

**SOUTH AFRICA'S
NATIONAL FORESTRY ACTION PROGRAMME
(NFAP)**

INDUSTRIAL FORESTRY

KEY ISSUE PAPER FOR CHAPTER 11 OF THE NFAP

**"THE INDUSTRIAL FOREST SECTOR: ITS CURRENT AND
POTENTIAL CONTRIBUTION TO NATIONAL GOALS"**

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“THE INDUSTRIAL FOREST SECTOR: ITS CURRENT AND POTENTIAL FUTURE CONTRIBUTION TO NATIONAL GOALS”

Executive Summary

The executive summary for this Key Issue Paper is presented as Chapter 11 of the NFAP document (Department of Water Affairs and Forestry, 1 September 1997).

For a brief overview of the contents of this paper please refer to the relevant chapter in the NFAP document.

LIST OF ACRONYMS

n/a	not applicable
cub. m.	cubic metres
m ³	cubic metres
MT	metric tonnes
APS	Afforestation Permit System
SAFCOL	South African Forestry Company Limited
DWAF	Department of Water Affairs and Forestry
RDP	Reconstruction and Development Programme
L&APC	Land and Agriculture Policy Centre
CSIR	Council for Scientific and Industrial Research
FOA	Forest Owners' Association

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1. BACKGROUND AND CONTEXT

1.1 What is the issue and why is it important ?

1.1.1 The Industrial Forestry Sector - a term used to define the growing, primary processing of wood and its subsequent manufacture into finished products - has emerged as a major component of the South African economy over a historically short period of time. The industry's dynamic growth is a result of both public and private sector efforts and a past policy to promote the sector for strategic reasons of self sufficiency and to a lesser extent, regional development and employment creation. Establishment of large plantation forests created a resource of competitively priced wood fibre which has further stimulated the growth of the wood-processing industries.

1.1.2 The initial objective of self sufficiency has now been surpassed and the industry has evolved into an increasingly globally focussed entity: approximately 40% of the value of the industry's output is exported and South Africa's major companies are major overseas investors, particularly in pulp and paper.

1.1.3 The industry's future growth will be driven by local and international market opportunities. The extent to which this potential is realised however, will critically depend upon three issues:

- the availability of resources (especially fibre) to permit industry expansion;
- the degree to which South Africa's forest industries can remain competitive in an increasingly global market; and
- an objective assessment of the benefits to South Africa of further growth of the forest sector in relation to the economic, social, environmental and resource use (principally water) implications of expansion.

1.1.4 In addition, it is important to consider one further factor, namely:

- what structure of industrial expansion will allow the sector to make the maximum net contribution to South Africa's well-being and
- what structure will be best for the country?

1.1.5 The forest industry in South Africa has a undeniable place and role. It is a major contributor to the economy and to the livelihoods of many households. The industry however must not only be internally efficient and profitable, but also rational in terms of its use of the nation's resources, equitable and environmentally sustainable: factors which have assumed a new significance in the context of South Africa's new dispensation and forest policy.

1.1.6 This is the context for an objective debate on the industry's future. Important decisions, for example those regarding the extent of future afforestation, can then be made in an informed and balanced manner. The debate must be set in the framework of prevailing policy considerations, informed public opinion and of the industry's own changing structure and orientation: factors which have all markedly shifted since the industry first began. The debate must also recognise the regionalised nature of industrial forestry and the concomitant localisation of impacts and the possible divergence of public and private benefits and costs.

1.2 The policy context

1.2.1 A number of key national policies govern any debate concerning the future direction for the forest industry in South Africa.

1.2.2 The **Reconstruction and Development Programme (RDP)** - has as its central concept the achievement of sustainable development, i.e. development which meets the needs of the present without adversely affecting options for future generations. Within its Economic Policy Framework the RDP identifies the need for an open competitive industrial sector which competes in the global economy to generate wealth, employment and well-paid employment. The Rural Development Strategy, which compliments the RDP, identifies the forest sector as an important element that can contribute to better living conditions and economic opportunity.

1.2.3 The **White Paper for the Forest Sector** - sets as Government's overall goal the promotion of a thriving and sustainable forest sector which benefits the whole nation but which is developed and managed to protect and improve the environment. The important role of industrial forestry, especially in meeting South Africa's reconstruction and development objectives is acknowledged as is the need for that development to be balanced against environmental and resource use implications. In terms of specific policy, the Government commits itself to ensuring the sector's competitiveness within the bounds of acceptable environmental and social costs.

