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MAJOR DEFINITIONS USED IN THE GLOBAL FIBRE SUPPLY STUDY (GFSS)

1. LAND CLASSIFICATION

1.1 TOTAL AREA

Total area of country, including area of inland water bodies.

Excludes: offshore territorial waters

1.1.1 Inland water

Area occupied by major rivers, lakes and reservoirs.

1.1.2 Land area

Total area, excluding inland water.

1.2 OTHER LAND

Land not classified as forest or other wooded land as they are defined in this study.

1.3 FOREST AND OTHER WOODED LAND

1.3.1 Forest

Land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m at maturity *in situ*.

May consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground; or of open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 m are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention or natural causes but which are expected to revert to forest.

Includes: forest nurseries and seed orchards that constitute an integral part of the forest; forest roads, cleared tracts, firebreaks and other small open areas within the forest; forest in national parks, nature reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest; windbreaks and shelterbelts of trees with an area of more than 0.5 ha and width of more than 20 m. Rubberwood



plantations and cork oak stands are included.

Excludes: land predominantly used for agricultural practices.

It is worthwhile pointing out that the definition of forest used in the present study has a minimum vegetation cover requirement and is quite different from a legal definition of forest (i.e. an area proclaimed to be forest under a Forest Act or Ordinance).

1.3.1.1 Natural forest

Forest which are not plantation(s). Natural forest can be:

1.3.1.1.1 Forest undisturbed by man

Forest which shows natural forest dynamics, such as natural tree composition, occurrence of dead wood, natural age structure and natural regeneration processes, the area of which is large enough to maintain its natural characteristics and where there has been no known significant human intervention or where the last significant human intervention was long enough ago to have allowed the natural species composition and processes to have become re-established.

1.3.1.1.2 Forest disturbed by man (or semi-natural forest)

Forest which is neither “forest undisturbed by man” nor “plantation” as defined separately.

1.3.1.2 Plantation(s)

Forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either:

of introduced species (all planted stands), or

intensively managed stands of indigenous species which meet all the following criteria: one or two species at plantation, even age class, regular spacing.

Excludes: Stands which were established as plantations but which have been without intensive management for a significant period of time. These should be considered semi-natural.

1.3.2 Other wooded land

Land either with a tree crown cover (or equivalent stocking level) of 5-10 percent of trees able to reach a height of at least 5 m at maturity *in situ*; or crown cover (or equivalent stocking level) of more than 10 percent of trees not able to reach a height of 5 m at maturity *in situ* (e.g. dwarf or stunted trees) and shrub or bush cover.

Excludes: areas having the tree, shrub or bush cover specified above but of less than 0.5 ha and width of 20 m, which are classed under “other land”; land predominantly used for agricultural practices.

1.3.2.1 Other wooded land undisturbed by man

Other wooded land which shows natural forest dynamics, such as natural tree composition, occurrence of dead wood, natural age structure and natural regeneration processes, the area of which is large enough to maintain its natural characteristics and where there has been no known significant human intervention or where the last significant human intervention was long enough ago to have allowed the natural species composition and processes to have become re-established.

1.3.2.2 Other wooded land disturbed by man

Other wooded land which is neither "other wooded land undisturbed by man" nor "plantation" as defined separately.

2. FOREST CLASSIFICATION SYSTEM

For the purpose of the present study it has been decided to use the country's own forest classes as much as possible. The advantage of this approach is that country experts can readily understand our data description and can readily evaluate our estimates. We also anticipate that many countries will continue to maintain their forest inventories using these classes, or at the very least some link to these classes.

Countries can classify forests by geographic location, by forest type, or some combinations of these elements. However, where no such classes were available, closed and open forest definitions as developed for the 1980 FAO Tropical Forest Resources Assessment were used. Examples of the classification systems used by the countries and in the GFSS are presented in 2.1, Country classes. Each forest class can also be further subdivided in species groups. The definitions of these groups are presented in 2.2, Species Groups.

2.1 COUNTRY CLASSES

2.1.1 Geographical location

Geographical systems usually refer to the location or the altitude where the forests occur (montane forest, lowland, etc.). An example for a geographical classification is Colombia. Publications that report forestry related data on a national level usually refer to *Pacífico*, *Andina*, *Caribe*, *Orinoquia* and *Amazonia*. Another example is the Republic of Congo, where data is reported according to the major geographical regions: *North*, *Chaillu*, *Kouilou-Mayombe*.

