

# international forestry report

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## FORECAST WORLD TIMBER SUPPLY 2010-2020\*

IN MILLIONS OF CUBIC METRES

REGION	1996	2010	2020
Oceania (NZ and Australia)	41.5	57.5	74.0
South America	129.5	158.0	190.0
North and Central America	600.1	502.7	539.1
Europe and Baltics	281.9	330.1	354.9
Asia	252.0	217.0	228.0
Africa	67.1	66.0	70.0
Russia	67.0	130.0	160.0
<b>Total supply</b>	<b>1,439.1</b>	<b>1,461.3</b>	<b>1,616.0</b>
<b>Forecast demand</b>		<b>1,801.0</b>	<b>2,100.0</b>
<b>Forecast shortfall</b>		<b>339.7</b>	<b>484.0</b>

\*Note: Industrial wood only; excludes fuelwood. Apsey and Reed, Canada 1998.

# Does the world need plantations?

By Dr. W. R. J. (Wink) Sutton\*

## Summary

Wood has been one of human civilisation's most important raw materials. The continued use of wood is not assured because there are suitable (and increasingly cost competitive) substitutes for every wood use. Most wood substitutes require either fossil fuels or the energy from fossil fuels.

The major advantage of wood is its environmental friendliness. Although it involves forest felling (which may increase atmospheric emissions of carbon dioxide) wood differs greatly from wood substitutes made from fossil fuels. The carbon dioxide from the use of wood is, within a few decades, recycled back into more wood by the regenerating forests. In contrast, the carbon dioxide from fossil fuels remains a permanent addition to the atmosphere.

Wood is very energy efficient. Wood requires a tenth or less of the energy needed to make wood substitutes such as steel and concrete.

Further substitution is unlikely because of the huge energy requirements and because of concerns about further increases in atmospheric carbon dioxide (from the use of fossil fuels).

If the world wishes to reduce fossil fuel use while improving average standards of living, the future world could require more wood than is used now.

However, let us assume that there is no future increase in the average per capita use of wood and that it remains at 0.6m<sup>3</sup> per person per year.

The increase in the global population alone (expected to be ten billion by the middle of the new century) will require at least two billion m<sup>3</sup> more wood each year than can be supplied from those forests existing at the end of the twentieth century. Globally, an additional 100 million hectares of very productive managed plantations will be required to meet even this conservative increased demand projection.

**The major advantage of wood is its environmental friendliness.**



PINEWOOD PICTURES

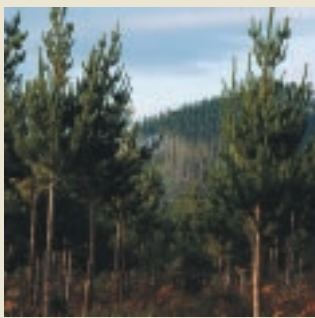
\*Dr. W. R. J. (Wink) Sutton is a New Zealand based forestry consultant and a recognized authority on global plantations. He was previously Director of Strategic Research, Fletcher Challenge Forests Limited. In 1997 he was made an Officer of the New Zealand Order of Merit (ONZM) for his services to forestry.



### The importance of wood

In 1996 approximately 55% of the 3.36 billion m<sup>3</sup> annual wood harvest was used as fuelwood (wood is still the primary energy source for most of the world's population). The other 45% was used industrially, mostly as sawlogs (see Global Wood Harvest below).

Wood is very versatile. Industrial wood has at least 10,000 different uses. Probably no other raw material has been so useful throughout human civilisation.



PINEWOOD PICTURES

### Wood and fossil fuels compared

There are increasing concerns about the long-term global effects, especially on climate, of the continuing release of greenhouse gases into the atmosphere.

Of the greenhouse gases, the atmospheric concentration of carbon dioxide is of particular concern. International concern has resulted in the *Framework Convention on Climate*

*Change* with the stated objective of stabilising greenhouse gases, especially carbon dioxide.