1.2.4 The **Macro-economic Strategy** - of growth, employment and redistribution identifies rapid economic growth as the cornerstone of reconstruction and development. For the industrial sector, this necessitates a policy of creating internationally competitive industries. Achieving this goal requires a fundamental shift of policy away from demand-side interventions (such as tariffs and subsidies) which protected local industries at the expense of consumers, towards supply-side measures designed to lower unit costs and encourage value addition. This has clear implications for an increasingly internationally focussed industry such as forestry.

1.2.5 The **Green Paper on Environment** - focuses on people and their participation in environmental decision-making processes and the need to ensure that environmental decisions are not made in isolation from consideration of wider macro-economic perspectives. Participation and balance in environmental decision making are characteristics which thus need to be incorporated into assessing the forest industry's future direction.

1.2.6 The **White Paper on the Conservation and Sustainable Use of Biological Diversity** - identifies three main strategic objectives:

- i. the conservation of biological diversity, including elements such as landscapes, ecosystems, habitats, populations, species and genes;
- ii. the sustainable use of South Africa's biological resources and the minimisation of negative impacts; and
- iii. ensuring that the benefits derived from the use of genetic resources serve national interests.

1.2.7 A number of specifically stated policy objectives are of particular relevance to this debate. Namely:

- restoring degraded ecosystems;

- controlling the introduction and spread of alien organisms; and
- the integration of biodiversity considerations into land-use planning procedures and environmental assessments.

1.2.8 The White Paper identifies a number of means by which these objectives can be achieved. These include: participation; informed decision making; the introduction of full cost benefit accounting; the creation of conditions and incentives that support the conservation of biological diversity.

1.3 Purpose of this paper

1.3.1 This paper seeks to inform decision making on the future direction of the forestry sector in South Africa through:

- reviewing the industry's historical performance, with particular reference to identifying the underlying influences which determined its growth and structure, including the influence of past policy
- identifying and providing an initial assessment of the range of costs and benefits to South Africa which can be attributed to the industrial forest sector: factors which must be taken into account when making decisions about its future
- appraising the possibility for the sector's future growth in terms of: the availability of key factors of production, the opportunity costs of this growth and the domestic and global competitiveness of the sector
- identifying the likely range of benefits and implications from the expansion of the industry through modelling two scenarios of industry development.

2. SITUATION ANALYSIS

2.1 What is industrial forestry?

2.1.1 Industrial forests in South Africa comprises those plantations which have been established to supply raw materials to satisfy mining, construction, furniture, pulp and paper and industrial markets.

2.1.2 Of the estimated total plantation area of 1,5 million hectares (ha) (DWAF 1997) the government (through SAFCOL) owns an estimated 270 400 ha and a further approximately 156 700 ha in the former homelands. Large companies in the private sector own 735 000 ha and commercial farmers and other private individuals 304 500 ha. Of the planted area approximately 53% is pines, 39% was eucalyptus and 7% was wattle. Small commercial farmers own about 3 300 ha of small plantations of poplars for the match industry.

2.1.3 Geographically, most industrial plantations are located where climatic conditions are suitable for afforestation, in the Provinces of Northern (3%), Mpumalanga (42,5%), KwaZulu-Natal (37,5%), Western Cape (6%) and Eastern Cape (11%) (see Table 1).

Table 1. Afforestation according to province (June, 1996)

Afforestation according to province (hectares and percentage)		
Northern Province	61 788	2,8%
Mpumalanga	614 881	42,4%
KwaZulu-Natal	557 375	37,5%
Free State	108	0,0%
Eastern Cape	169 484	11,3%
Western Cape	83 287	6,4%
RSA	1 486 923	100,0%

2.1.4 Forest industries currently consume about 19 million m³ of roundwood of which (in 1996), about 51% was hardwood and 49% softwood. An estimated 68 percent of the total roundwood production is consumed in pulp and paper manufacture, 20% in sawn timber, and about 7,5% in mining timber. In 1995/96 investments in the forest products industry were valued at about R12 billion, 90% of which was in pulp and paper mills (DWAF 1997).