2.1.2 Forest type

Forest type classification systems used by countries usually refer to the forest formation (high forest, shrubs), to the climatic or edaphic conditions under which the forest is growing, to the species composition, to the quality of the timber and to many other factors (harvesting status, etc.).



Examples for such types are: deciduous thornbush, evergreen bushland and thicket, rainforest, swamp forest, etc. Frequently other factors such as the logging status or the timber density and quality become used in the classes. A typical example for such a system is Malaysia, which uses, for example, mixed dipterocarp forest superior, good, medium, poor, and commercial forest superior, good, poor, etc. Frequently forest types are combined with geographical classes.

2.1.3 Closed/open

2.1.3.1 Closed forest

Closed forests are vegetation formations where trees occur in single or multiple stories with crowns interlocking, which, in conjunction with the undergrowth, cover a high proportion of the ground and consequently do not have a continuous dense grass layer at the ground level. They are either managed or unmanaged forests, primary or in advanced state of succession and may have been logged over one or more times, having kept their characteristics of forest stands, possibly with modified structure and composition.

2.1.3.2 Open forest

Open forests are vegetation formations where trees occur with discontinuous, non-interlocking crowns, but with a crown coverage of at least 10 percent. Generally there is a continuous grass layer allowing grazing and spreading of fires. Examples are various form of "cerrado" and "chaco" in Latin America, tree and wooded savannas, and wooded lands in Africa, dry dipterocarp forests and "forêts claires" in Asia.

The division between closed and open forests is more of ecological than of physiognomic nature, not characterized only by a crown cover percentage. A dense forest after logging may look as open forest from crown cover point of view alone; however, it cannot be classified as open forest unless there are some permanent changes in flora, fauna and soil condition due to repeated fire, grazing, etc., which keep the forest in a sub-climax stage.

2.2 SPECIES GROUPS

2.2.1 Predominantly coniferous forest/other wooded land

Forest land on which more than 75 percent of the tree crown cover consists of species classified botanically as *Gymnospermae*. They are sometimes referred to as "softwoods".

2.2.2 Predominantly broadleaved forest/other wooded land

Forest land on which more than 75 percent of the tree crown cover consists of trees classified botanically as *Angiospermae*. They are sometimes referred to as "non-coniferous" or "hardwoods".

2.2.3 Predominantly bamboos, palms, etc.

Forest/other wooded land on which more than 75 percent of the crown cover consists of tree species other than coniferous or broadleaved species (e.g. tree-form members of the bamboo, palm, fern families).

2.2.4 Mixed forest/other wooded land

Forest/other wooded land on which neither coniferous, nor broadleaved, nor palms, bamboos, etc., account for more than 75 percent of the tree crown area.

3. FOREST FUNCTION

Forest function is defined with reference to the forest land capability to support land uses like nature conservation, soil and water protection, wood production, etc. For the present study two main classes are defined:

3.1 FOREST AVAILABLE FOR WOOD SUPPLY

Forest where any legal, economic, or specific environmental restrictions (see 3.2.2) do not have a significant impact on the supply of wood

Includes: areas where, although there are no such restrictions, harvesting is not taking place, for example areas included in long-term utilization plans or intentions.

3.2 FOREST NOT AVAILABLE FOR WOOD SUPPLY

Forest where legal or economic restrictions prevent any significant supply of wood.

Includes:

3.2.1 Legal restrictions

Forest with legal restrictions or restrictions resulting from other political decisions, which totally exclude or severely limit wood supply, *inter alia* for reasons of environmental or biodiversity conservation, e.g. protection forest, national parks, nature reserves and other protected areas, such as those of special environmental, scientific, historical, cultural or spiritual interest.

Area under IUCN management categories I or II is considered as protected from wood harvesting (for IUCN management categories see 12).



3.2.2 Economic restrictions

Forest with economic restrictions due to environmental, physical or wood quality factors, e.g. environmental regulation on harvesting systems, steep terrain; terrain dominated by swamps and/or rocks interspersed with some commercial trees; deformed growth of individual trees; and fire, insect and/or disease damaged forests. All restrictions other than legal restrictions can be summarized as economic restrictions. For the purpose of the GFSS, they are subdivided in three classes:

3.2.2.1 Physical reasons (I)

Harvesting is economically unfeasible at the current wood price level because the terrain conditions require extraordinary equipment or time.