**The only natural counter to carbon dioxide emissions is the absorption by regenerating and newly established forests.**

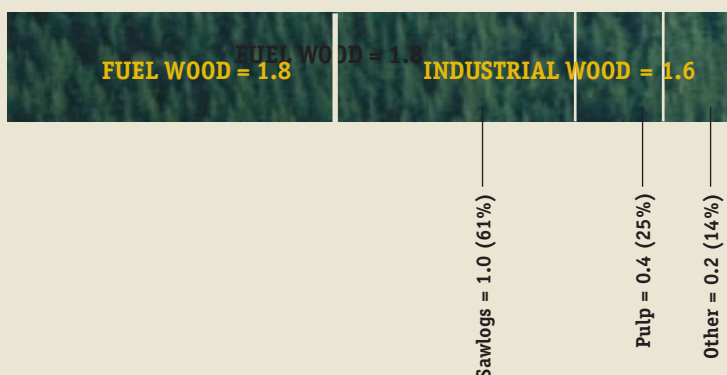
The use of both wood and fossil fuels produces atmospheric carbon dioxide. The only natural counter to carbon dioxide emissions is the absorption by regenerating and newly established forests.

Wood is formed from sugar that is "manufactured" by the photosynthesis process in the tree's needles or leaves. In this process, carbon dioxide from the atmosphere is combined with water from the soil (and solar energy) to form sugar (and oxygen). The tree soon transforms that sugar into wood. When wood is used as a fuel it is essentially releasing the solar energy that the tree used to make the sugar in the first place.

### A comparison between wood and wood substitutes for industrial uses

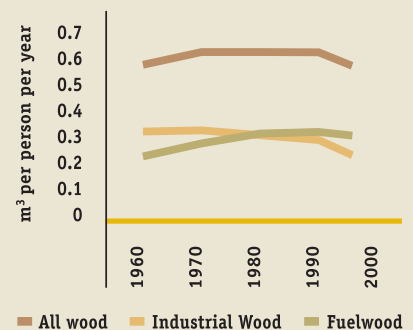
FAO figures suggest that the per capita consumption of wood has declined in recent years. Some of that reduction is probably explained by understatements in country returns, especially Russia, but some is almost certainly because wood is being replaced by substitutes such as metals, cement and plastic.

### GLOBAL WOOD HARVEST (billion m<sup>3</sup>)



### ANNUAL CONSUMPTION TRENDS

per capita of industrial wood, fuelwood, and all wood



The per capita consumptions are calculated from:  
 1 the annual wood harvests given in FAO yearbooks.  
 2 populations (based on mid year totals) from various yearbooks.

Most wood substitutes are made either from fossil fuels or the energy from them. Production of substitutes often involves processes that cause pollution, including the addition of significant amounts of carbon dioxide to the atmosphere. For instance, cement-making results in the release of fossil carbon from limestone.

Wood has an ideal and stable structure and is very strong for its weight. This is why wood is used in building and for joinery, furniture, containers, etc. When wood is made into useful solid wood products (as opposed to reconstituted wood products such as fibreboard or pulp) processing begins with the wood already in a form that requires the minimum of conversion. Not surprisingly wood is a very energy efficient raw material. In a comparison (Koch, 1992) of major wood uses it was established that solid wood products are ten to thirty times as energy efficient as fossil fuel substitutes.

### Further wood substitution is most unlikely

In the longer-term, further wood substitution is most unlikely.

The main reasons are:

#### 1. Constraints on the supply of energy

As most substitutes for wood require at least ten times as much energy as wood itself, widespread substitution of wood is not possible unless the world finds a cheap, large scale, renewable, and environmentally friendly new energy source. This must be an energy source that is non-polluting and does not produce atmospheric carbon dioxide.

A major factor is the sheer size of the wood-using sector relative to steel,

cement etc. Any constraint on the world energy supply is going to make further substitution of wood increasingly difficult. Because substitutes require comparatively more energy, any increase in energy prices will result in large cost increases for wood substitutes.

#### 2. The need for restraint on the further emissions of atmospheric carbon dioxide

If the world is serious about reducing the increase in atmospheric carbon dioxide the use of wood offers a realistic solution. Regenerating or newly established forests provide a recycling of emissions and, over time, do not contribute to atmospheric pollution.

#### 3. The use of wood is easier on the environment

Wood use involves the harvesting of forests but need not require the use of non-renewable resources. Wood is one of the least polluting of all products and is one of the world's very few renewable raw materials.

