

# Forest health and vitality

## Background paper to the Kotka V Expert Consultation

### 1 Introduction

Healthy forests are essential for sustainable forest management, yet forests, like other forest ecosystems, are subject to a number of disturbances that can cause tree mortality or reduce productivity, and their ability to provide of a full range of goods and services. The causes of the negative impacts on forest health and vitality vary from place to place, and the magnitude and duration of the impacts are not easy to assess. Causes include, but are not limited to, fire, insects and diseases, overexploitation of wood and non-wood forest products, poor harvesting practices, poor management, uncontrolled grazing, invasive species, air pollution and extreme climatic events (e.g. drought, frost, storms and floods). The complexity and interrelationship of these factors and their impact on the health and vitality of forests are difficult to unravel. Indirect impacts may be far reaching and include social, economic and environmental dimensions.

Several disturbance factors were not included in FRA 2005 owing to lack of quantitative information in most countries: illegal logging, encroachment, overharvesting and other unsustainable management practices, pollution and the impact of invasive plant species.

#### 1.1 FRA 2005 variables

FRA 2005 focused on the following variables, which to some extent are quantifiable and for which many countries record incidence and extent: • **forest fires**; • **insects and diseases**; • **other disturbances** (including wind, snow, ice, floods, tropical storms, drought and damage by animals), defined as in the tables below:

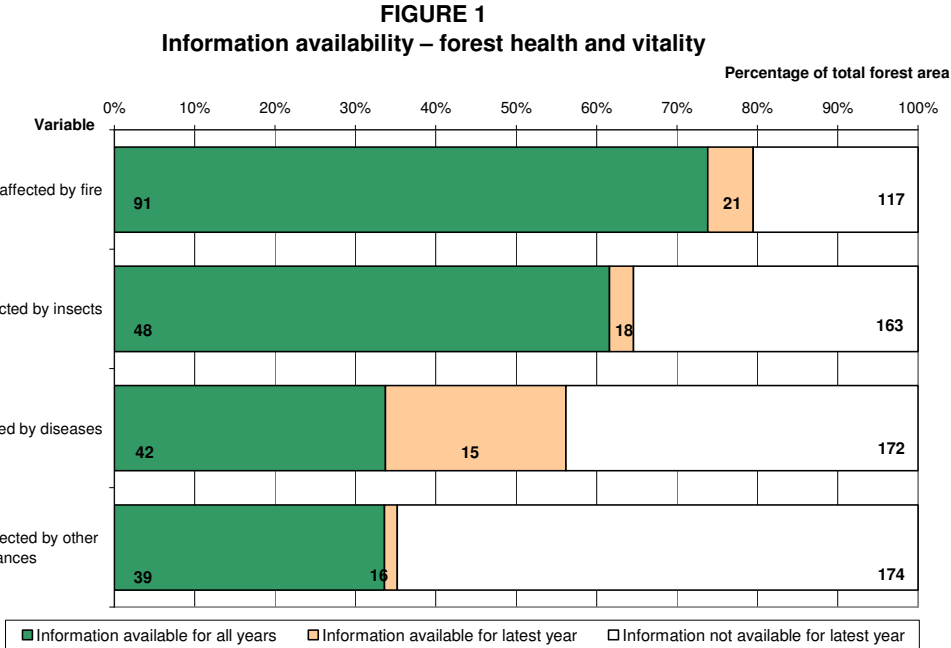
Category	Definition
<b>Disturbance by fire</b>	<b>Disturbance caused by wildfire, independently whether it broke out inside or outside the forest/OWL</b>  <u>Explanatory note:</u> 1. A wildfire is any unplanned and uncontrolled wildland fire which, regardless of ignition source, may require suppression response.
<b>Disturbance by insects</b>	<b>Disturbance caused by insect pests that are detrimental to tree health.</b>
<b>Disturbance by diseases</b>	<b>Disturbance caused by diseases attributable to pathogens, such as a bacteria, fungi, phytoplasma or virus.</b>
<b>Other disturbance</b>	<b>Disturbance caused by other factors than fire, insects or diseases.</b>  <u>Explanatory note</u> 1. The countries should specify type of disturbance included in this category

Countries were asked to provide data averaged over five years, so that a large fluctuation in a single year did not significantly skew the figures. Data on disturbance were presented for 1990 (an average of the period 1988–1992) and 2000 (average of 1998–2002).

No attempt was made to forecast figures for the 2005 reporting period or to obtain data on frequency, intensity and time of disturbance events.

**1.2 Data availability**

Globally, information on forest and other wooded land disturbances is relatively sparse and the data-collection basis for disturbances is highly variable.



Figures present number of countries in each category.

Although information on forest fires was available for 80 percent of the total forest area for the period 1998-2002, it was missing from many African countries.

Information on the area of forest significantly affected by insects was available for more than 60 percent of the total forest area, while information on diseases and other disturbances was sporadic. Many of the small island countries and dependent territories did not provide information for this theme.