3.2.2.2 Transport distance/lack of infrastructure (II)

Remote forests where transport distance for logs or products is too high or where access is currently not provided. The situation can change if, for instance, the government or the industry invests in infrastructure.

3.2.2.3 Other (III)

E.g. low growing stock volume, wood quality too low, no commercial species.

4. OWNERSHIP

Three classes of ownership are distinguished:

4.1 PUBLIC

Forest/other wooded land belonging to the state or other public bodies.

4.1.1 State

Forest/other wooded land owned by national, state and regional governments, or by government-owned corporations; crown forest and other wooded land.

4.1.2 Other public

Forest/other wooded land belonging to cities, municipalities, villages and communes.

Includes: any publicly owned forest and other wooded land not classified as being "in state ownership".

4.2 INDIGENOUS AND TRIBAL PEOPLES

Indigenous and tribal peoples in independent countries are defined as those who:

(1) are regarded as indigenous on account of their descent from the populations which inhabited the country, or a geographical region to which the country belongs, at a time of conquest or colonization or the establishment of present state boundaries and who, irrespective of their legal status, retain some or all of their own social, economic, cultural and political institutions;

(2) are tribal peoples whose social, cultural and economic conditions distinguish them from other sections of the national community, and whose status is regulated wholly or partly by their own customs or traditions or by special laws and regulations.

For both categories (1) and (2) self-identification as indigenous or tribal shall be regarded as the fundamental criterion for determining the groups. (Source: ILO Convention No. 169 on "indigenous and tribal peoples").

For the purpose of the Global Fibre Supply Study this data is collected under "private ownership".

4.3 PRIVATE

Forest/other wooded land owned by individuals, families, cooperatives and corporations which may be engaged in agriculture or other occupations as well as forestry; private forest enterprises and industries; private corporations and other institutions (religious and educational institutions, pension and investment funds, nature conservation societies, etc.).

4.3.1 Individuals

Forest and other wooded land owned by individuals or families, including those who have formed themselves into companies.

Includes: individuals and families who combine forestry with agriculture (farm forests), those who live in or near their forest holdings, and those who live elsewhere (absentee owners).

4.3.2 Other private institutions

Forest/other wooded land owned by private corporations, cooperatives or institutions (religious, educational, pension or investment funds, nature conservation societies, etc.).

5. DEFORESTATION AND DEGRADATION

5.1 DEFORESTATION

Deforestation refers to change of land use with depletion of tree crown cover to less than 10 percent. Changes within the forest class (e.g. from closed to open forest) which negatively affect the stand or site and, in particular, lower the production capacity are termed forest degradation.



5.2 DEGRADATION

Forest degradation takes different forms, particularly in open formations, deriving mainly from human activities such as overgrazing, overexploitation (for firewood in particular), repeated fires, or due to attacks by insects, diseases, plant parasites or other natural sources such as cyclones. In most cases degradation does not show up so much as a decrease in the area of woody vegetation but rather as a gradual reduction of biomass, changes in species composition and soil degradation. The logging of forests for sawlogs and veneer logs without a proper management plan can contribute to degradation if the extraction of mature trees is not accompanied with their regeneration or if the use of heavy machinery causes soil compaction or loss of productive forest area.

6. PLANTATION

6.1 FOREST PLANTATIONS

Forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either:

of introduced species (all planted stands), or

intensively managed stands of indigenous species which meet all the following criteria: one or two species at plantation, even-age class, regular spacing.

6.1.1 Industrial forest plantations

Forest plantations grown mainly for the production of industrial roundwood (sawtimber, veneer, pulp, reconstituted wood). Note that industrial roundwood may also come from non-forest plantations and trees grown outside the forest.

6.1.2 Non-industrial plantations

Planted trees established mainly for domestic use or for use in non-forest industries, including fuelwood and poles, non-wood forest products and for service functions such as protection. Non-industrial tree plantations are assumed not to make a significant contribution to industrial roundwood supplies and thus data referring to these plantations (where they can be identified) are not used as inputs to the GFSS.

6.1.3 Indigenous tree species

Tree species which have evolved in the same area, region or biotope where the forest stand is growing and are adapted to the specific ecological conditions predominant at the time of the establishment of the stand. May also be termed native species or autochthonous species.