**Production of substitutes often involves processes that cause pollution... wood is a very energy efficient raw material.**



PINEWOOD PICTURES

### The future demand for wood

The major drivers of future wood demand will be global population, living standards and wood's cost competitiveness relative to substitute products.

As already shown, the relative cost of wood and wood substitutes will be largely determined by energy costs.

Fossil fuels and energy costs are expected to rise in the long-term because of the increasing awareness that resources (especially oil) are being depleted and





because of the strong likelihood of disincentives, especially carbon taxes. Any energy price increase will improve the cost competitiveness of wood and probably increase the demand for wood. By the end of 1999 the global population will exceed six billion and current expectations are that it should stabilise at around ten billion by the middle of the twenty-first century.

It is likely that much of this increase will be accompanied by improved living standards in developing countries. As living standards improve the demand for industrial wood increases. South Korea is a good example. In the period 1985 to 1990 the average wealth of the South Korean people doubled in real terms. That increase in wealth not only resulted in a slower rate of population increase but also increased average consumption, including a nearly 50% increase in the per capita consumption of industrial wood. And this was in a non-traditional wood using country (Sutton, 1993).

The dilemma for the world will be how to satisfy increased consumption expectations without an increase in the use of fossil fuels. Wood could make a major contribution. Because it is so energy efficient a far greater use of wood in the global economy would permit greater consumption without the need for more fossil fuel usage.

#### How much more wood is needed?

Let's assume that there is no further increase in the global average per capita use of wood and that by the middle of the new century the average demand for wood will be as it was in the mid 1990s, i.e. wood use will still average around 0.6 m<sup>3</sup> per person per year.

A global population of 10 billion using an average of 0.6 m<sup>3</sup> of wood per person per year would require an annual global wood harvest of 6 billion m<sup>3</sup> per year. That harvest is 2.5 billion m<sup>3</sup> more than the 3.5 billion m<sup>3</sup> annual global wood harvest of the mid 1990s.

#### How can we satisfy this increased demand?

Wood has traditionally come from natural forests. During the mid 1990s more than 80% of the world's industrial wood harvest came from natural forests, less than 20% coming from forests planted and managed for the production of industrial wood (i.e. plantations).

In theory, the natural forests of the world could support some increase in the future wood harvest. There are, however, at least two factors that will make this difficult:

- The ongoing conversion of natural forests to both farm and urban development land. FAO estimates that currently there is a net loss of over 16 million hectares of forests which are deforested each year (FAO 1997).
- There are concerns about the loss of wilderness, biodiversity, species habitat, as well as possible threats to recreation and tourism. While some of these concerns can and are being addressed, public pressures could demand less wood harvesting from natural forests.

These pressures are likely to limit further increases in the wood harvest from natural forests and will almost certainly increase wood costs. An extra 0.3 billion m<sup>3</sup> of harvested wood will most likely be the upper limit of the supply from natural forests.

Assuming that the current annual harvest of 3.5 billion m<sup>3</sup> (which comes from both natural forests and mature plantations) can be maintained, then an extra 0.3 billion m<sup>3</sup> from natural forests takes the total annual supply to 3.8 billion m<sup>3</sup>. The deficit between potential future demand and potential future supply is therefore 2.2 billion m<sup>3</sup>.

There are already established plantations (in regions such as Africa, Australasia and South America) which have not yet reached maturity. The additional supply from these plantations at maturity will be no more than 0.2 billion m<sup>3</sup> annually. This leaves a minimum potential annual supply deficit of (2.2 minus 0.2, or) 2 billion m<sup>3</sup>.

**How can the world obtain this additional supply of 2 billion m<sup>3</sup> of wood?**

There is a clear limit to further increases in the harvest from the world's natural forests. The wood cannot come from existing plantations - the expected harvest levels of both natural forests and existing plantations have already been included.

The only solution is to get the extra wood from plantations that have yet to be established. These plantations can be with tree species indigenous to the region or with species which have been introduced.