2.1.5 Table 2 indicates the age class distribution in respect of the main species classes, while progress of afforestation since 1876 is captured in Figure 1. Area-wise the industrial forest area is the second largest dryland crop area, after maize, but before wheat.

Table 2. Age distribution of species (June 1996)

Age class	Pines and other softwood species		Eucalypt species		Wattle species		Other hardwood species	
	ha	% of total	ha	% of total	ha	% of total	ha	% of total
Area temporarily unplanted	48 138	6,1	27 937	4,8	7 236	6,9	688	7,8
0-4 years	159 252	20,2	222 841	38,2	39 218	37,5	1 917	21,7
4-9 years	184 286	23,3	254 567	43,6	32 851	31,4	1 763	19,9
9-14 years	124 333	15,7	57 830	9,9	16 551	15,8	948	10,7
14-19 years	94 214	11,9	7 345	1,3	3 189	0,3	1 174	13,3
19-24 years	78 514	9,9	4 491	0,8	997	0,9	447	6,8
24-29 years	43 957	5,6	2 851	0,5	664	0,6	428	4,8
29-34 years	29 998	3,8	1 835	0,3	459	0,4	331	3,7
34+ years	23 256	2,9	2 985	0,5	2 535	2,4	658	7,4
Jungle	4 004	0,5	777	0,1	895	0,9	496	5,6
Total: RSA	790 042	100,0	583 456	100,0	104 575	100,0	8 850	100,0

2.1.6 On the processing side, there are at present (June 1996) 149 primary roundwood processing plants, producing data for the Department's annual survey. Eight of these belong to state entities, individuals or partnerships hold 25, while the rest are registered private companies' installations.

2.1.7 The number has declined from, for example 260 on June 1979, but capacities have increased. Sawmill capacities, for example, increased from an average of 15 000 cub. m. in 1975 to 16 500 cub. m. in 1996, while annual volumes sawn increased from 2,9 million cub. m. to 3,4 million cub. m. for those dates. Mining timber mills declined for the same dates from 58 to 13.

2.1.8 A recent estimate of the number of so-called bushmills (Crickmay, 1997), not measured in the Department's annual census, indicated that 293 bushmills, spread all over the forestry regions, have a combined annual log intake of 714 00 cub. m and could contribute about 300 000 cub. m to the sawn timber production figures of the census figures.

2.1.9 Pulping capacities have increased by leaps and bounds since 1938. Capacities for all grades were in 1996, 2 405 000 MT. Paper and paper board production capacities were in the same year 2 372 500 MT (PAMSA, 1996).

2.2 The development of the industrial forestry sector - a brief historical perspective

2.2.1 In a little over one hundred years South Africa has made the transition from a net importer to a net exporter of forest products with an industry of international size and competitiveness. Understanding the reasons behind this dynamic growth, including the underlying national policy objectives, is central to an appreciation of the industry's current status and any debate on its future role and place.

2.2.2 Three broad phases in the development of the industry can be defined:

i. **1870 - 1914**

Purposeful afforestation efforts commenced in the late 1870s as both public and private concerns sought to provide an alternative to a fast disappearing (and in any event limited) natural local resource and costly imported timber. By 1914 the afforested area was estimated to have reached an estimated 175 000 ha and early processing industries had begun to appear. These early efforts, although limited in extent, demonstrated the potential of afforestation to meet the nation's needs.

ii. **1914- 1945**

Afforestation accelerated greatly in the years following the outbreak of the First World War. This phase of forestry development was characterised by Government assuming a leading role in pursuit of a self sufficiency policy: the First World War had clearly demonstrated South Africa's vulnerability to any disruption to the flow of imported timber. This policy objective, which remained unchanged and unchallenged until recently, along with a shorter term objective of employment creation for unemployed whites in the Depression years, provided the rationale for major investment in the sector by the State. By 1945 the afforested area had reached around 600 000 ha and a network of both State and privately owned sawmills providing an increasing share of the nation's lumber.

iii. **1945 to today**

The years since the end of the Second World War have been characterised by continued expansion of the afforested area (reaching an estimated extent in excess of 1,5 million hectares in 1996) but with the increased involvement of the private sector and the emergence of the domestic pulp and paper industry as the industry's major driving force.

