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# The Ukrainian Forest Sector in a Global Perspective

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# Contents

# Abstract

This paper was prepared for and presented at the so-called IIASA Days in Kiev, Ukraine held on 18–19 March 1999.

The paper discusses the possible long-term development of the international forest sector and endeavors to put the Ukrainian forest sector development options into this perspective. It is concluded that the niche for development is the low delivered wood costs in Ukraine. It can also be concluded that dramatic reconstruction of the forest industry in Ukraine is required.

Even if there is a substantial potential for development there are serious bottlenecks to be overcome. These bottlenecks are connected to the existing institutional framework in Ukraine. Without substantial changes in the institutional framework there are limited possibilities for the development of the Ukrainian forest sector.

# The Ukrainian Forest Sector in a Global Perspective

*Sten Nilsson and Anatoly Shvidenko*

## Introduction

The objective of this paper is to try to put the forest sector of Ukraine into a global perspective. Based on this and the Ukrainian conditions we will try to identify strategic choices facing the Ukrainian forest sector. We will start with the global demand and supply outlooks for wood and fiber.

## 1. Global Outlook

In order to get an outlook on the global fiber balance, we have used the sustainable yield approach, which tries to reflect supply as the sustainable yield (net annual growth or annual allowable cut) on productive, closed, and exploitable forests. There are a number of studies carried out on global wood fiber supply and demand. These studies are Apsey and Reed (1995), Brooks *et al.*, (1996), FAO (1997a and b, 1998), Nilsson (1996), Sedjo and Lyon (1996), Simons (1994), WRI (1997a and b), UNECE/FAO (1996). There is a lot of difficulty in comparing these studies due to the different methodologies, data and definitions used in the analysis. One of the few conclusions common to all of the studies is an estimated tightening of the global timber situation over the next 15–30 years. For our purpose we have chosen to use the WRI (1997b) study as a platform for our analyses.

The sustainable yield is the biological supply of wood under currently identified land-use rules and growth conditions. Probable supply is defined as the part of the biological supply that is likely to be available for use given available utilization technology, landowner attitudes, environmental restrictions, etc.

The estimates on the sustainable yield and probable supply for different regions are presented in Tables 1 and 2.

Table 1: Sustainable Yield Supply in 1995. Biological and Probable Supply (in million $m^3$/year). According to WRI (1997a).

| | CONIFEROUS | | NON-CONIFEROUS | |
|---|---|---|---|---|
| | **Biological** | **Probable** | **Biological** | **Probable** |
| Western Europe | 282 | 244 | 126 | 85 |
| Eastern Europe | 67 | 61 | 65 | 46 |
| Russia | 285 | 271 | 190 | 171 |
| North America | 436 | 392 | 276 | 193 |
| Latin America | 97 | 88 | 380 | 292 |
| Japan | 45 | 38 | 20 | 14 |
| China | 123 | 106 | 173 | 144 |
| Other Asia | 55 | 50 | 210 | 159 |
| Rest of the World | 24 | 22 | 173 | 127 |
| **Total** | **1416** | **1272** | **1612** | **1230** |

Table 2: Estimated Future Probable Supply in million $m^3$/year. According to WRI (1997b)

| | 1995 | | 2010 | | 2020 | | 2030 | |
|---|---|---|---|---|---|---|---|---|
| | **Coniferous** | **Non-Coniferous** | **Coniferous** | **Non-Coniferous** | **Coniferous** | **Non-Coniferous** | **Coniferous** | **Non-Coniferous** |
| Western Europe | 244 | 85 | 270 | 94 | 274 | 99 | 277 | 102 |
| Eastern Europe | 61 | 46 | 63 | 48 | 62 | 47 | 62 | 47 |
| Russia | 271 | 171 | 272 | 176 | 272 | 176 | 266 | 172 |
| North America | 392 | 193 | 439 | 189 | 442 | 179 | 448 | 173 |
| Latin America | 88 | 292 | 104 | 330 | 120 | 364 | 131 | 420 |
| Japan | 38 | 14 | 32 | 9 | 32 | 9 | 32 | 9 |
| China | 106 | 144 | 104 | 161 | 100 | 214 | 107 | 242 |
| Other Asia | 50 | 159 | 66 | 186 | 75 | 212 | 76 | 249 |
| Rest of the World | 22 | 127 | 24 | 147 | 25 | 116 | 30 | 118 |
| **Total** | **1272** | **1230** | **373** | **308** | **1401** | **1416** | **1426** | **1531** |

The global probable supply is estimated to be some 80% of the biological supply. However, in reality, the entire probable supply will not be used, as it is not all economically accessible.

As seen in Table 2, the major increases in probable supply between 1995–2020 are foreseen in Other Asia (some 115 million $m^3$/year) and in Latin America (170 million $m^3$/year). Hence, there will be a structural change in the future wood supply, meaning a reduction in supply from natural and extensively managed forests (Figure 1). On the other hand, plantation fiber will more than offset reductions in supply from natural forests. Although increased roundwood supply from short- and medium-term plantations will not only be used for pulp production, but also for solid wood products. Plantations, originally planted for fuel wood production, will increasingly be used as a fiber source by the forest industry. By the year 2030, plantation fiber is estimated to account for some 40% of the total probable supply to the forest industry, compared to 18% today.

Paper and board production is projected to increase from approximately 280 million tons in 1995 to 710 million tons in 2030. Printing and writing papers, tissue and packaging board are among the fastest growing paper and board products, with regional growth dominated by the economies of Asia and Latin America. A fundamental change is projected with respect to the pulp and paper sector in the continued substitution of recycled fiber and coatings/fillers for virgin pulp. As a percentage of the total forecasts, wood pulp decreases from 56% in 1995 to 42% by the year 2030. The increased use of recycled fiber helps reduce the incremental demand for wood by some 300 million $m^3$ annually.

The fastest growing product areas are composite boards (some 4% per year). Substitution for both solid wood products (composite products, non-wood products and engineered wood) and pulp and paper (electronic media) will play a key role in defining demand. As an illustration of the possible impact of the information technology we use estimates on the future reading format in the USA (Figure 2).

The incremental demand for some major forest industrial products is illustrated in Figures 3 and 4.

All of these factors result in an increase of industrial roundwood demand by 1.74% per year during 1995–2030. The *industrial* roundwood demand is expected to increase from some 1.6 billion $m^3$ per year in 1995 to 2.9 billion $m^3$ per year in 2030 (Figure 5).

Very few countries in the world have reliable statistics on the fuel wood consumption (even in the developed world). Therefore there are gross uncertainties surrounding estimates of roundwood fuel wood demand. We have chosen to use a conservative estimate on future fuel wood consumption produced by WRI (1997b). This estimate is presented in Table 3 (wood for charcoal production is not included which was 25 million $m^3$ in 1995). This estimate gives a total fuel wood consumption of 2,175 billion $m^3$ in the year 2030 or an increase of nearly 460 million $m^3$ compared to 1995.

There will be a number of imbalances at the regional level with respect to *industrial* wood in the year 2030. The wood balances are calculated based on the probable supply and demand development discussed earlier in the text. The balances with respect to industrial wood are presented in Figures 6 and 7.

Table 3: Global Fuel Wood Demand 1995–2030 (WRI, 1997b) in million $m^3$/year

| | 1995 | | 2010 | | 2020 | | 2030 | |
|---|---|---|---|---|---|---|---|---|
| | **Coniferous** | **Non-Coniferous** | **Coniferous** | **Non-Coniferous** | **Coniferous** | **Non-Coniferous** | **Coniferous** | **Non-Coniferous** |
| Western Europe | 17 | 21 | 17 | 22 | 17 | 22 | 17 | 22 |
| Eastern Europe | 16 | 80 | 14 | 79 | 13 | 78 | 12 | 77 |
| Russia | 34 | 205 | 35 | 212 | 36 | 216 | 36 | 220 |
| North America | 12 | 24 | 12 | 24 | 12 | 24 | 12 | 24 |
| Latin America | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Japan | – | – | – | – | – | – | – | – |
| China | 83 | 121 | 93 | 137 | 98 | 145 | 104 | 153 |
| Other Asia | 19 | 644 | 20 | 742 | 20 | 797 | 20 | 856 |
| Rest of the World | 3 | 440 | 4 | 515 | 4 | 563 | 4 | 617 |
| **Total** | **184** | **1536** | **194** | **1731** | **200** | **1845** | **206** | **1970** |

For coniferous *industrial* wood the most expressed deficits are for North America, Eastern Europe, China, Other Asia, and the Rest of the World. The dominating surplus regions are Russia and Western Europe. The large deficit regions with respect to non-coniferous *industrial* wood are North America, Japan and other Asia. The dominating surplus regions are Latin America and Russia.

But the balance presented did not include fuel wood. If we add fuel wood to the picture (with all its uncertainties) we get a picture of the wood balances as illustrated in Figures 8 and 9. With the fuel wood demand included in the balances the picture will not change much for coniferous wood in comparison with only the demand of industrial wood included. But for non-coniferous wood the picture will change dramatically with huge deficits in Other Asia, the Rest of the World, Russia and Eastern Europe. However, it should be underlined that there are uncertainties on how much of the fuel wood consumption is really stemming from the probably wood supply.

Major conclusions that can be drawn from the global outlook are:

- Global wood supply, while increasing, is unlikely to keep pace with even moderate increases in demand. Demand for forest products is increasing at a faster rate than the available global supply;
- The next 30 years will bring regional wood shortages and constraints;
- Investments in plantations throughout the southern hemisphere will increase;
- New primary manufacturing operations will be targeted toward emerging resources, rather than traditional demand areas of the world;
- The acquisition of start-up resources and manufacturing investments in the southern hemisphere will be the mechanism by which some old-line players in the north become global forest industry players;
- It will be those companies that understand the evolving role fiber will play in shaping the global forest industry of the future that will survive to be part of the future.

