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Forest damage in the region of the Economic Commission for Europe

Summary

This document was prepared by the secretariat based on findings derived from the ongoing project of the Joint ECE/FAO Forestry and Timber Section on reporting and assessing forest damage and disturbance in the ECE region.

The secretariat will inform delegates on the progress of the project since the last session and the ongoing implementation in line with the mandate given at the 2021 joint session (ECE/TIM/2021/2-FO:EFC/2021/2). Delegates are invited to discuss findings from the project and provide feedback on the possible continuation of this work.

I. Background

1. Forest health and vitality are fundamental requirements for forest durability and resilience, and their ability to provide multiple essential ecosystem services to society. Temporary or locally limited loss of vitality of individual trees is a normal and non-detrimental phenomenon in forest ecosystems. However, the health of forests becomes critical when large areas deteriorate, or when the deterioration persists beyond the natural recovery time. In the 1980s and 1990s, forest dieback in the United Nations Economic Commission for Europe (ECE) region caused great concern. The subsequent implementation of air pollution control measures gradually improved forest conditions, restoring the vitality and health of forest ecosystems.

2. Droughts, fires, storms and insect infestations continued to cause large-scale tree mortality in forest ecosystems. Since the late 2010s, an increased number of reports have concluded that in Central Europe particularly the vitality and health of forests are once again an area of concern. These losses of vitality and health are associated with several consecutive periods of drought, which are known to weaken trees and increase the vulnerability of forests to other damage agents.

3. The consequences of these losses of vitality and health are striking. Forests are struggling to provide the entire range of their ecosystem services and landscapes are altered by the wide-ranging mortality of forests. Timber markets are in economic distress owing to the massive accumulation of salvage timber, forest owners lose their livelihoods and forest-rich tourist regions lose attractiveness.

4. While the resilience of forest ecosystems as well as their protective function is weakened, the risk of other natural hazards such as fires, flooding or erosion is increasing together with a decrease in carbon storage. Consequently, forests are no longer an ensured sink for atmospheric carbon dioxide (CO_2) and might become a source of CO_2. Current forest damage might be further escalated by anticipated climate changes resulting in a loss of vitality and health that may well exceed everything experienced to date.

5. Strengthening ecosystem resilience and adapting forests to climate change requires action at the local, pan-European and global level. International reporting of forest data should not only provide the necessary information but also must be adapted to the forest conditions, hazards, technology and demands. Therefore, the question arises whether the current system of international reporting can address these challenges. The ECE project study on forest damage and disturbance monitoring in the region addresses this question by critically analysing the present international reporting systems, while revealing gaps and identifying opportunities for improvement.

II. Distinction of forest damage and disturbance

6. Forest damage is the reduction of health and vitality of individual trees, stands, and forest habitats and biomes. It can be caused by biotic agents such as insects, fungi, diseases, wildlife or grazing livestock. Damage can also be caused by abiotic phenomena such as wind, drought or snow. Forest damage can also be human induced, ranging from large-scale industrial pollution to local factors such as forest operations. Forest fires occupy a special position since they can occur naturally or as an intentional or accidental result of human activities.

7. Serious losses of ecosystem vitality and health are often synonymously referred to as damage or disturbance. However, there is a significant difference between the two terms:

(a) ***Disturbance*** is ostensibly value-neutral;

(b) ***Damage*** involves the interpretation of disturbance information as it relates to negative impacts on human values.

8. The distinction between damage and disturbance may be relevant for several reasons:

(a) Human values associated with forests will vary over space and time and therefore compromise the comparability of damage and disaster risk reduction measures taken in different places and time periods, or focused on different outputs;

(b) Some level of disturbance is endemic to all forest ecosystems and may be part of their natural or desired development; and

(c) Separating damage and disturbance will often require further information, such as the addition of thresholds and/or computational steps, further complicating statistical reporting.

9. The use of the respective terms depends to a large extent on the perspective from which ecosystem vitality and health are valued, interpreted and assessed. Here, many forest owners primarily consider the economic loss of their assets. The loss of vitality, including extensive dieback, could also be considered an ecologically beneficial event for the restoration of natural habitats and for the adaptation of forest ecosystems to climate change.