This period has also been characterised by an increased focus on overseas markets for both the forest industries in general and the major companies. Self-sufficiency was achieved in value terms in 1985. Forest product exports (mostly paper based), which in 1996 accounted for around 4,7 % of total export earnings and utilise an estimated 35% of locally produced wood volumes. At the same time South Africa's leading forest product companies have become international players both through the export of products and the acquisition of overseas assets.

2.3 Driving forces in the development of the forest industries

2.3.1 A number of factors have provided stimulus and support to the sector's development over the last one hundred years. Principle amongst these have been:

- the existence of a strong demand for forest products from local industries combined with limited competition from overseas supplies given South Africa's relative isolation and the imposition of protective tariff structures
- the existence of favourable conditions for the rapid expansion of a plantation resource in the Northern, Mpumalanga, KwaZulu-Natal, Eastern Cape and Western Cape Provinces
- little impediment, at least until the adoption of the Afforestation Permit System in 1972, to the expansion of the afforested area. The impact of the APS on the pace of afforestation is debatable. But it should be noted that approximately one million hectares

of plantations (70% of the existing plantation estate) were established prior to the system's implementation.

- a conducive policy environment which emphasised self sufficiency and industrial development. A range of supporting measures were implemented in pursuit of this policy. These included the heavy subsidisation of timber from Government-owned plantations to support the development of private sector processing industries, a range of decentralisation benefits and export incentives were provided to processors, as well as tariff protection, and export subsidies
- the initial direct investment role played by the state which established a sizeable proportion of the overall resource that formed a basis for the development of processing industries
- the early establishment of a strong research, technology and education base.

3. ESTIMATING THE BALANCE OF INDUSTRIAL FORESTRY'S COSTS AND BENEFITS

3.1 Conceptual context

3.1.1 The development of successful forest industries in South Africa has depended upon the availability of competitively produced wood fibre, achieved through substantial and rapid afforestation. Afforestation, in common with any other human activity, makes a claim on natural resources (principally land and water) and has a number of inevitable environmental and social consequences. That forestry, and associated processing industries, have such impacts is not in question. What is important is to determine the extent of these costs and to assess whether the benefits from forestry exceed them at a level that will justify the further expansion of the forest industries where it is based upon an expansion of the afforested area.

3.1.2 The areas of high forestry potential are also frequently areas of high agricultural, water yield or conservation potential or combinations of these. Given that conditions conducive to afforestation occur in just 15% of South Africa - essentially in the provinces of Mpumalanga, KwaZulu-Natal and most significantly perhaps the Eastern Cape - the debate also assumes an important provincial dimension. These are the conditions that have led to strong competition for resources and environmental values between the forest sector and others.

3.1.3 Any such analysis of environmental and social costs and benefits is, however, complicated by a number of factors:

- valuation techniques for intangibles such as the aesthetic impact of forestry on the landscape or loss of habitat and its impact on biodiversity are difficult to apply and often subjective
- there is an assumption that the measures may be utilised to an equal degree by one or more other sectors
- a divergence is likely to exist between benefits which inevitably largely accrue to individuals (or companies) and the costs which are often publicly borne.

3.1.4 With the exception of work undertaken by CSIR in respect of the impact of the forestry sector in Mpumalanga (CSIR 1996) little work has yet been done to date on these issues in the forestry sector. A number of complex and diverse Environmental Impact Assessments, which entail essentially similar analytical procedures, have, however, recently been undertaken. These may assist in developing an analytical framework for such an objective assessment to be made.

3.1.5 This particular Key Issue Paper concentrates on the economic costs and benefits. A specific Key Issue Paper (for Chapter 12) addresses the integrations with water and other environmental aspects, while two key issue papers (for Chapters 16 and 17) address the social issues. Employment issues are raised in more detail in Key Issue Papers for Human Resources Development chapters.

3.2 The economic and social benefits of industrial forestry

3.2.1 Contribution to national and provincial economies

3.2.1.1 As the forest industry has grown in size, scope and composition its absolute and relative contribution to the national economy has increased substantially with respect to a number of key

economic indicators.