With respect to the European forest sector the following conclusions can be made:

- European wood-based industries will face increasing competition in world markets from both pulp and solid wood products based on extremely cost-competitive southern plantation fibers.
- Hence, European producers will find it increasingly difficult to compete internationally in commodity products, and a shift toward the production of niche or differentiated products will be necessary.

- As illustrated earlier the demand growth on forest products will be low in Europe.
- The industrial coniferous wood balance for Europe will fall into a deficit situation during the studied time horizon (1995–2030).
- The European coniferous-based forest industry will expand only modestly over the forecast period and will expand imports from Russia and Latin America.
- The regions that have defined the forest industry over the past 100 years (northern Europe and North America), will become less important due to relatively static manufacturing capacity.
- The western European industries will continue to operate in an environment of high wood costs, which is an opportunity for the forest sectors of Eastern Europe and Russia.

## 2. Ukrainian Forest Resources

The Ukrainian forest classification system follows the former USSR system, which means a division into *Forest Fund*, subdivided into *Forest Land* and *Non-forest* land. The Forest Fund is constituted by the land which could be of importance for the forest sector economy and amounts to 10.78 million ha. The Forest Land includes Forested Areas and Unforested areas; the latter are designated for forest growth but are temporarily without forests. The Forest Land constitutes 10.04 million ha. The Forested Areas (stocked forests) amounts to 9.4 million ha. This means that the forest cover (Forested Areas) is 15.6% of the total land area. The total growing stock on Forested Areas is 1.74 billion $m^3$. These figures correspond to 0.18 ha of Forested Areas and 33 $m^3$ of growing stock per capita. Figures which are similar to the conditions in Germany and France. The production values of the forest sectors in Germany and France are 1090 US$/capita and 890 US$/capita respectively. In Ukraine the corresponding value is in the range of 10 US$/capita (Hazley, 1998).

The forests are dominated (Forested Areas) by pine (33%), oak (33%), spruce (8%), and beech (7%) and are characterized by high productivity. The annual total average increment is 4.0 $m^3$/ha (for forests under State Forest Management — 4.8 $m^3$/ha), which is about 10% higher than the average level in the EU countries. There is a dominance of young and middle aged stands, accounting for 76% of the total forests. The average age of forests is 51 years and the average age of coniferous is 49 years (Shvidenko and Andrusishin, 1998). The age distribution is illustrated graphically in Figure 10. The high productivity and the dominance of young forests results in a high aggregated average increment of 35 million $m^3$ per year (Derjcomlis, 1998).

In Ukraine the so-called first group forests (forests with protection functions) account for 56% of the Forested Areas. In these protected forests 6.6% are inaccessible and 30.2% have restrictions on the rate of exploitation according to the forest legislation. By this more than 200 million m³ of premature and mature stands are excluded from industrial utilization.

The development of the forest resources in Ukraine over the period 1961–1996 is illustrated in Table 4.

Table 4: Forest Resource Development in 1961–1996 (According to Shvidenko and Andrusishin, 1998).

| **Indicators** | **1961** | **1966** | **1973** | **1978** | **1983** | **1988** | **1996** |
|---|---|---|---|---|---|---|---|
| Forested Area, thousand ha | 7131 | 7771 | 8457 | 8261 | 8558 | 8620 | 9400 |
| of which exploitable forests[1] | 3368 | 3417 | 4448 | 4438 | 4331 | 4312 | 5680 |
| Planted forests, thousand ha | n.a. | n.a. | 3706 | 2685 | 2832 | 3885 | 4715 |
| Growing stock, million m³ | 733 | 738 | 968 | 1026 | 1240 | 1320 | 1736 |
| of which acceptable for exploitation | 421 | 398 | 613 | 627 | 711 | 731 | 849 |
| Average growing stock , m³/ha | 103 | 95 | 115 | 124 | 145 | 153 | 185 |
| Reforestation, total by 5 – years periods, thousand ha | 771 | 415 | 283 | 260 | 238 | 221 | 181 |
| of which, planting of forests | 722 | 385 | 262 | 240 | 219 | 209 | 164 |

[1] Forested Area under state forest management.

From Table 4 it can be seen that nearly half of the Forested Areas are constituted by planted forests and that the area of planted forests have increased substantially during the studied period.

There are a number of positive developments of the Ukrainian forest sector between 1988 and 1996. The Forested Areas have increased by 800,000 ha (which can, to a large extent, be explained by changes in the Forest Code and improved forest inventory system), the average growing stock has increased from 153 to 185 m³/ha, and the total annual increment has increased from 22.4 million m³ to 35 million m³. But there are also negative trends. During the same period the unforested areas have increased from 184,000 ha to 292,000 ha. There has been a deterioration of the growing stock quality in unexploitable forests and the average growing stock of mature and overmature exploitable forests have declined due to premature harvests. The quality of the forests managed by the Ministry of Agriculture has continued to worsen.

We have studied the wood balance of Ukraine for the period 1961–1996 by taking into account the development of Forested Areas, increment, growing stock and harvest. In these calculations we find a loss of some 400 million $m^3$ (the same size as the total harvest between 1961–1996), which we can not explain. Thus, an appropriate question is: "Where have the 400 million $m^3$ gone?"

Ukrainian forestry is facing specific problems connected with the explosion at the Chernobyl atomic power station. The area of contaminated forests exceeds 4 million ha (nearly 45% of the Forested Areas), of which 157,000 ha are completely taken out of economic use. This means that a considerable part of Ukraine's timber potential was lost due to the Chernobyl accident.

Ukrainian forests present a considerable fire hazard due to large areas of planted mono cultures of pine. In 1994, 7400 fires were registered, which affected an area of 3100 ha. Nearly all of the fires were caused by man (Shvidenko and Andrusishin, 1998). The fires may also lead to serious emissions of radionuclides in the contaminated forests.

The anthropogenic pressure on the forests have caused an extended weakening of the forests over time. Thus, in 1995, 445,000 ha was damaged by pests and diseases and the areas of dead forests were estimated to be 20,000 ha in 1996.

Ukrainian agricultural land is one of the best in the world from a productivity point of view. However, between 1961 and 1981 the content of humus in the agricultural soil decreased from 3.5 to 3.2%. The area eroded is estimated to have increased by 70-100,000 ha per year during the last decades (MEPRS, 1996). Forests and shelter belts play a very crucial role in protecting soils from erosion, and agricultural landscapes from deterioration. About 1.6 million ha of protected forests are growing on lands of agricultural organizations of which 150,000 ha are shelter belts along small rivers and 440,000 ha are shelter belts, which protect 13 million ha of arable land (Shvidenko and Andrusishin, 1998).

About 10% of the Forest Fund has the status of natural reserves. The total area of specially protected areas is 1.66 million ha or 2.8% of the total land.

## 3. Institutional Framework

Some 65% of the Forested Areas are under the ownership and jurisdiction of state forestry bodies, 26% are managed by agricultural cooperatives, and 8% are managed by state agricultural enterprises and other organizations. Despite the modest extent of forests and economic impact by the forest sector (some

4% of the total economy, Rudenko, 1993) the Ukrainian forests play an important role in the society. This is reflected in the Ukrainian forest legislation, which states “The forests are part of Ukraine’s wealth and exercise primarily ecological, aesthetic, educational and other functions”. Accordingly, the forest legislation is applying strict limitations on harvesting in protection forests.

In the Ukrainian Land Legislation it is proclaimed that the forests are state property and can not be the subject for privatization. Forests are also regulated by the Forest Code of 1994. Forests may be rented out temporarily or permanently for different kinds of utilization. Permanent forest utilization is only allowed by so-called forestry enterprises. Areas of the Forest Fund may be rented out (for a short term of 3 years or for a long term up to 25 years) to enterprises, organizations and private citizens both of Ukraine and other states. There is a division of the forest resources into: (1) resources of state importance (wood from final harvest and resin collection), and (2) resources of local importance (all other products). This means that the wood coming out of thinnings do not necessarily have to be used by the forest industry.

All citizens have the right to walk in the forests, pick berries and mushrooms. Any other utilization is connected with a fee. The stumpage fee for the final harvest is set by Ukraine’s Cabinet of Ministers.

The forest legislation has not yet taken its final shape and Ukraine does not have a properly organized system for public influence on the interactions between the society and the utilization of forest resources.

# 4. Forest Utilization

The development of the harvesting rates in Ukraine during the period 1990–1997 is presented in Table 5.

Table 5: Harvesting Rates of Commercial Wood (Industrial and Fuel Wood) in Ukraine During 1990–1997 in 1000 m³ (According to Shvidenko and Andrusishin, 1998).

| | **1990** | **991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** |
|---|---|---|---|---|---|---|---|---|
| Final Felling | 6269 | 5785 | 5304 | 5325 | 5082 | 5009 | 6070 | – |
| Intermediate Harvest | 8080 | 7394 | 7493 | 6721 | 6845 | 6955 | 5337 | – |
| **Total** | **14349** | **13179** | **12797** | **12046** | **11927** | **11964** | **11407** | **11430** |

The harvest has decreased by some 20% during the studied period, which is a surprisingly small decline taking into account the dramatic transition of the Ukrainian economy taking place during this period. The corresponding development, during the same period of time, in Russia is a decline in the harvest level by roughly two thirds.

The amount of final felling volume has been limited by the lack of mature stands.

# 5. Harvesting Potentials

The debates on the sustainable level of the harvests have been going on for decades in Ukraine. Calculations, based on dynamic models, current state of the forests, productivity, anthropogenic pressure, environmental constraints, give a result illustrated in Table 6. These results are based on analyses by Shvidenko, *et al.* (1987), Isaev (1991), Nilsson, *et al.* (1992), and Ukrainian Ministry of Economy and Ukrainian Academy of Sciences (1993).