10. The aim of monitoring and reporting is to provide value-free and unbiased information, since their interpretation differs among the respective users. Assuming that the forest damage is the expected information resulting from this reporting, additional information would be needed to separate damage from overall disturbance. Reporting in the ECE region, which is based on the causes of damage/disturbance, does not provide this information. Therefore, a rigorous separation of the two terms, however desirable, does not seem to be immediately applicable in regard to the current national reporting, especially since some languages do not distinguish between the two terms. In the project study, the two terms are used synonymously; however more attention should be paid to this aspect in future development of international forest damage reporting.

III. National data assessment

11. Forest damage can be assessed by terrestrial (in-situ) surveys, remote sensing methods or a combination of both. National forest inventories (NFI) are a basic source of information on forest disturbance. In combination with additional information, the NFI data can allow for reporting on damage. In the case of large-scale damaging events, such as storms and forest fires, special surveys are often carried out immediately after the damaging event. In some countries, there are also regular phytosanitary monitoring systems that collect data on biotic damage.

12. The observation units for damage/disturbance assessments can be individual trees or forested areas. The various systems differ in terms of the number and type of damage/causes that are covered, threshold values above which a given measure is reported and the time period in which a damage event must have occurred to be included in the current survey. While some systems collect data on current damage, others are oriented around accumulated values.

13. Differences in national systems of nomenclature often reflect the importance attached to individual causes of damage. Differences in the statistical survey designs used in the different countries play a minor role, as they are generally based on sampling theory and provide unbiased estimates for the individual countries.

IV. Current reporting in the ECE region

14. International reporting on forest damage in the ECE region is fragmented, with diverse and incomplete data availability of countries, sub-regions and causes of damage. Basic data on forest damage is collected by FAO’s Global Forest Resources Assessment (FRA); however, there is no regular reporting dedicated to forest damage in the ECE region.

(a) Global Forest Resources Assessment reporting on forest damage

15. The FRA, published by FAO, has compiled information on forest conditions on the global level since 1946. Currently, the FRA receives data from up to 100 countries on the forest area damaged by fires and data from up to 60 countries for insect damage, diseases and severe weather events. Since 1990, the assessments have been published in five-year intervals, with the FRA 2020 being the latest release.

16. According to the FRA 2020 results, the most commonly reported damage factor in the ECE region is fire, followed by insects. Damage caused by diseases and extreme weather are reported least often. Insects caused the most widespread damage/disturbance (18 million ha), followed by forest fires (11 million ha). The areas affected by extreme weather (1 million ha) and diseases (1.4 million ha) are considerably smaller. The geographical extent of damage, however, does not automatically indicate the severity of the impact.

(b) Regional reporting on forest damage

17. For Central Asia and the Caucasus, country reports have been prepared with the assistance of ECE, providing an overview of the state of forests and forest management for the reference year 2020. These reports, except for those of Georgia and Azerbaijan, include more detailed information on forest damage (all abiotic and biotic causes, including fire, insects and diseases) as a percentage of total forest area. In Canada, forest disturbance and damage data are organized federally and most often collected by sub-national jurisdictions. At the national level, data are summarized, harmonized and aggregated for international reporting. In the United States, aggregated national statistics for forest damage/disturbance are reported through various channels, including the national forest sustainability reporting activity.[1] Both the United States and Canada, as well as the Russian Federation, report forest damage in accordance with the Montreal Process Criteria and Indicators (C&I).

18. In Europe, national data on damage and disturbance are collected by the Joint ECE/FAO/Forest Europe Pan-European Data Collection on Forests and Sustainable Forest Management and published every five years in the topical databases of FAO/ECE and are also included in Forest Europe´s "State of Europe's Forests (SoEF)" report. Information about forest condition in Europe is also gathered through ICP Forest programme.

(c) Current information needs

19. A questionnaire for FRA national correspondents was used in the project to assess whether the current reporting of FAO and the ECE satisfies the information needs on forest damage. Most of the respondents found the reported damaging agents, a reporting period starting in 1990 with 5-year intervals and the division into regions to be sufficient. Owing to the high annual variability, there were demands for more frequent, annual damage reporting.

20. No clear picture emerged about the need to introduce common thresholds, e.g. of certain minimum amounts of damaged areas, damaged timber volumes or financial losses to be reported as damage. A threshold based on national needs was preferred. A distinction between areas affected by one or more causes of damage was not considered necessary. Respondents indicated that in addition to the report on areas affected by forest damage, the volume of damaged wood should also be included.