3.2.1.2 The forest products industries, i.e. all those industries using wood products as a raw material are of great importance as they -

- meet an estimated 90% of the 1996 domestic demand for industrial forest products;
- contributed 1,8% the country's GDP in 1996;
- contributed about 7,7% of the country's manufacturing output in 1996;
- provide 4,7% total export of earnings and about 10% of manufactured exports

3.2.2 Employment

3.2.2.1 The sector directly employ the equivalent to 111 550 people: 20% in sawmilling; 12% in the paper industries; and 55% directly in plantations.

3.2.2.2 Employment is once again concentrated in Mpumalanga and KwaZulu-Natal reflecting the distribution of the national forest estate and to some extent the associated processing industries. The provincial benefits of employment creation is consequently far greater than the sector's national contribution would suggest. Estimates of employment in Mpumalanga (CSIR 1996, Kruger et al. 1995 suggest that forestry provides employment to around 2,6% of the available labour pool. Given an average household size of 8,46 people (1991 Census) this level of employment suggest that 10% of that Province's people derive some benefit from having one or more family members working in the forestry sector. Furthermore, most of this employment is centred in rural areas where employment is scarce. Wages paid by forestry companies, while below the national average, are usually higher than other rural wages.

3.2.3 Foreign exchange

3.2.3.1 The volume and value of forest product exports has increased significantly over the last twenty years. South Africa now enjoys a sizable surplus on its trade in forest products reflecting the increasing importance of export markets for the sector's performance. In 1995 forest produce exports generated an estimated R4,8 billion in export earnings, 4,7% of the value of South Africa's total exports. The R2,829 billion imports for the same year resulted in a net surplus of R2 billion. Exports are dominated by pulp and paper products which comprise almost 80% of the value of total exports and which have increased in absolute and relative terms over recent years.

Table 3. Exports of forest products 1980 -1995 (1995 Rands)

Year	1980	1985	1990	1995
Total value of forest product exports (R million)	275	772	1 940	4 825
Forest products as a percentage of total exports	1,6	2,2	3,7	4,7
Balance of payments on forest products (R million)	(133)	215	709	1996
Composition of forest products exports (%)				
Pulp	47,1	n/a	46,1	46,0
Paper	30,9	n/a	33,8	33,0
Sawn timber	4,1	n/a	2,0	0,7
Wood products excluding timber	18,0	n/a	18,0	17,4

Source: Customs and Excise, Forest Owners Association

3.2.3.2 Any assessment of forestry's net contribution to South Africa's balance of trade position should, however, also recognise the value to the economy in foreign exchange saved through import substitution. This is difficult to calculate, but is likely to be sizable given that local industries meet an estimated 90% of domestic demand for forest products. A first estimate is that the cost of having to import all our timber needs, would value R10 billion a year, compared to the R7,9 billion income enjoyed under present conditions.

3.2.4 Local social benefits

3.2.4.1 Social responsibility programmes

3.2.4.1.1 In addition to the significant generation of employment most forestry operations operate social responsibility programmes. These typically focus on the provision of housing, water, sanitation and health care for employees. Precise information on the extent of these activities is limited but are estimated to be by FOA members in the region of R70 million in 1995, a figure which clearly does not include non FOA members and non respondents.

3.2.4.2 Access to firewood

3.2.4.2.1 Surrounding communities have traditionally been allowed access to firewood from forest areas, under what is known as the "theza" system. It appears that some forest managers allow this practise whilst others strictly prohibit it, for fear that wood gatherers will start forest fires. Prohibitions on access to firewood and other forest resources are associated with poor relations between forest managers and neighbouring communities rather than on any real evidence of damage to the forest by firewood collectors (Berns 1995).

3.2.4.3 Access to non-timber forest products

3.2.4.3.1 There are a variety of non-timber forest products which can be accessed by neighbouring communities for subsistence, such game-meat, mushrooms, wild vegetables, medicinal plants and honey. As with the gathering of firewood, the attitudes of forest manager to communities wishing to gather these resources are variable. Good relations between the two parties appear to be the exception rather than the rule.

3.3 Social and economic costs of industrial forestry

3.3.1 Forestry's use of land and water resources relative to other economic activities

3.3.1.1 Forestry consumes land and water which would otherwise have potential alternative uses. While the extent and economic potential of the alternative use varies between regions and provinces, forestry appears to be a relatively efficient user of land and water resources relative to competing agricultural land uses. This is illustrated in table 3 and table 4 below .