In the FRA 2005 report, other disturbances included abiotic factors (e.g. wind, snow, ice, floods, tropical storms and drought) and damaging biotic agents other than insects and diseases (e.g. camels, beavers, deer and rodents). In general, information on disturbances attributed to these other biotic and abiotic factors was highly erratic, with a broad range of causative agents. Thus few of the data were comparable.

## **2 Forest fires**

Of the 229 countries and areas included in FRA 2005, 91 provided data on the average annual area of forest adversely affected by fires for both the 1990 and 2000 reporting periods, while an additional 21 countries provided data for the 2000 reporting period only – for a total of 112 countries accounting for 80 percent of the total forest area.

While eight regions or subregions provided data on more than 50 percent of their forested area, Oceania provided data on less than 5 percent of its forested area and information from Africa was largely missing.

Data were reported on 73, 65 and 35 percent of other wooded land in South America, Northern Africa and Western and Central Asia respectively, but on 25 percent or less of other wooded land in all other regions. Information was lacking for a number of countries in which forest fires are known to have occurred, including countries in Africa, Central Asia and Oceania.

### **2.1 *Issues related to forest fires***

Classification of fires that occur in forests and other wooded land is complex. There is presently no global classification that distinguishes between beneficial and detrimental fires, and consequently no detailed global information on fire types in forests and other wooded land.

Different methodologies of data collection resulted in different units of measurement of forest fire: number of fires, area affected by fire, forest area affected by fire, forest area damaged by fire.

As a consequence of these different methodologies, data were not usually directly comparable among regions and countries except on a broad scale. Some countries did not separate forests and other wooded land when recording data, while others did so.

There were large discrepancies between the area of forest adversely affected by fires reported by countries and the estimates of forest area affected by fire obtained from remote sensing analysis.

To improve the monitoring and assessment of fire damage to forests and other wooded land, it would be useful to have data-collection systems that are directly comparable. Thus there is a need to harmonize definitions and share information on methods of data collection and analysis.

## **3 Pests and diseases**

For insect infestations, of the 229 countries included in FRA 2005, 48 countries provided data for both the 1990 and 2000 reporting periods; a further 18 countries provided data for the 2000 reporting period only. These 66 countries represent

65 percent of the world's forest area. Reports from East Asia, Europe and North America covered more than 90 percent of their forest areas, while those from Africa and Oceania covered less than 1 percent of the forest area in their respective regions

For diseases, 42 countries provided data for both the 1990 and 2000 reporting periods. A further 15 countries provided data for the 2000 reporting period only. For the 2000 reporting period, East Asia and Europe provided data for over 80 percent of the forest areas within the region, while North America, South America and South and Southeast Asia each provided information for more than 50 percent of the forest area in their respective region or subregion. Data from Africa, the Caribbean and Oceania were largely missing

### **3.1 *Issues related to forest pests and diseases***

Despite the significant adverse impacts of forest insects and diseases, and indications that outbreaks are on the increase in some regions, insects and diseases are often not considered in the planning of forest and forest-conservation programmes. There has been no attempt to systematically gather and analyse comprehensive information on the type, scale and impact of such outbreaks at the global level and many countries lack information at the national level.

Globally, the quantifiable data on insect incidences and their effects on forests and forest products are limited. Insect and disease outbreaks in developing countries are primarily surveyed and reported for forest plantations and planted trees only, and corresponding surveys of forest decline and dieback are rare in these countries. Serious outbreak situations may be recorded, but details of causative agents and the quantifiable impact on forest resources often are not. In some instances, there may be a reluctance to record such severe outbreaks because management jobs or even forest products trade can be put at risk. Data on insects and diseases are collected and reported in a variety of ways. In some instances, data provided on the area of forest affected by diseases and insects (and other biotic disturbances) are not separated.

There also seems to be a lack of clarity in interpreting what constitutes a 'disturbance'.

## **4 Other disturbances**

Of the 229 countries involved in FRA 2005, 39 countries provided data on other disturbances for both the 1990 and 2000 reporting periods (33 percent of the total forest area). A further 16 countries provided data for the 2000 reporting period only. The reports were mainly from Europe and East Asia.

### **4.1 *Issues related to other disturbances***

Overall, the data reflect a range of types of disturbances. First, there were single, major catastrophic events such as hurricanes, which cause widespread destruction and loss of trees, and which may weaken trees and make them susceptible to secondary infestations. Second, there were longer term, chronic pressures, such as consistent feeding by animals that either cause significant, direct damage to trees or have indirect effects such as increased soil compaction beneath the trees, which may contribute to dieback and decline. Thus, collectively, without being broken down, the data are not particularly useful in the development of

management strategies. However, detailed breakdowns into specific types of disturbances are given in most of the country reports for use at the national level.

Information on the impacts of these types of disturbances is important. At this point in time, there is insufficient quantitative information for a proper trend analysis. Some data have relevance to relatively isolated areas (specific animal species), whereas other types have much broader relevance (storms, wind).