Table 6: Harvesting Potentials in million m³.

| | **2000** | **2010**<br>**"Realistic" Scenario** | **2020**[1] |
|---|---|---|---|
| Final Felling | 6.2–8-3 | 7.0–9.4 | 9.3–10.1 |
| Intermediate Harvest | 5.5–6.4 | 5.3–6.5 | 6.8–7.6 |
| **Total** | **12.5–14.2**<br><br>**14** | **13.3–14.7**<br>**"Optimistic" Scenario**<br>**17** | **16.9**<br><br>**20–21** |

[1] According to Nilsson, *et al.* (1992).

These analyses show a "realistic" total maximum sustainable harvest level of 14 million m³ in the year 2000, 15 million in the year 2010, and 17 million in the year 2020. The distribution of these amounts over type of fellings, species groups and use group is illustrated in Table 7.

Table 7: Distribution of Potential Harvest Levels of Commercial Wood Over Type of Fellings, Species Groups, and Use Groups in million $m^3$.

| | **2000** | **2010** | **2020** |
|---|---|---|---|
| Total Harvest | 14 | 15 | 17 |
| · Final Felling | 8 | 9 | 10 |
| · Intermediate | 6 | 6 | 7 |
| Coniferous | 8.5 | 9 | 10 |
| Non-coniferous | 5.5 | 6 | 7 |
| Fuel Wood | 7 | 7 | 7 |
| Industrial Wood | 7 | 8 | 10 |

The “optimistic” scenario is not implementable under current conditions. This scenario requires: (1) a significant increase of reforested areas, (2) strong improvement of the forest legislation, (3) radical improvement of harvesting technologies, (4) utilization of soft deciduous species by the industry, and (5) harvest in protected forests.

The final felling is dominating but there is a high extent of intermediate harvests (40–45%) due to the age structure of the forests. The coniferous harvests dominate the total harvest. There is a large amount of fuel wood included in the commercial harvest and only 8–10 million $m^3$/year can be regarded as a sustainable harvest level of industrial wood. However, some of the fuel wood assortment can be used in the board industry and for pit props. With an average annual total growth of 35 million $m^3$ at the average age of 50–55 years of the forest, the maximum theoretical harvest level can not under the Ukrainian Forest Fund Structure and current environmental and forest legislation exceed 20–21 million $m^3$ per year.

The Ukrainian Academy of Sciences (1993) claims that the removal of the ban on logging in protection forests can allow for an additional harvesting of commercial wood of 3–5 million $m^3$ per year without threatening the protective functions of these forests. We do not see this proposal as realistic due to the fact that the Ukrainian forests are under-protected rather than over-protected.

The estimates presented in Table 7 are supported by Poliakov and Backman (1996). They used a "window" model and came to the conclusion that the maximum harvest level around 2015 is about 17 million $m^3$ per year.

Bobko (1994, 1996) claims (without any quantitative analyses) that changes of legislation and organization of the forest utilization would make it possible to increase the final fellings to 12–15 million $m^3$ per year and by that the total harvest to 20–22 million $m^3$ per year. We do not judge this as a suitable option based on the quantitative analyses presented in Table 7.

In August 1993, the Cabinet of Ministers of Ukraine adopted the "Program of Development of Forest and Forest Industrial Complexes of Ukraine up to 2015" (Ukrainian Academy of Sciences, 1993 and MEPS, 1996). The Program proposes a long-term expansion of the forested areas by 3–4.5 million ha, which would increase the forest potential substantially. But given the overall economic conditions, we are of the opinion that these intentions will not be currently implemented and will not influence the wood supply possibilities in the mid-term.

Therefore, our current understanding is that the maximum sustainable harvest level in Ukraine is 14 million $m^3$ today, 15 million $m^3$ in the year 2010 and 17 million in the year 2020. With substantial investment programs and radical changes of the institutional framework a sustainable harvest of 20–21 million $m^3$ in the year 2020 may be possible.

# 6. Domestic Demand

The wood demand during the 1980s in Ukraine is estimated to be 38–40 million $m^3$ of roundwood equivalents. Over time, the domestic demand of forest products has been satisfied by a huge import from the former USSR. The amount of imported timber and forest products during the 1970s amounted to 32 million $m^3$ of roundwood equivalents and the import decreased in 1990 to 21 million $m^3$ roundwood equivalents and in 1993 to 5.8 million $m^3$. Today, there is hardly any import at all of roundwood and forest products to Ukraine due to the economic conditions.

By using background information on consumption of different forest products from Poliakov (1995) and Poliakov and Backman (1996) an estimate can be made on the domestic demand of commercial wood in Ukraine. For the estimate on the future demand in the mid-term a modest economic growth scenario has been used (Table 8).

Table 8: Estimate on Domestic Demand of Commercial Wood in Ukraine. According to Poliakov (1995) and Poliakov and Backman (1996). In million m³ of roundwood equivalents.

| 1990 | 1993 | Mid-term Estimate |
|---|---|---|
| 38 | 18.5 | 22 |

If these numbers are compared with our estimate on the sustainable harvest level in the mid-term of 15–17 million m³, it can be concluded that Ukraine can not be self-sufficient in order to support the domestic demand of commercial wood. An import is necessary of the size of 5–7 million m³ roundwood equivalents per year.

# 7. Domestic Industrial Capacity

As illustrated above, historically the Ukrainian forest industry operated to a large extent based on imported cheap subsidized wood from Russia. In 1989–1990 the import of logs was 9–10 million m³ and the domestic production of industrial wood was 6–7 million m³. This means that the structure of the current industry is built on large and cheap import of wood.

The forest industry structure is dominated by sawmills (from a wood consuming point of view), board industry and paper industry. The manufacturing equipment is rather old. Ukrainian Academy of Sciences (1993) estimates that some 75% of the equipment is more than 25 years old. There is no satisfactory statistics on the existing industrial capacity today in Ukraine. But based on information from Andrusishin (1994), Poliakov (1995), and MEPRS (1996) we estimate the forest industrial capacity to be of the size corresponding to 27–28 million m³ roundwood equivalents. Some of this capacity utilizes wood waste and the capacity using primary fibers is estimated to be 23–24 million m³ roundwood equivalents.

If this capacity is compared with the sustainable supply of industrial wood of 10 million m³ (and perhaps 2 million m³ of the fuel wood can be used in the board industry) it can be concluded that there is an industrial over-capacity of some 12 million m³ roundwood equivalents. This over-capacity can only operate based on cheap imported wood and that is not a feasible option today. Therefore a lot of industrial capacity has to be closed down and a complete restructuring of the industry must take place. The forest industry is deadlocked today due to the transition.

## 8. Wood Costs

In comparison with the rest of Europe the wood costs are very low in Ukraine. The stumpage fee for large sized high quality industrial wood of coniferous (sawlogs) is 4–5$US/m³ and for high quality oak and beech 8–9$US/m³ (Shvidenko and Andrusishin, 1998). The stumpage for pulp logs and lower quality logs are even less.

## 9. Restructuring of the Ukrainian Forest Industry

In order to get a healthy forest sector in Ukraine the forest industry has to be restructured. From the global outlook it can be concluded that Europe (western) is a high wood cost region and will probably remain like that. It was also concluded that competition will increase in Europe with a price press as a result and that European producers must cultivate niches for survival. The obvious niche for the Ukrainian forest industry is the low wood costs. This is illustrated in Figures 11 and 12 on the average delivered wood costs to industry. In these figures we have used the stumpage fees discussed above and logging-, road- and transportation costs estimated by Poliakov (1995) to be twice as much as the stumpage fee.

From these figures, it can be seen that there are only two other regions in the world with lower delivered coniferous wood costs than Ukraine, namely Latin America and Indonesia. Compared with the European Union, Ukraine is substantially below the delivered coniferous wood costs in the Union. The picture is similar for non-coniferous wood products. Hence, the low delivered wood costs are an avenue for the strategy of reconstructing the industry. If we combine this information with wood fiber costs as a percentage of the average production costs (Figure 13) we get an indication on which products to concentrate. The concentration should be on the products with the highest wood fiber cost percentage of the average production costs. These products are sawn wood, liner and bleached sulphate pulp. If a similar exercise is carried out for non-coniferous the result is sawn wood, mechanical pulp and wood free papers.

If we look into the contribution of 1 m³ wood to export revenue, contribution to GDP, labor income, and employment we get the following priorities: coniferous sawn wood, bleached sulphate pulp, mechanical pulp and wood free papers.

Thus, in order to start restructuring the forest industry in a sound direction a lot of existing capacity has to be closed and the remaining capacity should concentrate on saw milling, pulping, and wood-free papers. The key market target for the products would be Europe. It can be argued that there is already

a substantial industrial over-capacity in Europe (DI, 1999). But against this argument it can be stated that the competitive position, illustrated above, the Ukrainian industry would be the price setter in Europe with a reconstructed industry.

A sound forest industry is a must in order to achieve a sustainable development of forestry in Ukraine. The income by the industry will to certain degrees be redistributed to forestry, which will make it possible to carry out necessary investments in forestry.

## 10. Is Restructuring of the Ukrainian Forest Sector Possible?

It is generally acknowledged that forestry reform is overdue in Ukraine. A strategy and a Forest Code have to be developed, which ensure sustainable development of forest resources and the forest industry. This means that a new mechanism of interaction between bodies of state administration, forestry and forest industry enterprises, and consumers must be established.

The Greenhouse Gas emissions are estimated to be 233 TgC in Ukraine in the early 1990s (AREUE, 1997 and MEPS, 1998a). Forestry, which is the only sector constituting a net sink in the country, is estimated to have a net sequestration of 14 TgC. Ukraine has significant possibilities to improve its greenhouse gas balance by forest/land-use management improvements. Land is available and productivity of forests is high.