6.1.4 Introduced tree species

Tree species occurring outside their natural vegetation zone, area or region. May also be termed non-indigenous species.

Includes: Hybrids

6.2 TREES OUTSIDE THE FOREST

Trees on land other than forest or other wooded land.

Includes: Trees on land that meets the definitions of forest and of other wooded land except that the area is less than 0.5 ha and the width is less than 20 m; scattered trees in permanent meadows and pastures; permanent tree crops such as fruit tree orchards and coconut palm plantations; trees in parks and gardens, around buildings, in hedgerows and in lines along streets, roads, railways, rivers, streams and canals; trees in shelterbelts and windbreaks of less than 20 m in width and 0.5 ha in area.

6.3 PLANTATION AREA

6.3.1 Reported area

The plantation area reported to be present, either by government, industry, or some outside source. Normally this refers to the area planted or planned, but does not take into account the area actually stocked.

6.3.2 Net area

The reported area reduced by a factor to allow for plantation area losses due to failed plantation areas, fire, etc. In the absence of any specific information or opinion a default value of 0.7 reduction has been used (taken from FAO Forestry Paper #128).

7. FOREST VOLUME AND GROWTH

7.1 BIOMASS

7.1.1 Tree

A woody perennial with a single main stem or, in the case of coppice, with several stems, having a more or less definite crown.

Includes: bamboos, palms and other woody plants meeting the above criterion.

7.1.2 Shrubs and bushes

Woody perennial plants, generally of more than 0.5 m and less than 5 m height, and often without a definite stem and crown.



7.1.3 Woody biomass

The mass of the woody parts (wood, bark, branches, twigs, stumps and roots) of trees, alive and dead, shrubs and bushes, measured to a minimum diameter of 0 mm (dbh).

Includes: Above-stump woody biomass, and stumps and roots.

Excludes: Foliage.

7.1.4 Above-stump woody biomass (tons/ha)

The mass of the woody part (stem, bark, branches, twigs) of trees, alive or dead, shrubs and bushes, excluding stumps and roots

7.1.5 Stumps and roots

Parts of the whole tree volume, which exclude the volume of the above-stump woody biomass. The height of the stump is taken to be that at which the tree would be cut under normal felling practices in that country or region.

Excludes: Small roots.

7.2 VOLUMES

7.2.1 Growing stock (m³/ha)

Living volume of standing trees, above-stump measured overbark to top. Includes all trees with diameter over a reported reference diameter (diameter at breast height, dbh).

Excludes: branches.

7.2.2 Commercial growing stock (m³/ha)

Part of the growing stock, that consists of species considered as actually or potentially commercial under current (1995) market conditions, at the reported reference diameter (dbh). Can be identical to the growing stock, but can also be much smaller if only very few species are merchantable or greater if the forest available for supply consists of high volume stands only.

Includes: species which are currently not exported, but potentially commercial having appropriate technological properties; species provided to the local market are included.

7.2.3 Reference diameter [cm]

Inventory diameter at breast height used for determining the growing stock and commercial growing stock. Volumes can be converted to different reference diameters, using conversion factors as presented in 8.1.

7.3 GROWTH

7.3.1 Gross annual increment (mean annual increment) (m³/ha)

Average annual volume of increment over the reference period of all trees, measured to a minimum diameter breast height (dbh) of 0 centimetres (cm).

7.3.2 Natural losses (m³/ha)

Average annual losses to the growing stock during the given reference period, measured to a minimum diameter of 0 cm (dbh), due to mortality from causes other than cutting by man, e.g. natural mortality, diseases, insect attacks, fire, windthrow or other physical damage.

7.3.3 Net annual increment (m³/ha)

Average annual volume over the given reference period of gross increment less that of natural losses on all trees to a minimum diameter of 0 cm (dbh).

7.4 AGE

7.4.1 Cutting cycle (years)

The silvicultural/harvesting cycle chosen for the sustainable harvest of timber. It is dependent on management objectives for the forest.

7.4.2 Rotation age (years)

The planned number of years between the establishment or regeneration of a tree crop or stand and its final cutting at a specified stage of maturity.

