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A practical guide on developing national forest information systems

Assessing critical information technology processes and required resources, defining key performance indicators and strategic actions

Submitted by the secretariat

Summary

This document, which was prepared by the secretariat under the project "Strengthening cooperation and national capacities in selected UNECE countries for sustainable forest management", contains the second part of the practical guide on developing national forest information systems. It outlines the final stages of the analysis, which are (e) identifying and assessing critical information technology processes, (f) assessing available and required critical information technology resources, (g) defining key performance indicators and (h) identifying strategic actions.

This document is submitted to the Joint Working Party for information.

I. Background

1. This document contains the second part of the guide on developing national forest information systems. The first part can be found in document ECE/TIM/EFC/WP.2/2024/5.

II. Stages of the analysis

2. Various strategic planning frameworks help to structure the work of identifying objectives and actions, maintaining control and disseminating results. They are all based on a layered approach, from the general to the specific.

3. First, (1) external conditions are considered, then (2) needs and opportunities for intervention are identified, followed by (3) establishment of key performance indicators (KPIs) and (4) performance of a cost-benefit- analysis, and finally (5) formulation of individual projects and their execution. The general strategy for building an information system can be designed and implemented at different levels. Therefore, the planning and implementation framework should be adapted accordingly.

4. This guide concentrates on the following elements of a forest information systems' (FIS) information technology (IT) governance implementation approach:

(a) Institutional mapping;

(b) Understanding the organizational context (mapping crucial forest sector activities and identifying the most important stakeholders);

(c) Defining business objectives;

(d) Defining IT-related objectives;

(e) Identifying and assessing critical IT processes;

(f) Assessing available and required critical IT resources;

(g) Defining key performance indicators;

(h) Identifying strategic actions.

5. Stages a-d were described in document ECE/TIM/EFC/WP.2/2024/5. This document includes the final stages of the analysis.

A. Stage D: Defining information technology-related objectives

6. **Objective of the exercise:** Business objectives defined in the context of the current policies and the forest value chain must be translated into actionable IT objectives. IT-related objectives establish clear targets and outcomes that guide the development, implementation and management of FIS, aligning them with the specific needs and goals in the context of the business objectives.

7. In the context of forest information systems, defining IT-related objectives is a critical process that aligns IT projects with the overarching business objectives of the forest sector. This step ensures that the IT initiatives undertaken are purposeful and geared towards delivering specific outcomes that contribute to the achievement of broader goals. By clearly outlining the IT-related objectives, stakeholders can prioritize and plan IT projects effectively, optimizing resources and maximizing the impact of technological investments.

8. IT-related objectives serve as the bridge between the business objectives of the forest sector and the technical implementation of FIS. They define the specific technology-related targets and outcomes that need to be accomplished to support and enhance various activities within the sector. These objectives are framed in a manner that reflects the benefits that technology can bring to the sector's functioning and long-term growth.

9. By defining clear and measurable IT-related objectives within the framework of FIS, organizations can ensure that their technology projects are purpose-driven, aligned with business goals and yield tangible benefits for the forest sector and its stakeholders.

10. Some examples of possible IT-related objectives in the forestry sector:

(a) Enhanced forest monitoring and management through remote-sensing technology;

(b) Strengthened forest supply chain transparency with blockchain technology;

(c) Enabled data-driven decision-making with advanced analytics.

11. **What are the steps in defining IT-related objectives of an FIS development programme:** The steps in defining IT-related objectives of an FIS development programme are:

(a) Step 1. Formulation IT-related objectives;

(b) Step 2. Validation IT-related objectives;

(c) Step 3. Selection candidates for intervention (optional).

12. **Step 1. Formulation of IT-related objectives:** The starting point for this exercise is the list of business objectives of the FIS programme as outlined before. They represent the possible points of intervention in the value chain to improve its functioning. They should be translated into actionable IT-related objectives.

13. Technical solutions are not expected to be defined at this stage because this would require a detailed process and resource analysis which will be done in Phase 2. At this point, the process should focus on identifying IT-related product or solution ideas that will support the achievement of the business objectives.