The Red Data Book for the Ukraine contains 383 animal species. The Ukrainian government has signed many agreements in order to protect the environment and the biodiversity (MEPS, 1996, 1998a) and has developed a Strategy of Conservation of Ukraine's Biological Diversity (MEPS, 1998b). But in spite of these efforts, due to a chronic lack of funds, not much of these strategies have been implemented in reality. There is a high priority to increase the areas under protective management to 5% of the territory in order to save the biodiversity.

During the Soviet era there was a rigid branch organization, which resulted in conflicts between forestry and the forest industry. These bottlenecks still remain. In order to get a sound development of the industry, it is dependent on secured wood deliveries. The current organizational system of the forest sector does not allow this. For example, the wood from the intermediate fellings have been declared a local resource, which hinder the industry to get access to the wood.

In the privatization process of the forest industry the mechanical wood processing industry has been able to privatize without difficulties. But for the privatization of the pulp and paper industry permission by the Cabinet of Ministers has been required, which has slowed down the process. Still, some 45% of the forest industry is not privatized.

Capital investments in the sector are lacking in Ukraine and the dominating part of the investments in the forest industry are still state investments and it can be expected that some of these investments have been made in industries, which should have been closed down (Shvidenko and Andrusishin, 1998). It should also be pointed out that not a single enterprise in Ukraine is owned by a multi-national company or individuals in foreign countries.

The development of the overall economy is of major concern for structural change in the forest sector (and all Ukrainian sectors). The difficult development of the overall economy in Ukraine can be illustrated by the average annual inflation of 800% during 1990–1996 (Rose, 1998) and the real GDP development (Table 9).

Table 9: Growth in Real GDP in Eastern Europe, the Baltics and the CIS (according to Stern, 1998).

| | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|
| | | | *(percentage change)* | | |
| Albania | -7.2 | 9.6 | 9.4 | 8.9 | 9.1 |
| Bulgaria | -7.3 | -1.5 | 1.8 | 2.1 | -10.9 |
| Croatia | -11.7 | -0.9 | 0.6 | 1.6 | 4.3 |
| Czech Republic | -3.3 | 0.6 | 3.2 | 6.4 | 3.9 |
| Estonia | -14.2 | -8.5 | -1.8 | 4.3 | 4.0 |
| FYR Macedonia | -21.1 | -8.4 | -4.0 | -1.4 | 1.1 |
| Hungary | -3.1 | -0.6 | 2.9 | 1.5 | 1.3 |
| Latvia | -34.9 | -14.9 | 0.6 | -0.8 | 2.8 |
| Lithuania | -37.7 | -17.1 | -11.3 | 2.3 | 5.1 |
| Poland | 2.6 | 3.8 | 5.2 | 7.0 | 6.1 |
| Romania | -8.7 | 1.5 | 3.9 | 7.1 | 4.1 |
| Slovak Republic | -6.5 | -3.7 | 4.9 | 6.8 | 6.9 |
| Slovenia | -5.5 | 2.8 | 5.3 | 4.1 | 3.1 |
| *Eastern Europe and the Baltic States* | *-4.1* | *0.7* | *3.5* | *5.3* | *4.2* |
| Armenia | -52.6 | -14.8 | 5.4 | 6.9 | 5.8 |
| Azerbaijan | -22.6 | -23.1 | -18.1 | -11.0 | 1.3 |
| Belarus | -9.6 | -7.6 | -12.6 | -10.4 | 2.6 |
| Georgia | -44.8 | -25.4 | -11.4 | 2.4 | 10.5 |
| Kazakhstan | -2.9 | -10.4 | -17.8 | -8.9 | 1.1 |
| Kyrgyzstan | -19.0 | -16.0 | -20.0 | -5.4 | 5.6 |
| Moldova | -29.1 | -1.2 | -31.2 | -3.0 | -8.0 |
| Russia | -14.5 | -8.7 | -12.6 | -4.0 | -4.9 |
| Tajikistan | -29.0 | -11.0 | -18.9 | -12.5 | -4.4 |
| Turkmenistan | -5.3 | -10.0 | -18.8 | -8.2 | -8.0 |
| Ukraine | -13.7 | -14.2 | -23.0 | -12.2 | -10.0 |
| Uzbekistan | -11.1 | -2.3 | -4.2 | -0.9 | 1.6 |
| *Commonwealth of Independent States* | *-14.3* | *-9.3* | *-13.5* | *-4.9* | *-4.6* |
| **Eastern Europe, the Baltics and the CIS** | **-10.5** | **-5.5** | **-7.1** | **-1.1** | **-1.3** |

A reconstruction of the forest sector will require a lot of foreign capital. The attraction of foreign capital is not only a question of cheap wood and strong competitive production costs on the paper. The main question is boiling down to the issue of the possibilities to operate efficiently within the overall economic and institutional framework.

There are many overall institutional framework aspects in the society which hinder the needed structural change of the forest sector. We will just illustrate these conditions by two examples, namely unofficial payments by enterprises for official permits (Table 10), and trust in political and civil institutions (Table 11). With this kind of phenomena and distortions in the overall institutional framework it will make it difficult to achieve any structural changes in the forest sector.

Table 10: "Unofficial" Payments by Enterprises for Official Permits, etc., in Ukraine (according to Raiser, 1997).

| **Ukraine** | | | | | |
|---|---|---|---|---|---|
| | "Unofficial fee": type of licence/favor | Average "unofficial" fee required for "favor"[1] | | % of enterprises admitting need to pay "unofficially" | |
| | | 1996 | (1994) | 1996 | (1994) |
| 1 | Enterprise registration | $176 | ($186) | 66% | (64%) |
| 2 | Each visit by fire/health inspector | $42 | ($40) | 81% | (72%) |
| 3 | Tax inspector (each regular visit) | $87 | ($91) | 51% | (56%) |
| 4 | Each phone line installation | $894 | ($550) | 78% | (95%) |
| 5 | Lease in state space ($m^2$ per month) | $7 | (na) | 66% | (88%) |
| 6 | Each export licence/registration | $123 | ($217) | 61% | (96%) |
| 7 | Each import licence/registration | $278 | ($108) | 71% | (93%) |
| 8 | Each border crossing (lump sum) | $211 | ($194) | 100% | (90%) |
| 9 | Each border crossing (% of value) | 3% | (na) | 57% | (na) |
| 10 | Domestic currency loan from bank (preferential terms) | 4% | (na) | 81% | (na) |
| 11 | Hard currency loan (preferential terms) | 4% | (na) | 85% | (na) |

[1] Average among those that admit making unofficial payments.

Table 11: Trust in Political and Civil Institutions by Country: Means (stand deviations). According to Rose, *et al*. (1997).

| **Trust in:** | **BUL** | **CZE** | **SLK** | **HUN** | **POL** | **ROM** | **SLE** | **BEL** | **UKR** | **Mean** |
|---|---|---|---|---|---|---|---|---|---|---|
| Government | 2.7 | 4.6 | 3.7 | 3.2 | 3.5 | 3.3 | 3.7 | 3 | 2.4 | 3.4 |
| | (1.6) | (1.6) | (1.7) | (1.7) | (1.6) | (1.7) | (1.8) | (1.6) | (1.6) | (1.8) |
| Parliament | (2.2) | (3.6) | (3.4) | (3.2) | (3.5) | (3.2) | (3.5) | (2.9) | (2.6) | (3.1) |
| | 1.4 | 1.5 | 1.5 | 1.6 | 1.5 | 1.6 | 1.6 | 1.6 | 1.7 | 1.6 |
| President | 4 | 5.1 | 4.8 | 5 | 3.1 | 4.0 | 4.2 | 3.3 | 2.6 | 4 |
| | (1.9) | (1.8) | (1.7) | (1.8) | (1.7) | (2.1) | (2.0) | (1.7) | (1.8) | (2.0) |
| Civil Servants | (2.9) | (3.7) | (3.7) | (3.8) | (3.5) | (3.4) | (4.1) | (3.2) | (3.0) | (3.5) |
| | 1.6 | 1.3 | 1.5 | 1.6 | 1.4 | 1.7 | 1.6 | 1.6 | 1.6 | 1.6 |
| Courts | 2.8 | 4 | 3.8 | 4.3 | 3.9 | 4.1 | 4.1 | 3.5 | 3.2 | 3.7 |
| | (1.7) | (1.5) | (1.6) | (1.7) | (1.5) | (1.8) | (1.8) | (1.6) | (1.8) | (1.7) |
| Parties | 2.5 | 3.7 | 3.2 | 2.8 | 2.6 | 3.0 | 2.8 | 2.7 | 2.4 | 2.8 |
| | (1.6) | (1.3) | (1.6) | (1.5) | (1.3) | (1.6) | (1.5) | (1.7) | (1.5) | (1.6) |
| Army | 4.6 | 4.1 | 4.4 | 4.3 | 4.8 | 5.5 | 3.9 | 4.0 | 3.8 | 4.4 |
| | (1.9) | (1.5) | (1.6) | (1.7) | (1.6) | (1.6) | (1.9) | (1.8) | (1.9) | (1.8) |
| Police | 2.9 | 3.9 | 3.7 | 4.2 | 4.1 | 3.8 | 4.0 | 3.2 | 2.8 | 3.6 |
| | (1.7) | (1.5) | (1.6) | (1.7) | (1.6) | (1.8) | (1.7) | (1.7) | (1.7) | (1.7) |
| Media | 3.7 | 4.2 | 4.0 | 3.7 | 3.9 | 3.2 | 3.8 | 3.7 | 3.7 | 3.8 |
| | (1.8) | (1.4) | (1.5) | (1.6) | (1.5) | (1.6) | (1.6) | (1.7) | (1.8) | (1.6) |
| Churches | 3.4 | 3.5 | 4.2 | 4.1 | 4.0 | 5.4 | 3.5 | 4.6 | 4.2 | 4.1 |
| | (2.0) | (1.8) | (2.0) | (1.9) | (1.9) | (1.8) | (2.0) | (2.0) | (2.1) | (2.0) |
| Patriotic societies | 2.7 | 4.0 | 3.8 | 3.3 | 3.2 | 3.3 | 4.1 | 3.0 | 3.0 | 3.4 |
| | (1.8) | (1.4) | (1.6) | (1.6) | (1.4) | (1.8) | (1.7) | (1.7) | (1.8) | (1.7) |
| Farm | 3.1 | 4.0 | 3.8 | 3.9 | 3.6 | 4.0 | Na | 3.7 | 3.3 | 3.7 |
| organizations | (1.8) | (1.3) | (1.4) | (1.6) | (1.5) | (1.9) | | (1.7) | (1.8) | (1.6) |
| Unions | 2.5 | 3.4 | 3.4 | 3.5 | 3.0 | 3.4 | 3.2 | 3.0 | 2.7 | 3.1 |
| | (1.5) | (1.2) | (1.2) | (1.3) | (1.3) | (1.9) | (1.7) | (1.4) | (1.4) | (1.5) |
| Private enterprise | 2.7 | 4.2 | 3.5 | 3.9 | 3.1 | 4.1 | 3.4 | 2.9 | 3.4 | 3.5 |
| | (1.8) | (1.4) | (1.7) | (1.6) | (1.5) | (1.9) | (1.7) | (1.8) | (1.9) | (1.8) |
| Foreign experts | 2.5 | 3.6 | 3.2 | 3.3 | 2.9 | 3.4 | 3.5 | 3.1 | 3.2 | 3.2 |
| | (1.7) | (1.6) | (1.5) | (1.7) | (1.6) | (1.9) | (1.7) | (1.7) | (1.8) | (1.7) |