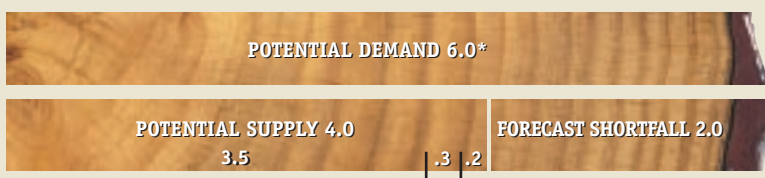
**Plantations have major advantages:**

- Plantations can ensure trees are grown for known end use options and markets, such as pulpwood, structural lumber and high value appearance grade wood for manufactured products.
- Plantations often have higher yields per hectare. This can reduce the area that needs to be felled to satisfy a given wood demand.
- Plantations can be profitable, especially when planted with fast-growing, well-managed trees.
- Plantations can often provide a profitable and practical way of restoring degraded and erosion-prone land, land that should never have been cleared of its forest cover in the first place.
- Much research is currently focused on the use of both natural forests and plantations as carbon 'sinks'.
- While they may have less biodiversity than natural forests, the greatest contribution that plantations make to biodiversity is indirect. Plantations reduce the need for wood harvesting in natural forests by providing an alternative source of wood (Sutton, 1995).



**The only solution is to get the extra wood from plantations that have yet to be established.**

**WOOD DEMAND AND SUPPLY 2050** (billion m<sup>3</sup>)



3.5 = Possible supply from existing natural and plantation forests  
 0.3 = Additional volume that may be supplied from natural forests  
 0.2 = Additional volume that will be harvested from existing plantation forests

**4.0 = Total Potential Supply**  
**2.0 = Forecast Shortfall** that can only be supplied by new plantation forests

*\*assuming a world population of 10 billion and per capita annual wood consumption of 0.6m<sup>3</sup>.*

- While much of the discussion so far has been about industrial demand for wood, the need for consistent supplies of fuelwood in the poorer areas of the world must not be ignored. As plantations can be established near to where the fuelwood is required, this reduces the time required to harvest and transport the wood. This could have major social and economic advantages.



PINEWOOD PICTURES

### What area of plantations might the world require?

Assuming high average yield and the use of productive land an extra 100 million hectares of additional plantations will be needed to supply two billion m<sup>3</sup> annually. This is an area equal to that of Nigeria or the Canadian province of British Columbia. Such a planting would require a huge global effort. This would require much of the world's land suitable for plantations and which is currently surplus to food production, but which is not already in forest.

There is real urgency for increased plantings because of the time required between initial establishment and final harvest. Fuelwood and some pulpwood plantations can be grown in under ten years but most industrial plantations require at least two to three decades to mature.

### Conclusions

If the world is to provide its future inhabitants with a reasonable standard of living, and if fossil fuels are either damaging to the global environment (because of permanent emissions of atmospheric carbon dioxide), or the supply is in any way limited, then a much greater use of wood offers a viable alternative. A wood consuming world would not solve all the concerns from the continuing use of fossil fuels but the wood solution would make a significant contribution. A wood based society would use less fossil fuel and produce less atmospheric carbon dioxide while permitting its population to still enjoy a high material standard of living.

Of the world's raw materials, wood is one of the very few that is renewable, sustainable and environmentally friendly. There is probably no other raw material which is so versatile.

One way the world could satisfy the potential future demand for wood, without significantly increasing the wood harvest from natural forests, is by the creation of a large area of plantations. These plantations would have the specific objective of supplying future wood demand. With sustainable forest management these plantations will supply environmentally friendly wood for centuries to come.

**References:** 1. FAO ( Food and Agriculture Organisation of the United Nations) 1997. **FAO Yearbook: Forest Products 1992 - 1996.** FAO forestry statistical series No 141, FAO Rome. 2. FAO 1997. **Forest resources assessment - global synthesis - baseline year 1990.** FAO Forestry Paper 124. 3. Koch, P. 1992. **Wood versus non-wood materials in residential construction: Some energy related global implications.** *Forest Products Journal* 42 (5) : 31-42. 4. Sutton, W. R. J. 1993. **The world's need for wood.** Pages 21-28 in **The globalization of wood** - the proceedings of a conference - **Supply processes, products and markets** held in Portland Oregon November 1 1993 and published by the Forest Products Society. 5. Sutton, W. R. J. 1995. **Plantation forests protect our biodiversity.** *New Zealand Forestry* 40(3): 2-5.