14. For example, if a business objective was defined as providing the general public with consistent, timely and accurate information on forest resources, the corresponding IT objective could be: create a national repository to collect, store, process and publish data on forests.

15. Another business objective could be: to monitor and prevent illegal logging and deforestation. Its corresponding IT objectives would be: (1) create a timber-tracking system, (2) create an early-detection deforestation monitoring system.

16. Practical note: This step could work well when participants work in separate discussion groups with each having the same value chain map and the same list of business objectives to work with, especially if there are more than five participants. Splitting into smaller groups prevents reaching the consensus prematurely, and thus potentially silencing minority views with important insights. The groups should use sticky notes for assembling their ideas on IT-related products or solutions with a potential to help attain each business objective, adding justifications. These could be placed on their copy of the value chain map, next to the respective business objective.

17. **Step 2. Validation of the IT-related objectives:** After completion of Step 1, findings should be summarized and discussed. Proposed items should be evaluated considering:

(a) Their relevance and alignment to the corresponding business objective, i.e. how much they can contribute to achieving the business objective;

(b) Effectiveness, i.e. whether they are the best imaginable solution for achieving the respective business objective; for example, if several solutions/products have been proposed, they should be evaluated and scored by their complexity, cost, etc. to identify the best one;

(c) Feasibility, i.e. how easy it would be to develop and maintain these particular solutions/products.

18. Care must be taken to ensure coherence between the proposed IT-related objectives for a FIS development programme. Practical note: Having completed the work in subgroups, the teams convene and present their ideas. The moderator keeps a table of all proposed IT-

related objectives, taking notes on their pros and cons for relevance, effectiveness and feasibility.

19. **Step 3. Selecting candidates for intervention (optional):** If members of the group feel competent, they might attempt to choose IT-related objectives to address future FIS-building projects. The selection of IT-related objectives is not an easy process, as it requires attention to many factors, some of which are general (e.g. cost, availability of technology) but others are specific to the context of the overall analysis (e.g. policy priorities, available resources, organizational circumstances, governance framework).

B. Stage E: Identifying and assessing available and required critical information technology processes

20. **Objective of the exercise:** The objective of the exercise is to identify the IT-related processes whose existence may be critical for achieving the business objectives, and assessing their current level of maturity (or development) and completeness. The purpose of this activity is to gain additional insight into the possible areas of intervention for developing or improving the information system(s).

21. While the previous exercise was devoted to formulating the IT-related objectives, attainable by means of information technology, which would support the business objectives. This activity aims at assessing what IT-related processes might be necessary to put in place (or improve if they already exist) to facilitate reaching these objectives.

22. Assessing the maturity level of IT processes from a business perspective is crucial for several reasons:

(a) **Alignment with business goals:** A maturity assessment ensures that IT processes are aligned with the business's strategic goals. Mature IT processes are better equipped to support and drive business objectives, leading to improved overall performance and competitive advantage.

(b) **Optimization of resources:** Mature IT processes often result in more efficient use of resources. This includes optimizing staff time, reducing wastage and making better use of technological investments, all of which can lead to cost savings and improved productivity.

(c) **Risk management:** A higher maturity level in IT processes generally equates to better risk management. Mature processes have well-defined procedures for handling risks and contingencies, thus reducing the likelihood of disruptions to business operations.

(d) **Quality of service:** Mature IT processes improve the quality of IT services and products. This results in higher customer satisfaction, increased reliability and better service delivery, which are all critical for maintaining a positive business reputation.

(e) **Innovation and adaptability:** Businesses with mature IT processes are often more agile and innovative. They can adapt more quickly to changing market demands, new technologies or disruptions, which is vital in today's fast-paced business environment.

(f) **Regulatory compliance:** Many industries and administrative environments have stringent regulatory requirements regarding data security, privacy and operational standards. Mature IT processes help ensure compliance with these regulations, reducing the risk of legal issues and penalties.