Source: Paul Lazarsfeld Society, Vienna. New Democracies Barometer III, 1994. Rose, Mishler and Haerpfer (1997), p. 17.

Note: Trust is scored on a 7-point scale with 7 = maximum trust and 1 = maximum distrust.

BUL = Bulgaria; CZE = the Czech Republic; SLK = Slovakia; HUN = Hungary; POL = Poland; ROM = Romania; SLE = Slovenia; BEL = Belarus; UKR = Ukraine; Mean = Average for all 9 countries. The sample for each country/institution range between 755 and 1000 cases.

The Ukrainian forest sector is facing the same problems as all forest sectors of the former Soviet Union. We have made a lot of quantitative analyses of the Russian forest sector and its development potentials (Nilsson and Shvidenko, 1998). We are convinced that the overall conclusions are also applicable to the Ukrainian forest sector. The analytical work has convinced us that there are limited possibilities for the development of the forest sector unless the institutional framework is changed dramatically. With the institutional framework we mean how the sector is organized as well as the rates with which the sector is managed. In the institutional framework are issues like legislation, fulfillment of made environmental agreements, allocation of harvesting rights, stumpage fees, taxation, privatization, corruption, transparent information, efficient science, etc., included.

Based on this work we are also convinced that the structural crisis in the Ukrainian forest sector cannot be cured by just loans or subsidies or only by policies and legislative actions by the Parliament. The best thing the government can do is probably to strengthen the institutions that support investments and innovations in the Ukrainian forest sector.

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**Figures**

Figure 1: Structural Changes in Probable Supply 1995–2030 (million $m^3$/yr.)

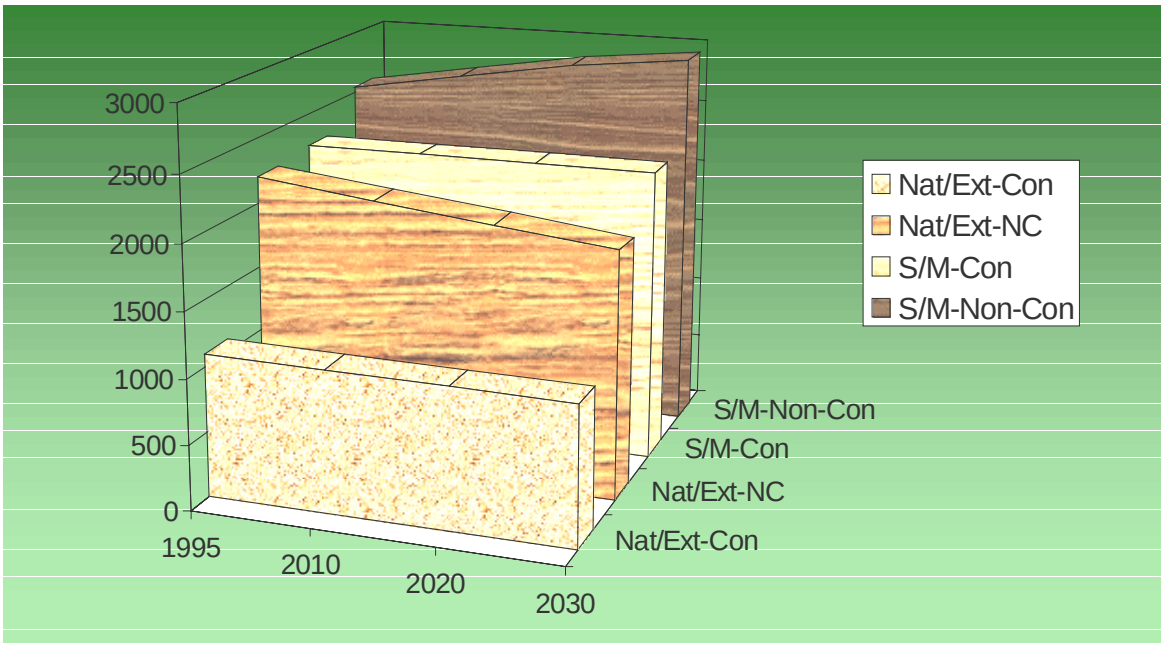


Figure 2: Material Read in Electronic Format: Future Expectations
(Source: EDSF Focus Groups)