8. VOLUME AND BIOMASS CONVERSION

8.1 GROWING STOCK CONVERSION

Where nationwide or local growing stock volumes are not available from the inventory database, or if volume data is reported only for a fraction of species (usually commercial species) special measures will be necessary to obtain standard cubic metre volume estimates.

To obtain growing stock volumes for all dbh classes down to 10 cm dbh, use should be made of appropriate conversion tables. Volume conversion factors, dependent on given minimum limits can be found in the table, which was prepared from data given in the following sources:

Brown, Sandra (1990): *Volume expansion factors for tropical forests*. Paper prepared for the FAO Tropical Forest Resources Assessment 1990 Project. University of Illinois, Department of Forestry, 9pp.



Brown, Sandra (1997): *Estimating biomass and biomass change of tropical forests: A Primer*. FAO Forestry Paper No. 134, Rome.

The equation used to convert total growing stock (m³/ha) from the reference diameter to the adjusted diameter of 10 cm was as follows:

$$\text{Total Growing Stock (Adjusted)} = \text{Total Growing Stock} * \text{Volume Expansion Factor}$$

where the volume expansion factor was dependent upon forest type and diameter class, as indicated below.

Undisturbed (Closed) Forest	Disturbed (Closed) Forest	Diameter Range
1	1	If 10 < d < 20
1.2	2.1	If 25 < d < 30
1.5	2.5	If 35 < d < 40
2.2	4.1	If 45 < d < 50

8.2 BIOMASS CONVERSION

To convert growing stock (m³/ha) to total forest biomass, the appropriate conversion factor is found using the equation postulated by Brown (1990). This equation is as follows.

$$\text{Total Forest Biomass} = \text{Growing Stock (m}^3\text{/ha)} * \text{Wood Density (t/m}^3\text{)} * \text{Biomass Expansion Factor}$$

where wood density is dependent on the region, as shown below:

(Africa): 0.58 t/m³

(Latin America): 0.60 t/m³

(Asia): 0.57 t/m³

and biomass expansion factor is:

$$e^{\{ 3.213 - 0.506 * \ln(\text{Growing Stock (m}^3\text{/ha)} * \text{Wood Density (t/m}^3\text{)}) \}}$$

where {growing stock*wood density} < 190 t/ha

or

1.74 where {growing stock*wood density} e 190 t/ha

This equation provides the total forest biomass, a number which indicates the entire volume of leaf, branch, and stem of all trees and shrubs within the forest ecosystem.

9. FOREST UTILIZATION

9.1 ANNUAL FELLINGS (1 000 M³)

Average annual standing volume of all trees, living or dead, measured over bark to a minimum diameter of 0 cm (dbh), that are felled during the given reference period, including the volume of trees or parts of trees that are not removed from the forest, other wooded land or other felling site.

Includes: silvicultural and pre-commercial thinnings and cleanings left in the forests; and natural losses that are recovered (harvested)

9.2 UNRECOVERED FELLINGS (HARVESTING RESIDUES) (1 000 M³)

Felling residuals, which are left in the forest after felling and not salvaged.

Excludes: parts of the tree left *in situ* after felling, e.g. stumps and roots, and parts of the felled tree not recorded in the volume of fellings (see above). Normally the volume over bark.

9.3 ANNUAL REMOVALS (1 000 M³)

Average annual volume of those fellings that are removed from the forest, other wooded land or other felling site during the given reference period.

Includes: removals during the given reference period of trees felled during an earlier period and removal of trees killed or damaged by natural causes (natural losses), e.g. fire, windblow, insects and diseases.

9.4 HARVESTING INTENSITY (M³/HA)

Volume actually removed from the forest within one cutting cycle. This volume may include wood for industrial purposes (e.g. sawlogs, veneer logs, etc.) and for local domestic use (e.g. rural uses for construction). Use of wood for fuelwood will not be included in this category. May show a significant difference for disturbed and undisturbed forest.



9.5 ROUNDWOOD (CONIFEROUS, NON-CONIFEROUS) (1 000 M³)

Wood in the rough. Wood in its natural state as felled or otherwise harvested, with or without bark, round, split, roughly squared or in other form. It may also be impregnated or roughly shaped or pointed. It comprises all wood obtained from removals, i.e. the quantities removed from forests and from trees outside the forest, including wood recovered from natural, felling and logging losses during the period, calendar year or forest year. Commodities included are sawlogs and veneer logs, pulpwood, other industrial roundwood (including pitprops) and fuelwood. The FAO statistics include recorded volumes, as well as estimated unrecorded volumes.