(g) **Decision-making and planning:** Mature IT processes provide better metrics and data for decision-making. This supports more accurate and strategic business planning, budgeting and forecasting.

(h) **Employee satisfaction and productivity:** Well-defined and efficient IT processes can lead to higher employee satisfaction, as employees have clear guidelines and tools to perform their tasks. This often translates into higher productivity and lower staff turnover.

(i) **Market competitiveness:** Businesses with mature IT processes are often more competitive in the marketplace. They are able to leverage technology effectively, respond quickly to market changes and offer better products and services.

(j) **Scalability and growth:** Mature IT processes are scalable, making it easier for organizations to grow and expand. Scalable processes accommodate increased workloads and organizational changes without a significant drop in performance or service quality.

23. In summary, assessing and improving the maturity level of IT processes is vital for ensuring that the IT function effectively supports and enhances business objectives, maintains competitiveness and adapts to the ever-evolving business and technological landscape. The steps in identifying and assessing available and required critical IT processes are:

(a) Step 1. Determination of critical IT processes;

(b) Step 2. Assessment of current maturity level;

(c) Step 3. Performance of gap analysis.

24. **Step 1. Determine critical IT processes:** Identifying critical processes starts with determining which IT processes are critical for achieving the defined business objectives. This could include processes like software development, data management, IT security and network infrastructure management. This should be done in collaboration with stakeholders across the organization, including business unit leaders, end users and IT staff. Their insights will be valuable in determining which IT processes are essential for daily operations and strategic initiatives.

25. Then map the determined critical IT processes to business functions (activities). Analyse how various IT processes support specific business functions. This mapping helps in determining which IT processes are critical for the functioning of key business areas such as sales, operations, finance and customer service.

26. Evaluate the impact of each IT process on the business. Consider what would happen if a process failed or were interrupted. Processes that have a high impact on business continuity or those on which multiple other processes depend are typically critical.

27. Determine IT processes that are essential for managing risks and meeting compliance requirements. Processes that safeguard data security, privacy and regulatory compliance are often critical. Analyse historical data regarding IT incidents, downtime and performance bottlenecks. Processes that have previously caused significant disruptions or frequent bottlenecks in performance are likely critical.

28. Prioritize processes based on the value they deliver to the business and their efficiency. Critical processes are often those that add significant value or require optimization to improve overall business performance.

29. This determination of critical IT processes is the first step in ensuring that these processes are managed effectively, optimized and aligned with the overall business objectives. Practical note: This step could be organized as separate discussion groups taking notes of their proposals of identified critical processes on post-it cards, together with justifications, and placing them on a large sheet of paper, one under another, together with the corresponding business objectives.

30. **Step 2. Assess current maturity level:** Various maturity models, such as the Capability Maturity Model Integration (CMMI) or the IT Infrastructure Library (ITIL), are widely used to assess the current maturity level of IT processes (CMMI Product Team and others 2006; Gërvalla et al. 2018). This assessment highlights areas of strength, identifies gaps and helps in formulating a structured approach to elevate the maturity of IT services, ultimately ensuring they deliver maximum value to the business.

31. In this exercise, the ITIL (Information Technology Infrastructure Library) framework is used. ITIL categorizes IT service management into several processes and functions, such as Service Strategy, Service Design, Service Transition, Service Operation, and Continual Service Improvement. Each area consists of specific processes (since ITIL v4 the term “practices” is also used, which conveys a broader meaning, as they can group several

processes). An ITIL maturity assessment involves evaluating how well an organization has implemented these practices.

32. ITIL does not prescribe a specific maturity model but is often assessed using a simple scoring scale. This scale typically ranges from Level 1 (ad hoc activities) to Level 5 (highly organized and self-optimizing processes). The assessment involves determining how well an organization's IT processes and practices align with ITIL recommendations at each maturity level.

33. The capability levels of every process can be described as follows:

(a) **Level 1:** The process is not well organized; it is performed as initial/intuitive. It may occasionally or partially achieve its purpose through an incomplete set of activities.