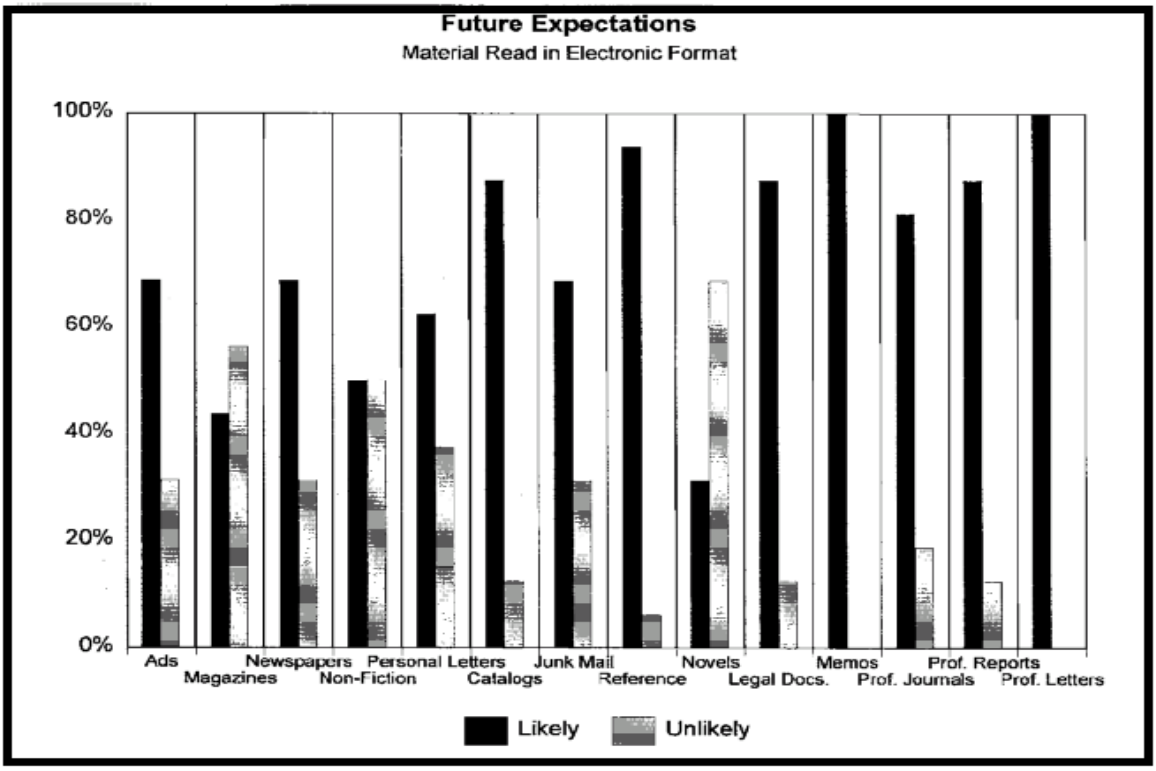


Figure 3: 1995–2030 Demand Growth for Selected SWP

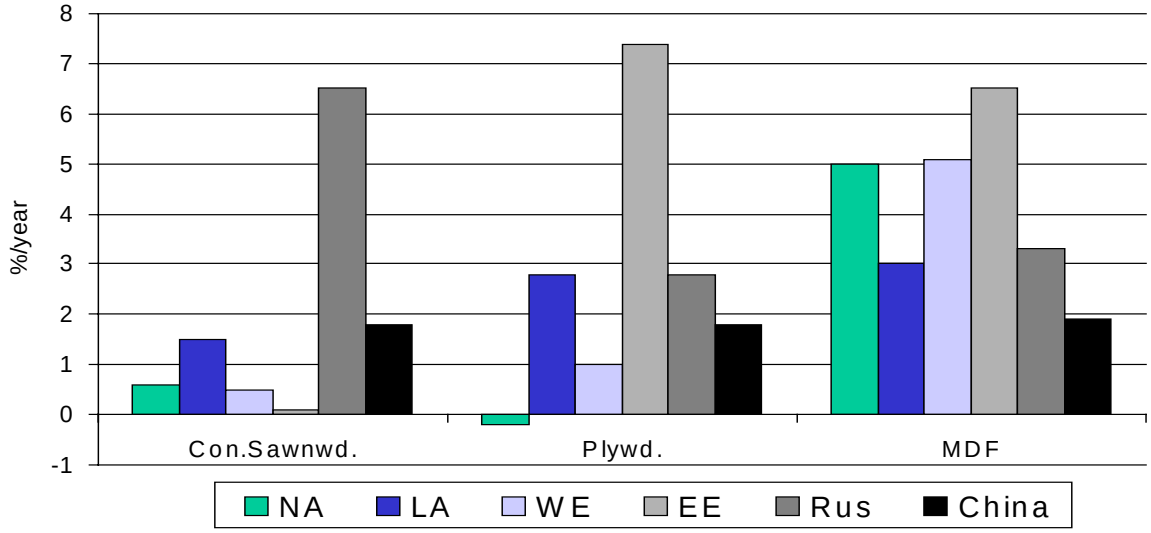



Figure 3a: Per Capita Consumption of Lumber — Japan

**1973 — 0.43 $m^3$**

**1996 — 0.28 $m^3$**

**2015 — 0.05 $m^3$**

*Dana Publishing, 1997*

## Figure 3b: Joining and Treatments of Eucalyptus

- **Has better characteristics for construction than our traditional softwood lumber.**
- **Will conquer the world in the same way as eucalyptus pulp has done. The costs will be one-third or one-fourth of the costs for softwood lumber products.**