V. Interpreting damage/disturbance data

21. The interpretation of data can be done from different points of view and is therefore a critical process. For example, tree mortality can be a serious loss of capital for forest owners, while for ecologists it may be a desirable process of natural forest development. The interpretation of data can therefore lead to contradictory assessments.

[1] https://www.fs.usda.gov/research/inventory/sustainability.

22. The interpretation of the damage/disturbance data is an inevitable element of policy and decision-making. However, the interpretation process and related need for additional information is complex. Therefore, the question remains whether international reporting should focus on the presentation of the current state and trends of forest resources, or should include also interpretation from multiple perspectives.

VI. Reporting challenges

23. Comparable reporting on forest damage is challenged by differences in data collection systems, availability, definitions, accuracy, timeliness, evaluation and interpretation.

24. The data analysis shows that forest damage/disturbance is reported inconsistently among member States of the ECE region, making data comparison and interpretation difficult. The main source of information remains national inventories, primarily developed according to national priorities, which includes different data-collection systems and monitoring cycles. Therefore, monitoring and reporting on the time and duration of forest damage/disturbance are not uniform in the ECE region.

25. The variety of technical approaches in recording severity and type of damage, reference information (e.g., forest type, form of ownership) on forest areas affected by damage/disturbance, as well as information about the condition of adjacent areas, hampers more refined international analysis.

VII. Innovative tools

26. Understanding and showing the spatial distribution of forest damage has been always important. For this purpose, remote sensing systems facilitate the integration of spatially explicit information into the reporting process. Furthermore, the increasing diversity of remotely sensed data sources, combined with an ever-expanding data archive, makes it possible to evaluate historical damage trends of forested locations over decades.

27. Nevertheless, integrating remote sensing data into international reporting poses several challenges. Owing to the considerable areas that must be analysed for reporting, particularly when assessing damage trends and patterns through time, the substantial computational effort requires cloud computing platforms and workflows instead of isolated solutions. Artificial intelligence (AI) approaches are increasingly available to evaluate complex, multi-source data sets. To assess the accuracy of the damage/disturbance maps and incorporate them into the interpretations, reliable accuracy assessments are required. Remote sensing data provide only a limited view of damage symptoms that can be recognized over a wide area but cannot necessarily determine the causes of these symptoms. While a dead tree can be identified, a definitive statement about the reasons for its death is seldom possible using only remote sensing data. Here, combinations of additional data sets, technologies and methods of data analyses open new possibilities to provide an overall picture.

VIII. Conclusions

28. Various conclusions for future international reporting can be derived from the ECE project and the prepared study. The increase of country responses to international reporting on forests and better integration of national assessments is urgently needed. For this purpose, relevant data collection systems should be refined, ideally in close connection with the adjustments of national systems.

29. Although current reporting already covers a large part of the information needs, improvements are desirable. Reporting on forest damage enhances timely communication of information for instant decision-making. Therefore, a transition to annual reporting should be considered to cover the most recent damage events. The latest developments in forest damage are also reflected in the high incidence of salvage timber, which has serious implications for timber markets. Therefore, the volume of salvage timber should be included in the reporting.

30. Forest areas that are simultaneously affected by multiple disturbance agents are a reporting challenge, especially in relation to double counting. The development and implementation of proper guidance to avoid double counting is strongly recommended.

31. International reporting obligations often receive only limited resources in terms of personnel and funding. The increasing importance of forest damage for society, the environment and the economy calls for a re-evaluation. The increased dedication of resources commensurate with the scale of the problem is urgently needed.

IX. Points for consideration

32. The Committee and the Commission may wish to invite member countries to:

(a) Support dissemination of this executive summary, the study and related data as appropriate;

(b) Further strengthen national and regional forest damage/disturbance data collection both through the development of dedicated systems and by including damage/disturbance disaggregated variables in general forest information systems.

33. The Committee and the Commission may wish to request ECE and FAO to continue:

(a) providing support to member countries in their work on forest damage/disturbance monitoring, assessment and reporting;

(b) working on the development of forest damage reporting and assessment in the ECE region.