems (CSS)** - specialized software for online use, and 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.

13. Other information system classifications have been developed for different needs. They vary in their complexity and concentrate on different aspects of information system usage.

C. Information technology governance and strategic planning

14. **Information technology governance** is defined as an organizational skill, crucial to the strategic alignment and delivery of value through information technology. Implementing IT governance, however, usually poses a challenge to organizations. The main issues to be addressed are: (i) the need of interaction and mutual understanding between IT and business areas to ensure strategic alignment, (ii) the influence of a wide range of contingencies, and (iii) the need to construct a continuous, adaptive and interactive process for IT governance.

15. An additional factor is usually the heterogeneity of the environment and the influence of a strong human factor.

16. Good IT governance is important to develop (i) trust and transparency among stakeholders, (ii) improved delivery of results through IT projects and, (iii) desired behaviour in using IT in alignment with higher-level priorities and strategies.

17. Strategic planning is the process of defining a strategy and allocating resources in order to achieve particular goals. Policy making in technology-related fields includes measures to enable or accelerate technology transfer and diffusion.

III. Information systems in forestry

A. Information in forest policy

18. Given its cross-sectoral nature, forest policy is a complex and multi-disciplinary subject. An effective forest policy is influenced by the variety of demands and impacts, driven by forest economics, ownership, management planning and law, climate change, bioenergy, afforestation, biodiversity, rural ecosystem services, land use policy, infrastructure, and others. Forest policy is strongly related to other sectors and encompasses a wide range of stakeholders and decisions about the maintenance, protection and use of forest resources.

19. Forest information systems help forest policymakers by providing forest information to support informed choices, monitoring results, and refining policies. Their relevance has been mounting in the past years owing to growing pressures on forest resources from human activities (e.g. forestry, agriculture, urbanization or mining) and natural factors.

20. This increased interest and focus on multi-dimensional monitoring of forests to better integrate information on greenhouse gas emissions, status of biodiversity, land degradation, implementing strategies, and policy implementation. As decision-making crosses more and more organizational boundaries and spans over different levels of government, involving citizens, interest groups, the media, and elected officials, forest information systems became ways to manage these new approaches.

21. The successful establishment of a forest information system isn't an ultimate objective, per se. Instead, it serves to attain broader goals (often balancing multilateral demands), including the ability to monitor policies on forest-based mitigation and make well-informed and rational policy choices.

22. Additionally, advancements like open data, computational techniques for data analysis, sentiment analysis, simulation, and the visualization of large data sets are important drivers in this context. These developments are complemented by public involvement, social media, and collaborative tools.

23. Information system is generally considered as a tool. It is designed to help users to perform certain recurrent tasks, keep track of various activities, events and parameters, as well as collect, store and process data about them. In addition, it should allow to edit, search, and report selected relevant information, as well as exchange the data with other departments, institutions and systems.

24. The most frequent applications of modern information IT tools in decision-making are: (i) collecting and processing large amounts of data, (ii) visualising data and possible alternatives, (iii) enabling and encouraging engagement of citizens through building communication platforms, and (iv) monitoring and assessing the results of enacted policies.

B. Components of forest information systems infrastructure

25. Given different countries' natural conditions, socio-economic circumstances, political practice, and other factors, forest policy and management frameworks are largely country specific. Therefore, the typical forestry administration/management is divided into various levels, where the national agency is a government body and houses the supervising functions and some special departments, e.g. the planning and information, communication and technology departments, a forest monitoring centres, etc.

26. Depending on the country-specific situation, a national agency can be supported by regional level units, composed of several offices with functions for management and support to the local offices. The local offices house the staff that work in the field with supervision, and/or practical forest protection and management, and related tasks.

27. Information systems can support tasks at all levels of governance and management, from the collection of field data in the local offices to the compilation of reports and all kinds of analysis at the national level.

28. Therefore, information systems should be aligned with the forest management strategy included in a country's existing forest policy, current institutional landscape, organizational capabilities, overall administration capacities, and societal needs. The individual components (or systems) perform different organisational functions and can be of various types (outlined earlier in this document).