Table 4. Financial returns to forestry and alternative agricultural production activities - Mpumalanga 1994

Products	Farming units		Gross Income (R'000s/yr)	Expenditure		Gross Income (R/ha/yr)
	No. of units	ha		Current (R'000s/yr)	Capital (R'000s/yr)	
Field crops	1 932	1 446 278	670 826	482 981	92 101	464
Horticultural crops	531	145 282	181 904	124 705	125 114	1 252
Animals and animal products	1 980	1 458 325	728 797	457 215	41 517	499
Forestry	262	663 784	285 662	94 950	32 636	430
All other products	16	7 872	2 816	1 265	1 063	160
Mixed farming	1 665	1 381 570	316 046	233 763	44 356	228
Total	6 386	5 103 111	2 186 051	13 394 879	336 787	505.5 (avg.)

Source: Provincial Statistics, 1994: Mpumalanga, No 8, Central Statistical Services

3.3.1.2 This concept of opportunity cost is predicated on the opportunity to use the resources being realised now, or at some future point. As noted above this concept makes any assessment of the cost of forestry's use of natural resources difficult.

Table 5: Patterns of water use in the Mpumalanga province by principle consuming sectors

Sector	Water Use for year		GDP in R x 10 ⁶	Economic water-use efficiency		Water-use intensity	
	Total evaporation	Incremental loss in river flow (surface runoff)		Total evaporation	Incremental loss in river flow (surface runoff)	Total evaporation	Incremental loss in river flow (surface runoff)
	million m ³			GDP/m ³		m ³ /ha	
Dryland Forestry	3 944	1 072	480	0.12	0.45	7 358	2 000
Dryland agriculture	15 871	1 619	3 000	0.20	1.85	4 900	500
Irrigated agriculture	3 119	1 770	1 000	0.30	0.57	17 622	1 000
Grazing and conservation	18 000	240	160	0.10	0.66	7 500	100
Mining	n/a	277	5 341	n/a	19.28	n/a	n/a
Industry	n/a	298	3 198	n/a	10.73	n/a	n/a

- a. The total water use is the amount of water evaporated from the land surface under a given use (i.e. rainfall minus runoff, assuming no net change in ground water storage).
- b. River water use includes both direct and indirect use (i.e. water which is prevented from reaching the river by increased evaporation relative to natural vegetative cover).

3.3.2 Local land and tenure issues

3.3.2.1 Insecurity of Tenure: Many thousands of families currently reside on public and private sector forestry land. These families comprise those of present and former employees, labour tenants, and more recent immigrants, including those who have recently invaded the land. These families generally do not have any legal rights to the land, and are vulnerable to evictions. Even the families of employees have no resource to law should the company choose to evict them. The insecure tenure status of families resident on plantation land is a cause of instability and conflict.

3.3.2.2 Land claims: Procedures for restitution of land to individuals and communities who were dispossessed as a result of racially biased policies of the past, have been set out in the Restitution of Land Rights Act, 1994. This also applies to afforested areas. So far more than 13 000 claims have been lodged countrywide, however, it is not possible to ascertain how many of these claims affect forestry land. However, there are too few staff in relation to the number of claims received, so it appears that court adjudication and issuing of court orders will take

years to complete. The time delays in processing claims underscore the need for locally developed solutions to be reached. It is in the interests of both parties to reach agreement as soon as possible.

3.3.3 Access to grazing and arable land

3.3.3.1 Plantations take up very large tracts of land in areas which are suitable for cropping and livestock grazing. Communities neighbouring plantations are typically living under extremely overcrowded conditions and are desperately short of both grazing land for their livestock and arable land to grow food and cash crops. In some cases, labour tenants would have had cultivation and grazing rights on the farm before it was bought by forestry and planted to trees. Removal of prior rights of access and prohibiting new claims for access to land and other resources leads to tremendous hardship and suffering of rural communities, as well as escalating conflict between the parties.

3.3.4 Influences on rural villages

3.3.4.1 Plantation establishment tends to occur over such large areas, that employment patterns within existing rural communities (black or white) can be severely disrupted. The range of rural livelihood activities is reduced resulting in some cases in changing social and economic infrastructures and in some cases, the closure of shops and other community facilities within small towns.