9.5.1 Industrial roundwood (1 000 m³)

The commodities included are:

Sawlogs and veneer logs

Pulpwood

Other industrial roundwood (includes roundwood used for tanning, distillation, match blocks, gazogenes, poles, piling, posts, pitprops, etc.).

9.5.2 Fuelwood and charcoal

Wood in the rough (from trunks and branches of trees) to be used as fuel for purposes such as cooking, heating or power production. Wood for charcoal, pit kilns and portable ovens is included.

10. ALTERNATIVE FIBRES

Any fibre source that does not come directly from a tree. These fibre sources include:

10.1 NON-WOOD FIBRES

Fibres that come from a non-wood species of plant. Non-woods include abaca (Manila hemp), bagasse, bamboo, corn stalk and sorghum, cotton fibre and stalks, *Crotalaria* (sun Hemp), esparto, flax straw, hemp, jute, kenaf core & bast, rags, reeds, rice straw, sisal and wheat straw.

Nonwoods are scientifically defined as non-woody cellulosic plant materials from which papermaking fibres can be extracted. Most nonwoods are annual plants that develop full fibre potential in one growing season or less. Historically, paper was made almost exclusively from non-woods. Today, most non-woods are used in other industries, such as textiles. Other related terms are:

10.1.1 Non-wood fibre usage rate

The percentage of pulp for paper production that consists of non-wood fibres.

10.1.2 Historical non-wood fibre usage rate of change

The annual percent change in the non-wood fibre usage rate. This is calculated by using the past five years worth of data on non-wood fibre usage and pulp for paper production. Not to be confused with the *Nonwood Fibre Usage Rate of Change* factor (Section 11.2.3.1).

10.1.3 Pulp for paper production

The total production of pulp that is intended for paper or paperboard products.

10.2 RECOVERED FIBRES

Recovered fibre refers to any fibre that is recycled, or used more than once in the manufacture of paper or board products. A recovered fibre may be wood or non-wood in origin. It may be recovered more than once, although the accepted upper limit for recycling is about five times. A recovered fibre is not as strong as a virgin fibre, often possesses less flexibility, and is likely to split along the vertical axis. Most recovered fibre comes from recycled paper sources. Other related terms are:

10.2.1 Wastepaper recovery rate

The percent of overall paper and paperboard consumption that is recovered for recycling. This figure is not always related to the consumption of recycled products.

10.2.2 Historical wastepaper recovery rate of change

The annual percent change in the wastepaper recovery rate. This is calculated by using the past seven years worth of data on wastepaper recovery and paper and paperboard consumption. Not to be confused with the *Wastepaper Recovery Rate of Change* factor (Section 11.2.3.3).



11. GFSM FUTURE PROJECTION TERMS

Quite a number of terms are used in constructing GFS future potential supply curves. These include:

11.1 FUTURES

This term replaces other misleading or confusing terms such as *scenario* or *outlook*. In the context of the GFSM, futures refers to the different potential supply curves that we can construct by adjusting factors and projecting the results over the next half century. The GFSM will produce three such futures, labelled Future₁, Future₂, and Future₃.

11.2 FACTORS

The variables that are included in the construction of future projections for each component. These variables are listed by component below.

11.2.1 Factors affecting natural forests

11.2.1.1 Land use (deforestation)

The factor which controls the rate of deforestation caused by thinning or conversion of forests to a deforested state, i.e. a permanent crown cover of less than 10%.

11.2.1.2 Land use (conservation)

The factor which controls the amount of forested land with legal restrictions which totally exclude or severely limit wood production, *inter alia* for reasons of environmental and biodiversity conservation, e.g. national parks, nature reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest.

11.2.1.3 Harvest efficiency

The factor which controls the efficiency with which timber is removed from the landscape and subsequently utilized. This affects both the amount of unrecovered fellings that one can expect in harvesting, and the yield that individual trees can provide due to better or worse harvesting techniques.

11.2.1.4 Sustainable forest management

The factor which controls the impact of sustainable forest management programmes. The impacts of such programmes affect total fibre yield to change the harvest scheduling in the area available for wood supply. To express sustainable forest management in quantitative terms means changing the silvicultural/harvesting system which in turn means changing the cutting cycle or increasing the rotation age used for forest utilization. Using this approach gives the forest manager a greater ability to address

forest management issues such as riparian zone management, wildlife corridors management, appropriate regeneration programmes, biodiversity and appropriate technology for tree harvesting.