(b) **Level 2:** The process systematically achieves its purpose through a basic set of activities supported by specialized resources.

(c) **Level 3:** The process is well defined and achieves its purpose in an organized way, using dedicated resources and relying on inputs from other processes that are integrated into a service management system.

(d) **Level 4:** The process achieves its purpose in a highly organized way, and its performance is continually measured and assessed in the context of the service management system.

(e) **Level 5:** The process is continually improving organizational capabilities associated with its purpose. Each capability level is based on the previous ones; they need to be achieved before the current level can be assessed.

34. The assessment process begins with collecting data on the organization's IT-related processes and practices. This includes reviewing process documentation, conducting interviews with IT staff and stakeholders and analysing service performance data. The goal is to gain a comprehensive understanding of how IT services are managed and delivered. The full description of a comprehensive review process for an organization is beyond the scope of this manual. The reader is referred to the official ITIL Process documentation or one of many books on the subject.

35. The collected data is then compared against ITIL best practices. This analysis helps identify areas where the organization's processes do not fully align with ITIL recommendations. It is important to consider both the efficiency and effectiveness of processes in delivering value to the business.

36. For each ITIL process or function, the organization's current practice (i.e. the way the process is organized and executed) is rated on the maturity scale. This involves assessing aspects like process standardization, documentation, integration with other processes, performance measurement and continuous improvement mechanisms.

37. Practical note: This step can be done as separate discussion groups taking notes of their evaluation of the maturity level of identified critical processes on post-it cards, together with justification of the assessment. After a group session, each group leader places the post-it cards next to the processes identified in the previous step. Then, an arithmetic average is calculated for each process. Identified areas for improvement can be noted on the side; they will help later identify strategic actions.

38. **Step 3. Perform gap analysis**: Compare the current maturity levels of the IT processes with their desired levels required to achieve the business objectives, then identify gaps and areas that need improvement.

C. Stage F: Assessing available and required critical information technology resources

39. **Objective of the exercise:** The objective of the exercise is to conduct a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis of the available and required critical IT resources in the forestry sector's information processing domain to facilitate effective strategic project planning aligned with business goals.

40. To effectively plan strategic projects leading to improvements defined in the business goals, it is necessary to identify how and where information technologies are employed (processes) and what resources (see the next section – Stage G) currently exist in relation to information processing in the forestry sector. It is part of the effort to evaluate the performance and capacity of IT to meet the IT objectives defined in previous exercises.

41. The approach used is a SWOT analysis of each resource assessed and considered important for the process of FIS development. The following types of IT resources should be included in the analysis:

(a) Existing IT systems;

(b) Qualified personnel;

(c) Communication infrastructure;

(d) Servers and other backend infrastructure;

(e) Software-as-a-service (SaaS) solutions available;

(f) Available IT services.

42. **Existing IT systems:** Existing IT systems includes all the software applications and hardware infrastructure that the forestry sector currently uses to process and manage information. It may involve data management systems, inventory tracking software, analytics tools, GIS (Geographic Information System) and more. These systems are critical as they form the backbone of information processing and decision-making within the organization.

43. **Qualified personnel:** Qualified personnel refers to the skilled and knowledgeable workforce responsible for managing, maintaining, and utilizing the IT resources. Having qualified personnel is crucial to ensure the smooth functioning of IT systems, troubleshoot issues and optimize processes to derive valuable insights from the data.

44. **Communication infrastructure:** Communication infrastructure encompasses the network and communication channels that enable data transfer and collaboration. It includes local area networks (LANs), wide area networks (WANs), internet connectivity and other communication protocols. A robust communication infrastructure is vital for seamless data-sharing and real-time collaboration, especially in geographically dispersed forestry operations.

45. **Servers and other backend infrastructure:** Servers and backend infrastructure are the physical or virtual servers that store and process data, along with the supporting infrastructure like data centres, storage systems and cloud platforms. Reliable servers and backend infrastructure are critical for data storage, processing and retrieval, ensuring data accessibility and security.