Countries have varying perceptions about what constitute ‘other disturbances’.

Subdivision of the data would help provide more meaningful comparisons and conclusions at regional and global levels. Where feasible, consideration should be given to both direct and indirect effects (e.g. compaction of soils).

## **5 Proposals for FRA 2010**

Based on information provided by the country correspondents in the evaluation questionnaire, comments collected during the regional workshops, internal communication with focal points and preliminary findings and recommendations coming from the FRA 2005 thematic study on health and vitality, a number of proposals for FRA 2010 are presented below. These have not been prioritised and are simply presented as a list of proposals received, for discussion by working group participants.

- The title of the table has a connotation of negative impact, while there are some positive effects of disturbances, such as forest fires, which should be considered.
- Information should not be requested for other wooded land.
- Clarification is needed on what to report for forest fires: number of fires, area affected by forest fires, forest area damaged by fires.
- Clarification is needed on what to report for all disturbances: only newly affected area and/or the area that stands affected from disturbances in earlier years (cumulative area).
- There is a need to better define when the level of disturbance should be consider a “disturbance” as the current definition is very subjective. It might be possible to define a minimum threshold: beyond the rate of historical variation and/or the percentage of forest with a decrease of biological components which indicates a change in ecological cycles.
- Important also to define the temporal dimension of a disturbance or disaster.
- The “other disturbances” should be split into biotic and abiotic agents.
- Defoliation should be included as variable, with a clear definition of “main trees”.
- It would be desirable to include degradation of forest if possible – including area affected by invasive alien species.

- The economic impact of disasters should be included – and the relation between area damage and volume damage.
- Policy and legislation and support measures to reduce impact on forest damages could be included as additional variables.

### 5.1 *Proposed tables*

The current table T8 should be divided between disturbance of biotic factors (including pest, diseases, insects, invasive species, others), and abiotic factors (fires, floods, droughts, winds, hurricanes, etc).

Where available, information regarding planning and strategies for reduction of damage, products treatments, forest control, both for natural forest and planted forest will provide a better picture of incidence and control.

Proposed additional tables:

#### *Temporal duration*

Pest name N= native I= introduced	less than 3 years	3-5 years	> 5 years
Pest A			
Pest B			
Pest C			
Pest D			

#### *Damage*

	2000	2005	2010
Area			
Volume of wood			
Value of the affected area			

See also Annex 1 and 2 for ideas for additional tables.

## Annex 1. Tables used for the FRA 2005 thematic study on forest pests and diseases.

Most of these tables are divided into planted and naturally regenerated forests.

### *Host and pest*

Pest name N= native I= introduced	Host species 1	Host species 2	Host species 3	Other host species
Pest A				
Pest B				
Pest C				
Other pest				

### *Distribution of pest in country*

Pest name N= native I= introduced	< 1% forest area	1-5 % forest area	5-10% forest area	10-20% forest area	20-50% forest area	50-75% forest area	75-100% forest area
pest A							
pest B							
pest C							
other pest							

### *Pest type*

Pest name N= native I= introduced	Native	New introduction	Established introduction	Other
pest A				
pest B				
pest C				
other pest				

### *Frequency of incidence of pest outbreaks –broad categories*

Pest name N= native I= introduced	Generally at low levels of outbreak	Constant level requiring management without specifics outbreaks	every year	2 years	3 years	4 years	5 years	10 years	20 years	> 20 years
pest A										
pest B										
pest C										
other pest										

### *Scale of impact: impact for area that damage occurs*

Pest name N= native I= introduced	< 1% forest area	1-5 % forest area	5-10 forest area	10-20% forest area	20-50% forest area	50-75% forest area	75-100% forest area
pest A							
pest B							
pest C							
other pest							

## Annex 2. Common indicators related to forest health and vitality

Source: FAO 2001. *Criteria and Indicators for Sustainable Forest Management: A Compendium*. Forest management working paper #5. Rome, Italy.

### Criterion 2: Maintenance of forest ecosystem health and vitality

	ITTO	TARA	ATO	CCAD	PAN- EURO	MONT	Dry Zone Africa	Near East	Dry Forest Asia
Insect/Disease Damage	yes	yes	no	+	yes	yes	yes	yes	yes
Fire and Storm Damage	yes	yes	no	+	yes	yes	yes	yes	yes
Deposition of Air Pollutants	yes	+	no	+	yes	yes	no	no	no
Damage by Wind Erosion	yes	+	+	+	no	no	yes	+	yes
Competition from Introduction of Plants	+	no	no	no	no	no	yes	yes	+
Nutrient Balance and Acidity	no	no	no	no	yes	yes	yes	no	no
Trends in Crop Yields	no	no	no	no	no	no	yes	yes	no
Wild Animal Damage	+	+	no	+	yes	yes	yes	yes	no
Incidence of Defoliators	+	+	no	+	yes	+	no	yes	no
Reproductive Health	+	no	yes	+	no	no	no	yes	+

+ = to some extent