11.2.2 Factors affecting industrial plantations

11.2.2.1 Land use (afforestation)

The factor controlling the rate at which new plantation area is added to the overall reported area.

11.2.2.2 Success rate

The factor which controls the plantation success rate, allowing for improvements in plantation establishment and management to be included in the model.

11.2.2.3 Research and Development gains

R&D gains include improvement in the establishment success rate (i.e. fewer gaps to reduce yields), as well as increases in growth and yield arising from research (especially tree improvement but also establishment techniques, site amelioration, etc.), improved management, and from greater experience of staff and labour.

11.2.3 Factors affecting alternative fibres

11.2.3.1 Non-wood fibre usage rate of change

The factor which controls the change in percent of non-wood fibres used in the manufacture of pulp for paper. This allows for eventual increases or decreases in the percent used.

11.2.3.2 Non-wood fibre yield

The factor which controls the yield of non-wood fibres from a hectare of land. Adjusting this factor allows us to model improvements in agricultural and harvesting practices.

11.2.3.3 Wastepaper recovery rate of change

The factor which controls the change in percent recovery of wastepaper.

11.2.3.4 Wastepaper recovery fibre yield

The factor which controls the amount of fibres that one can receive from a metric ton of wastepaper.



11.3 BASE REFERENCE POINT

The calculated, agreed-upon 1995 figure in the GFSM database that is used as a starting point for all future calculations. Each component of a projected line is somehow constructed from the base reference point.

11.4 STATIC SUPPLY LEVEL

A “flat” projection of fibre supply that is extended into the future. The difference between this and the possible futures is that no factor is adjusted and no trends are included. All the future models are built off of this line. All of the factors listed above are held static at the 1995 level for the construction of the static supply level.

12. IUCN MANAGEMENT CATEGORIES

[I] Strict Nature Reserve / Wilderness Area: protected area managed mainly for science or wilderness protection

These areas possess some outstanding ecosystems, features and/or species of flora and fauna of national scientific importance, or they are representative of particular natural areas. They often contain fragile ecosystems or life forms, areas of important biological or geological diversity, or areas of particular importance to the conservation of genetic resources. Public access is generally not permitted. Natural processes are allowed to take place in the absence of any direct human interference, tourism and recreation. Ecological processes may include natural acts that alter the ecological system or physiographic features, such as naturally occurring fires, natural succession, insect or disease outbreaks, storms, earthquakes and the like, but necessarily excluding man-induced disturbances.

[II] National Park: protected area managed mainly for ecosystem protection and recreation

National parks are relatively large areas, which contain representative samples of major natural regions, features or scenery, where plant and animal species, geomorphological sites and habitats are of special scientific, educational and recreational interest. The area is managed and developed so as to sustain recreation and educational activities on a controlled basis. The area and visitors' use are managed at a level which maintains the area in a natural or semi-natural state.

[III] Natural Monument: protected area managed mainly for conservation of specific natural features

This category normally contains one or more natural features of outstanding national interest being protected because of their uniqueness or rarity. Size is not of great importance. The areas should be managed to remain relatively free of human disturbance, although they may have recreational and touristic value.

[IV] Habitat/Species Management Area: protected area managed mainly for conservation through management intervention

The areas covered may consist of nesting areas of colonial bird species, marshes or lakes, estuaries, forest or grassland habitats, or fish spawning or seagrass feeding beds for marine animals. The production of harvestable renewable resources may play a secondary role in the management of the area. The area may require habitat manipulation (mowing, sheep or cattle grazing, etc.).

[V] Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation

The diversity of areas falling into this category is very large. They include those whose landscapes possess special aesthetic qualities which are a result of the interaction of man and land or water, traditional practices associated with agriculture, grazing and fishing being dominant; and those that are primarily natural areas, such as coastline, lake or river shores, hilly or mountainous terrains, managed intensively by man for recreation and tourism.

[VI] Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems.

Normally covers extensive and relatively isolated and uninhabited areas having difficult access, or regions that are relatively sparsely populated but are under considerable pressure for colonization or greater utilization.