## Figure 4: Incremental Demand for P&Pb 1995–2030 by Region

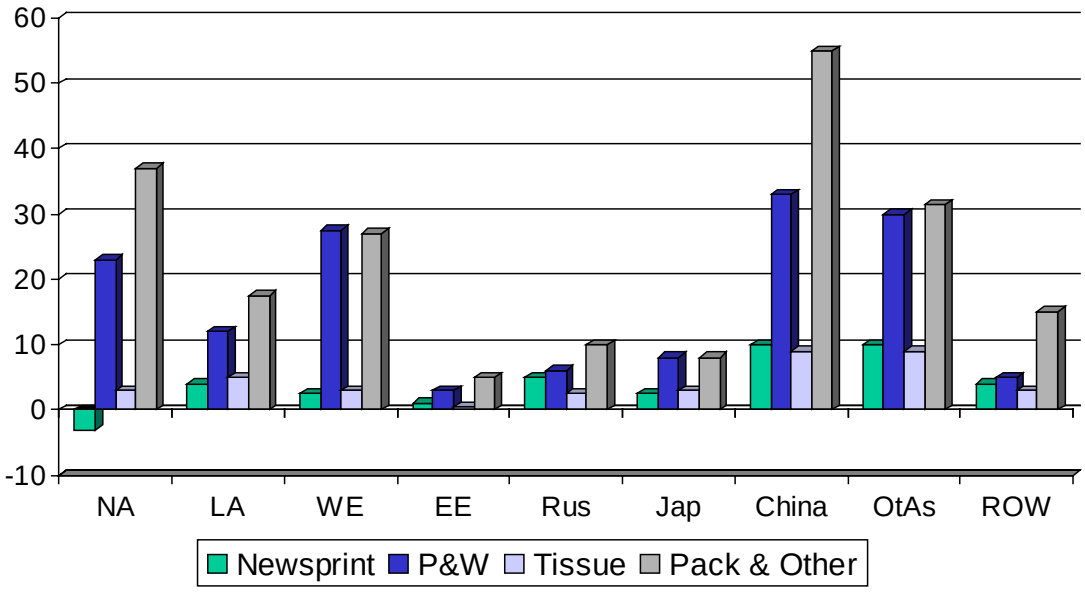


Figure 5: 1995–2030 Projected Industrial Roundwood Demand

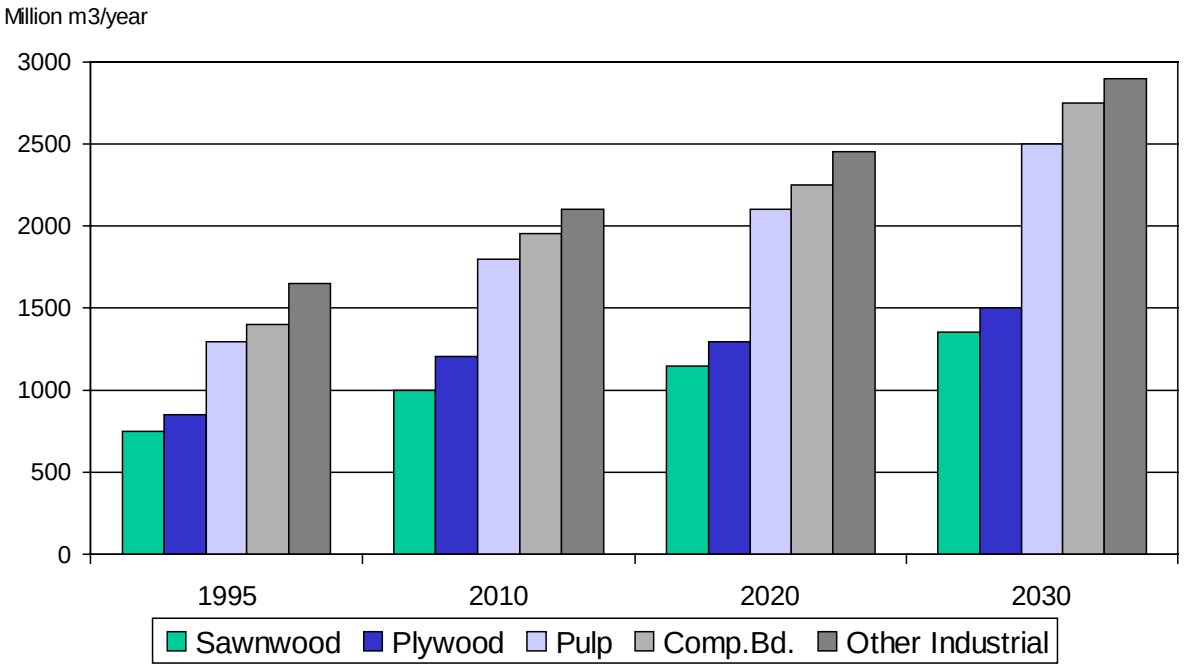


Figure 6: Projected Conifer Supply/Demand Balances – 2030

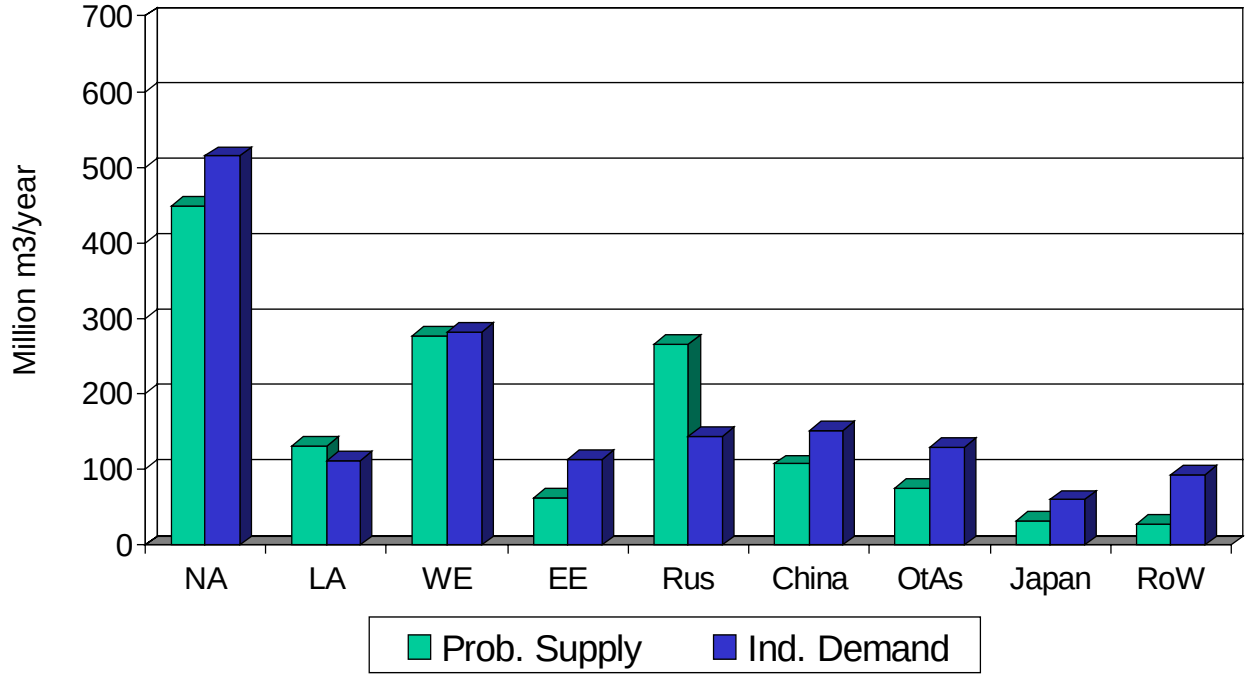


Figure 7: Projected Non-Conifer Supply/Demand Balances – 2030

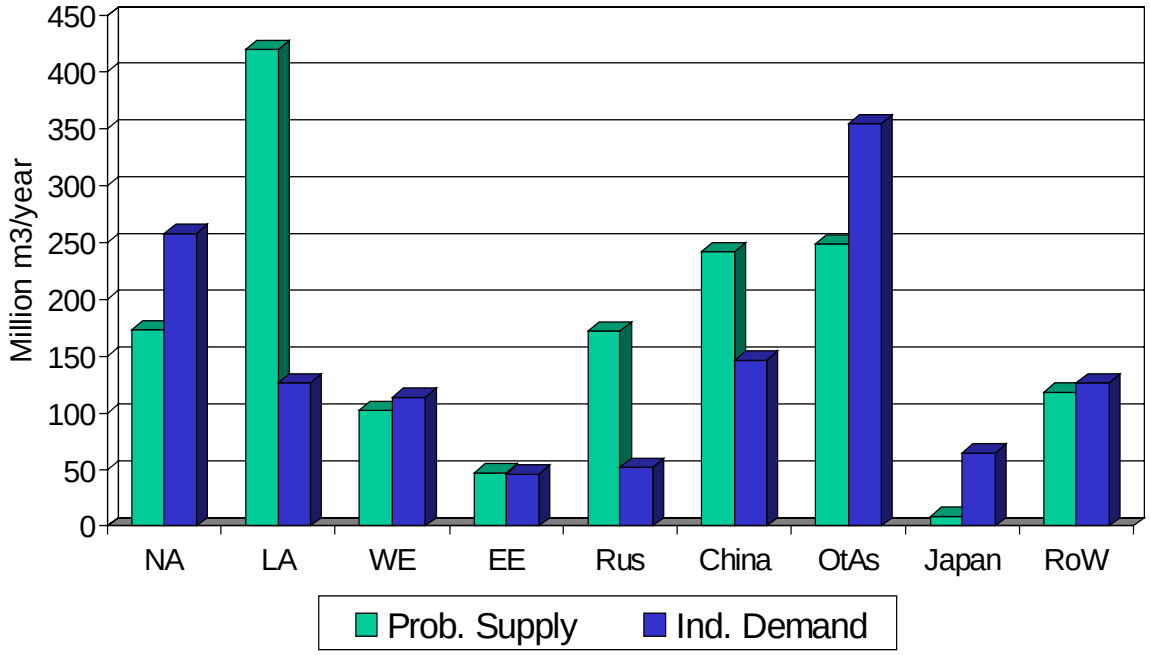


Figure 8: Projected Conifer Supply/Demand (with Fuel Wood) Balances – 2030

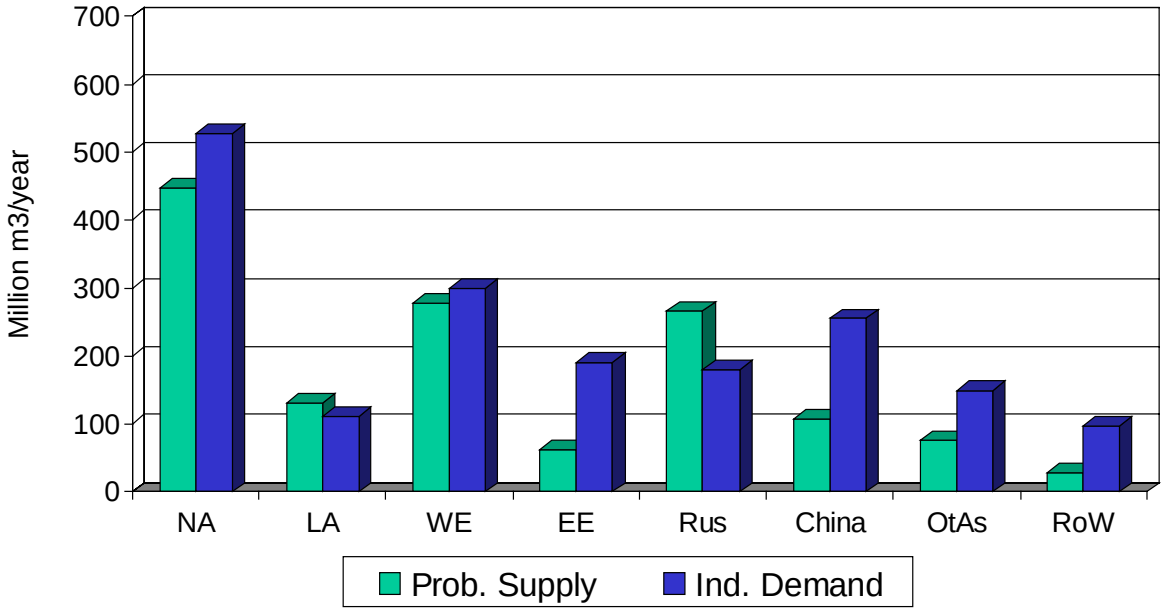
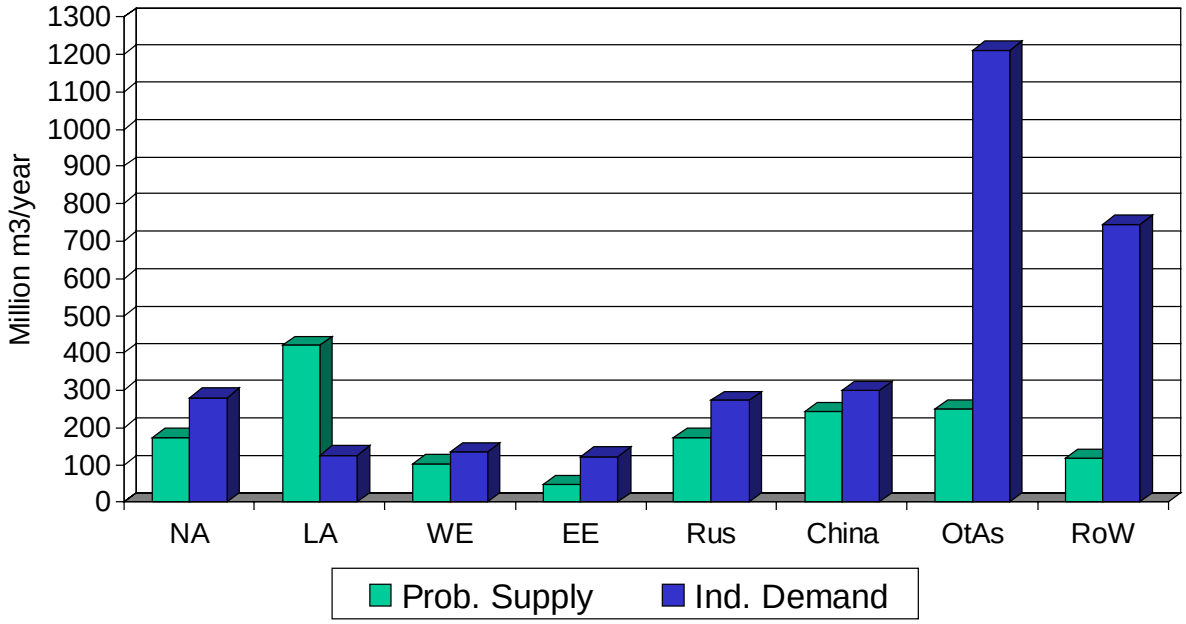