3.4 Industrial Forestry's impact on natural resources

As with any human activity, industrial forestry's use of natural resources (land, water and more generally environment) entails costs. That is, resources could have been used for other purposes, and generated and added value as a result. This concept of opportunity cost is predicated on the opportunity to use the resources being realised now, or at some future point. As noted above this concept makes any assessment of the cost of forestry's use of natural resources difficult. The impact on natural resources is dealt more fully with in the Key Issue Paper for Chapter 12.

3.4.1 Impact on water resources

3.4.1.1 Impact on streamflow

3.4.1.1.1 Forest plantations use more water than the natural vegetation which they generally replace which in turn results in reduced water flow within river systems. This occurs because of the great water demands of trees compared with natural vegetation reflecting the height, complex and evergreen canopies of plantation trees, their deep rooting and high growth rates. As with land resources, industrial forestry's national level use of water resources - estimated at just 3.1% of the mean annual flow of South Africa's rivers - masks significant provincial and local level variations. In general terms, the hydrological impact of afforestation (or any other water abstracting land use) is greatest in the immediate locality of a plantation and dissipates downstream as the percentage of the overall catchment under forest falls.

3.4.1.1.2 In the afforested provinces plantation forestry uses between 1,95% of water use in Western Cape, to 9,89% in Mpumalanga. On a catchment level this represents a mean annual flow reduction of over 20% (and up to 40%) in 36 out of 305 afforested quaternary catchments.

3.4.1.1.3 Water use by the industrial forest sector also extends to post-harvest processing, particularly by the pulp and paper industry. However, the standards of efficiency of water use

by South African pulp and paper processing companies are considered high by world standards (IDC 1995).

3.4.2 Impact on water quality:

3.4.2.1 Forestry also impacts upon water quality in a number of ways:

- decreased stream flow in general results in greater concentrations of sediments and other contaminants
- poor management of plantations can result in increased sediment discharge, particularly during harvesting, site preparation and road construction
- forest fires often result in very high levels of sediment discharge
- a common cause for concern is that pulp and paper processing plants release pollutants into water courses. However compared to other countries, discharges from South African processing plants are considered to be relatively low (IDC 1995).

3.4.3 Impacts on biological diversity

3.4.3.1 Forestry involves the transformation of natural vegetation to another effectively permanent land use, this entails potentially significant biodiversity impacts. The latest publication on South Africa vegetation (Low and Rebero, 1996) divides the RSA into biomes and vegetation types. Calculating afforestation areas per biome, with assistance of a Forestek satellite/GIS Mapping project (Forestek, 1995) and recent commercial forestry resources statistics (DWAF 1997), results in table 5:

Table 6. Present extent of afforestation per biome (1996)

Biome	Total area ha	Total conserved ha	Area transformed ha	Area afforested ha	Area afforested as % of total
Forest	717 700	128 500	315 800	55 600	7,7
Thicket	4 189 100	188 500	1 166 700	5 500	0,1
Fynbos	7 674 400	907 800	1 847 000	101 000	1,3
Savannah	41 757 800	4 231 100	20 491 100	152 100	0,4
Grassland	29 959 600	744 800	19 737 700	1 114 430	3,7
Karoo	38 021 500	250 600	9 125 160	0	0,0
RSA	122 320 100	6 451 300	52 683 460	1 428 630	1,17

3.4.3.2 Over the last 120 years the grassland biome (which itself consists of 21 vegetation types) has been the most affected by afforestation. The influence of afforestation is more severe on moist Upland Grassland of the Drakensberg foothills of Eastern Cape and KwaZulu-Natal, the North-Eastern Mountain Grassland stretching from the Eastern Cape for the Northern Province and the short Mistbelt Grassland of the KwaZulu-Natal Mistbelt region.

3.4.3.3 In general, within any biome, when an area is afforested, both plant and bird species numbers are usually depressed, and the species composition is changed. The effects tend to be strongest under dense canopies and acid sites. However, it is important to note that within any given plantation estate, no more (and often much less) than 75% of the land area can be afforested. This is because planting is restricted close to perennial streams and wetlands, and other areas within plantation estates cannot be planted such as roads, power lines, rocky outcrops, nature reserves, dams or rivers. It can even happen (Taylor 1995 in Venter) that overall biodiversity can be increased following a conversion from certain types of land use to forestry. However, even where this occurs it tends to happen that it is already common species which become more common, and rare species which become rarer.