46. **Software-as-a-Service solutions available:** Software-as-a-Service (SaaS) solutions are cloud-based software applications provided by third-party vendors. They offer flexibility and scalability without the need for extensive on-premises infrastructure. SaaS solutions used in the forestry sector might include data analytics platforms, project management tools and other specialized applications.

47. **Available IT services:** Available IT services refers to outsourced or managed services that the forestry sector can leverage, such as IT consulting, cybersecurity services, data analytics services and software development services. These services can supplement internal capabilities and expertise.

48. The steps in the assessing available and required critical information technology resources are as follows:

(a) Step 1. SWOT analysis;

(b) Step 2. Evaluation and identification of points of intervention.

49. **Step 1. SWOT analysis:** The SWOT analysis will be performed using a simple template. It is important that participants have knowledge of the current situation regarding IT resources within the area of analysis (e.g. country, forest agency, forest enterprise) and a general understanding of what these resources are and what is their general purpose. Each

resource is recorded in a table and is assessed over two dimensions: internal and external factors. For each dimension, both positive and negative aspects should be identified.

50. Practical note: The moderator presents a large table (on paper on the wall or on a whiteboard). Participants first insert the name of IT resource in the table rows. Once all important IT resources have been identified, participants assess each resource. Care should be taken to distinguish internal and external factors. While this could be complex, users tend to understand the difference better over time. As a rule of thumb, anything that is a property of the resource should be considered internal, while all factors outside the resource location influences or organizations will be treated as external.

51. **Step 2. Evaluation and identification of points of intervention:** The completion of the SWOT table should be followed by the identification of the crucial resources which require intervention to reach (or keep) the level sufficient from the point of view of FIS development, i.e. their condition, service level, quality, quantity, etc. There is no standardized routine for this, as it largely depends on local conditions and priorities.

52. It might turn out that some required interventions are so extensive and/or costly that this may jeopardize the viability of the entire FIS project. This would be important information for decision makers to know at this point, as they might decide to re-evaluate their priorities and develop other solutions.

D. Stage G: Defining key performance indicators

53. **Objective of the exercise:** The objective of this exercise is to design and develop specific, measurable, achievable, relevant, and time-bound (SMART) key performance indicators (KPIs) in line with the related IT objectives to assess the FIS alignment against the objectives and the FIS efficiency criteria and thus, enable corrective action if needed.

54. **What are KPIs:** KPIs are a measurable value or metric to assess the performance and progress of an individual, team, department or organization in achieving specific objectives or goals. KPIs are crucial in business and management as they provide a quantifiable way to track performance and ensure that efforts align with strategic objectives.

55. KPIs are typically chosen based on their relevance to the organization's overall mission and objectives. They should be SMART to be effective in providing meaningful insights and driving improvements. Examples of KPIs can vary widely depending on the nature of the organization and its goals. Some common KPIs in different functional contexts include:

(a) **Sales:** Revenue, sales growth rate, customer acquisition rate;

(b) **Customer Service:** Customer satisfaction score, average response time, customer retention rate;

(c) **Marketing:** Conversion rate, website traffic, cost per lead;

(d) **Finance:** Profit margin, return on investment (ROI), cash flow;

(e) **Human Resources:** Employee turnover rate, employee engagement score, training completion rate;

(f) **Manufacturing:** Production efficiency, defect rate, on-time delivery.

56. By regularly monitoring and analysing KPIs, businesses can make data-driven decisions, identify areas for improvement and focus their efforts on achieving success in line with their strategic objectives.

57. **What is the purpose of defining KPIs in developing FIS:** It should be remembered that the business objectives for building/improving a forest information system, and the corresponding IT-related objectives, have resulted from the analysis of what interventions could improve efficiency of the forest sector value chain (Phase 1). Tools are needed to assess the results of implementation of these strategies and, if necessary, to take corrective action. KPIs provide the necessary metrics for this purpose.