Figure 9: Projected Non-Conifer Supply/Demand (with Fuel Wood) Balances – 2030



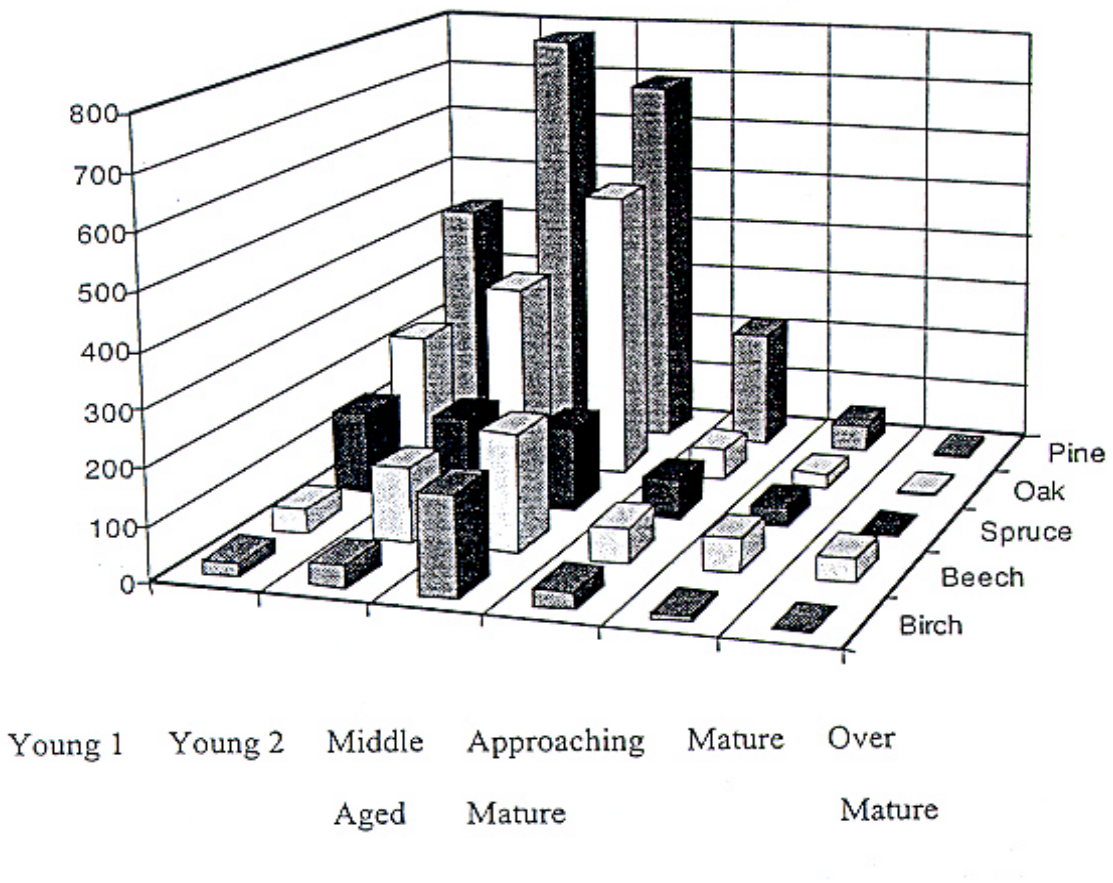
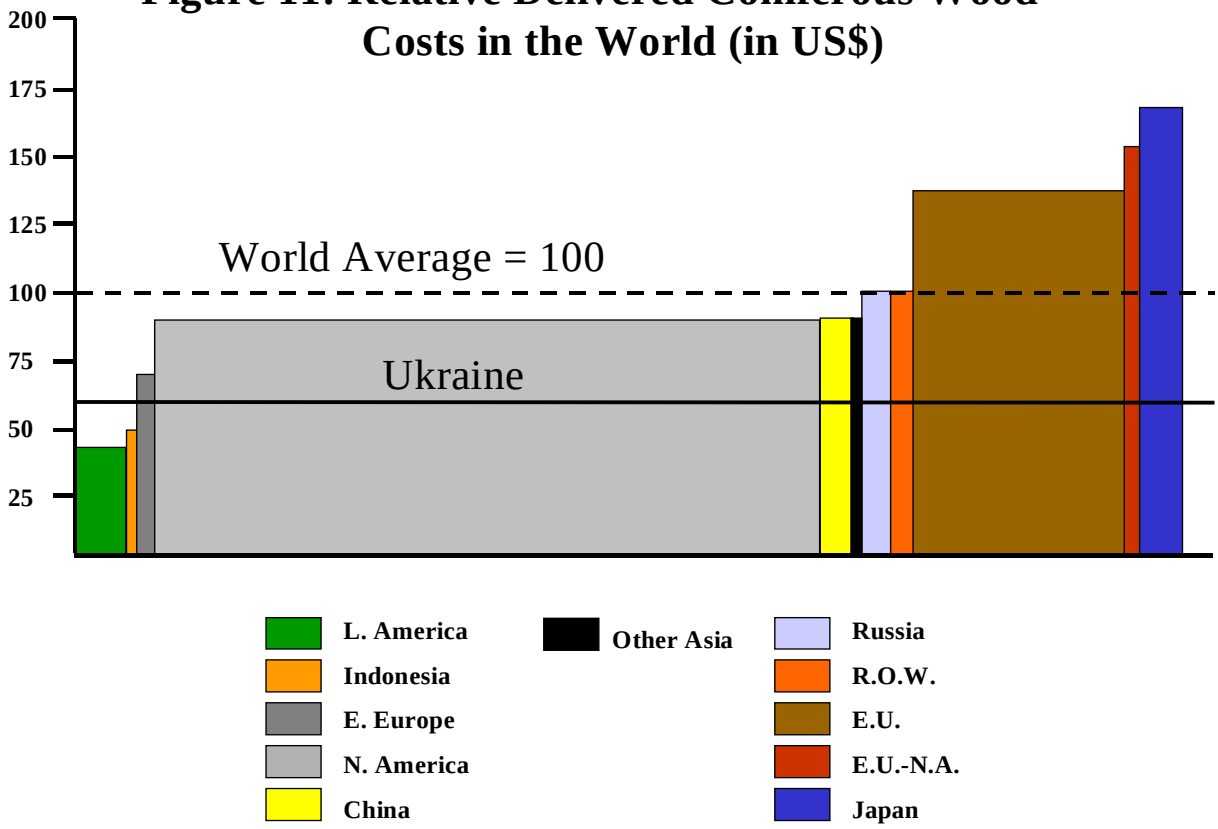
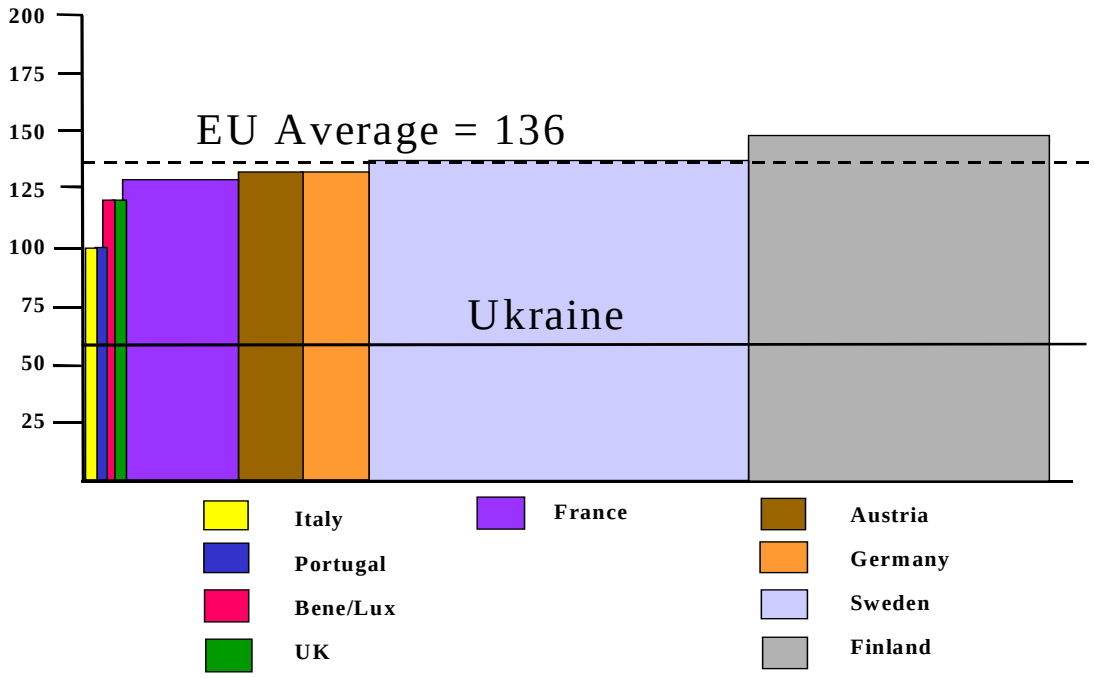



**Figure 10: Age Distributions of Main Species (According to Poliakov 1995)**

**Figure 11: Relative Delivered Coniferous Wood Costs in the World (in US$)**



## Figure 12: Relative Delivered Coniferous Wood Costs in the EU (in US$)



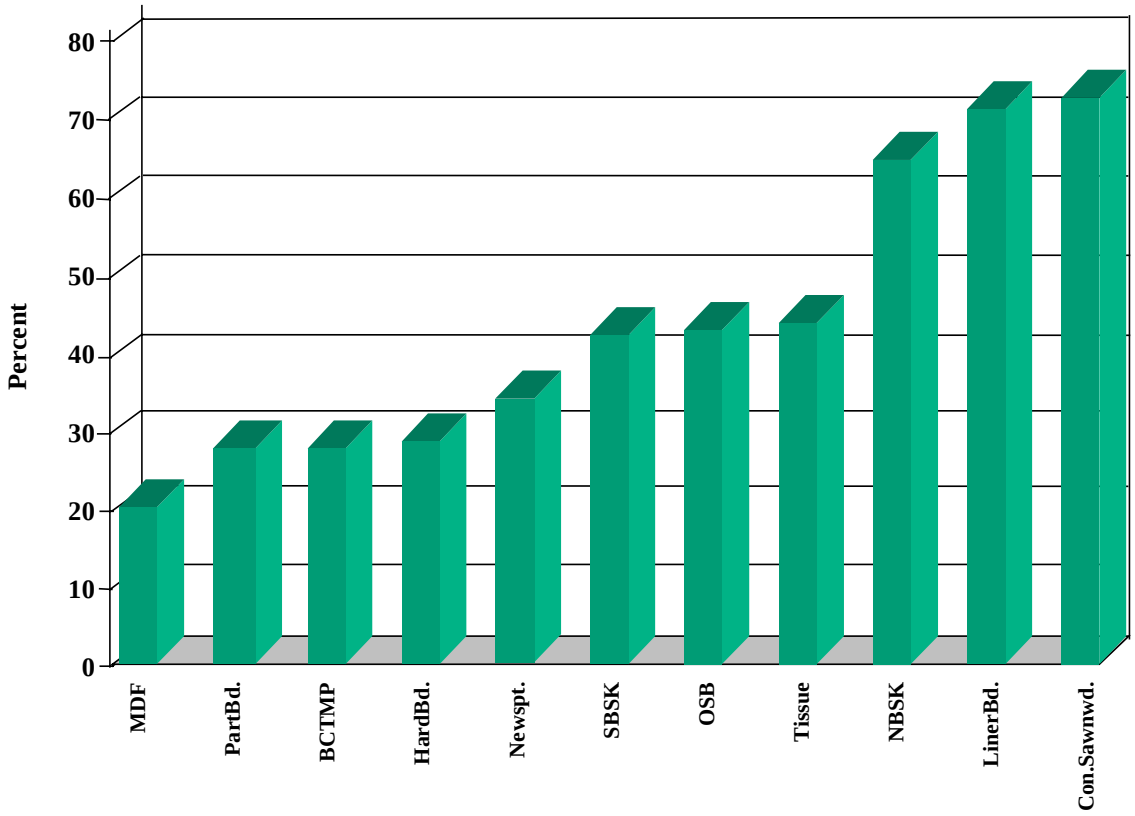



**Figure 13: Coniferous Wood Fiber as Percent of Average Production Costs**