29. Typical FIS components cover practically all areas of forestry, including forest monitoring, management planning and operations (resource planning, accounting, reporting) as well as forest damage and prevention, management of disturbances. FIS support forest management assistance to owners, and the provision and trade of forest products and services. They are an essential component of forecasting and modelling of forests and changes in forest resources, and of forest sector statistics. FIS are increasingly present in forest policy making and communication with forest sector stakeholders and the general public.

30. The key component of all information systems, including forest information systems are the data, specifically the following: provide the following types of data:

(a) Custom data for a specific task or decision-making process;

(b) Custom formats which can be tailored to the needs of their users, for example lists and charts;

(c) Real-time data - particularly useful when rapid action is needed, like dealing with illegal logging or calamities;

(d) Historical data, which are particularly useful for reports, analysis and business planning.

31. The relevance of all these components in a FIS depends on the local conditions and priorities in a country. For example, if the forest sector is small and of limited capacity, it is not reasonable to implement all these components. Certain functions can be simplified and gathered together in multi-purpose units to ensure efficiency.

C. Forest information systems benefits

32. 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. From a temporal perspective, FIS give users the following advantages:

(a) Improved **understanding of the existing situation**. Knowledge-management systems based on information technologies store data about the current state of a topic and provide tools to help acquire it. Examples include forest inventories and monitoring. They can also offer statistical analysis of this data;

(b) **Predicting changes.** Information technology tools can use existing information to provide predictive statistics, expert-based heuristics, and a range of modelling approaches;

(c) **Formulating solutions**. Information technology tools also help in understanding the underlying reasons behind things. They can analyse data and support various levels of decision-making, including landscape, forest, project/management unit, and forest management planning;

(d) **Implementing solutions**. Properly used information technology tools can 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 optimise costs and improve results;

(e) **Cost-displacement benefits** involve leveraging automation to perform tasks more efficiently, achieving comparable output with reduced input. The immediate benefits

from the implementation of an information system are improvements in operations, in part due to their automation. Both internal and external communications are usually sharply enhanced;

(f) **Effective communication**. Forest information systems are a strategic resource and a solution for the increased transparency and participation that modern societies expect and require.

33. Value-added benefits appear once automated information systems empower organizations to make informed decisions and effectively fulfil their mission. Moreover, the heightened decision-making capabilities of executives, managers, and professionals wield a substantial impact on the organization's overall success.

IV. Organization and management of a forest information systems development

34. Regardless of the level of analysis and intervention, the development of a forest information system requires agreement on a digital transformation strategy. This serves as the central concept to integrate coordination, prioritization, and implementation of a FIS and helps to better coordinate and prioritize the digital transformation in a country.

35. FIS development strategies focus on the transformation of products, services, processes, and organizational aspects using new technologies. It is thus critical to obtain a close fit between various organizational and functional strategies linked to digital transformation and IT strategies.

36. Various strategic planning frameworks have been developed to structure the work on developing information systems. This project has elaborated an approach based on these frameworks and drawing on the experience of developing national FIS. This approach consists of the following phases:

(a) Phase 0: **Initiation of the programme**: strategic decision to start the programme, appoint programme coordinator, carry out institutional mapping, establish a steering committee;

(b) Phase 1: **Alignment of IT with business**: understand the organizational context, define strategic business objectives, define IT-related objectives;

(c) Phase 2: **Analysis of performance and capacity**: identify and assess critical processes, assess available and required IT resources, assess and prepare governance arrangement matrix;

(d) Phase 3: **IT strategic planning**: define key performance indicators, identify strategic actions, develop IT balanced scorecard;

(e) Phase 4: **IT tactical planning**: specify strategic project(s), specify necessary outsourcing, acquisition and training, prioritize projects and strategies, prepare a technical plan;

(f) Phase 5: **Execution of the iteration**: execute planned projects, review and validate project results, disseminate project results, go to Phase 1 for the next iteration, if necessary.

37. The project provided a comprehensive set of information, including background knowledge, theoretical basis, methodology and practical guidance for the implementation of this approach. The study, the practical guide and the e-learning course (to be released at the end of 2024) support users with the tools to conduct a strategic analysis for national forest information systems and their development.