58. **How FIS KPIs should be defined:** For each improvement strategy (linked to the business objectives), KPIs should be defined, as well as the means to assess them. For example, for the business objective on "having control on illegal logging and deforestation", and the corresponding IT objective on "creating a timber-tracking system", the KPI could be: "the share of timber produced in the country which is tracked by the timber-tracking system", or: "the number of forest inspectorates which have implemented the timber-tracking system".

59. The KPIs must be SMART. They must provide the means for measuring the goals reached and the efficiency of critical processes linked to relevant business objectives. Potential KPIs could cover the following categories, with specifications:

(a) **Data accuracy:** Measure the accuracy and reliability of the data stored and managed within the FIS via data validation rates of logic checks

(b) **Data Timeliness:** Measuring the timeliness of data updates and availability in the FIS;

(c) **System Performance:** Assessing the performance and responsiveness of the FIS by including metrics on data and analysis processing;

(d) **System utilization and user satisfaction:** Evaluating the extent to which the FIS is utilized (for example the number of administrative cases done using the FIS) and the level of satisfaction by stakeholders;

(e) **Decision-making support:** Assessing the effectiveness of the FIS in supporting informed decision-making by tracking the number of decisions influenced by the system's outputs.

60. **Identification of KPIs:** Identification of KPIs involves only 1 step. There are many approaches to defining KPIs. They depend on the context, organizational structure, objectives and level of the analysis/assessment.

E. Stage H: Identifying strategic action

61. **Objective of the exercise:** The objective of this exercise is to prepare a strategic action plan for implementing a forest information system by considering key factors such as stakeholder needs, partnerships and technological infrastructure.

62. **Why do we need to identify strategic actions:** The previous exercises increased the understanding of stakeholders and institutions in the forest sector by mapping their relationships and dependencies. A value chain analysis (VCA) was carried out, which provided the foundation for identifying business-related objectives that should precede the FIS development. They were translated into IT-related objectives. Available critical IT resources were assessed, and necessary points of intervention were identified to properly support the IT-related objectives. Finally, principal KPIs designed to monitor alignment of FIS development results to the objectives were formulated.

63. In the next step, specific strategic actions should be defined. They should lead to the elimination or at the least reduction of the gaps identified. Likewise, efficiency and quality of processes in the forest sector should be improved to support the overall objectives. These strategic actions will be the framework for the individual projects.

64. **How should strategic actions be identified:** There is no one-fit-for-all approach, as the local context, priorities and resources must be considered. One possible method is to begin with designing information systems around the forest management strategy, stemming from existing forest policy, the institutional landscape, organizational and financial capabilities and administrative capacity.

65. Identifying strategic actions for implementing a FIS involves careful consideration of key factors that contribute to its successful establishment and operation. After a successful stakeholder analysis and the mapping of institutions, understanding the specific requirements and priorities of various stakeholders is essential to formulating a strategic action plan that addresses their diverse needs effectively.

66. Establishing strong partnerships and collaboration with relevant stakeholders is vital for engaging with experts from the forest sector, academia, technology providers, as well as political actors, to foster a shared vision and encourage knowledge exchange. This can be done by involving different stakeholders in the planning process at an early stage to create a joint strategic action plan.

67. Ensuring the availability and accessibility of appropriate technology infrastructure is crucial. This involves evaluating existing technological capabilities, addressing potential limitations and implementing upgrades or new solutions as needed.

68. **List strategic actions:** This also involves only 1 step. Use all the materials prepared at earlier steps of this methodological framework to identify strategic actions to be undertaken. This process should be done with the involvement of decision makers from policy, business and IT areas. There are many possible ways to create a strategic action plan. It could be a simple text document outlining the steps and projects necessary to achieve the strategic goals. It is often beneficial to use a structured template, as it may help to include all necessary information. The degree of detail of such a template depends on the level of analysis. High-level strategic action plans are generally less detailed, as their role is to outline only necessary actions. Low-level operational action plans are usually more detailed because they are later translated into specific projects with well-defined outcomes.

Annex

References

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