3.4.3.4 The impact on biodiversity in terms of flora and fauna in unplanted areas is a result of changes in ecological processes, in particular changes to the natural fire regimes which result in changing species composition and potentially a net loss of species. Other biodiversity impacts result from changes in plant dispersal processes, hydrological processes and nutrient cycles outside the planted area.

3.4.4 Invasive species

3.4.5 Plantation establishment is associated with the invasion of prolific exotic woody species within the plantation and surrounding unplanted areas. This is either because the plantation species themselves have invasive tendencies (e.g. wattles) or that invasive species are associated with disturbances and changes in land use which occur during afforestation. Invasive weed species can replace indigenous habitats and negatively impact on streamflow, changes in fire hazard, and costs of plantation management.

3.4.5 Soils

3.4.5.1 **Soil acidification** is the increase in solid acid concentration in the soil solution which occurs under plantations. In South Africa one third of soils on which plantations occur are susceptible to acidification, the extent of which is greatest under wattles, then Eucalypts and least under Pines. Acidification risk is greatest where acid rain occurs, such as in Mpumalanga. The impact can be mitigated by careful site species matching and soil liming.

3.4.5.2 **Nutrient Depletion** (of Nitrogen, Phosphorus, Calcium and Magnesium) occurs in soil under plantations over time through the removal of timber, erosion (particularly following forest fires), and by nutrients becoming unavailable to plants due to chemical changes caused by acidification. The long-term productivity implications for South African soils requires further investigation.

3.4.5.3 **Soil compaction** occurs on many sites, particularly as a result of timber harvesting. Compaction impacts on the capacity of soils to store and transmit water and on the soils penetrability to roots. Reduced soil permeability results in increased runoff resulting in greater flooding and surface erosion.

3.4.5.4 **Soil erosion** is low under plantations at about 0,1 MT/ha/a compared with a national average of 3 MT/ha/a for other land uses. However, soil erosion can be intensive following harvesting operations and forest fires.

3.4.6 Atmospheric factors

3.4.6.1 All plants produce hydro carbons, which bond with industrial atmospheric pollutants to exacerbate their impact on ozone depletion. However plantations produce more than other forms

of ground cover such as grasslands and perennial crops. The relative levels of hydro carbon release between different land use types, and therefore the importance of this issue, is not clearly known.

3.4.6.2 The tall rough canopies of plantations capture far more air borne pollutants than grassland ecosystems (particularly in high emissions areas such as Mpumalanga). These pollutants eventually get washed into the soil and accumulate in greater concentrations under plantations than elsewhere.

3.4.7 Carbon sequestration

3.4.7.1 Plantation establishment results in the fixation of atmospheric Carbon Dioxide CO₂ - a major greenhouse gas) into woody plant fibre. As long as the timber is not burnt or allowed to decompose, plantations can make an ongoing contribution to fixing CO. However, as South Africa is a major user of fossil carbon fuels, which result in large CO emissions, plantation establishment and growth can only be expected to make a small net national contribution.

3.4.8 Forest fires

3.4.8.1 Forest fires can be a significant environmental factor, particularly at the local level:

- approximately 0,5% of the country's plantations burn each year, resulting in economic loss and a decline in productivity.
- plantation establishment, with its associated increased fire risk, can result in increased fire insurance premiums for neighbouring land uses.

Fire management regimes (burning of fire strips and less frequent burning of unplanted areas) results in changing species composition. This is because natural ecosystems have evolved under natural fire regimes, which experience different frequencies and intensities of burning.

3.4.9 Amenity implications

3.4.9.1 Plantations tend to be monocultures which, when planted, blanket huge areas of often sloping high amenity-potential land. Plantation ground cover is uniform in terms of height, colour and texture and is characterised by compartments divided by straight lines which bear no relation to the natural contours of the landscape. This visual impact is high and considered by many to be negative. Little is done in SA to minimise this impact although lessons from elsewhere in the world show that a great deal can be done with careful compartment design and species arrangements.

3.4.10 Conclusion

3.4.10.1 In most cases there is not an inventory of the biophysical costs of industrial forestry (except water resources). Although most of the evidence remains anecdotal, there is clearly cause for concern in many cases, and real costs to forest operations as well as potential economic and environmental costs which are not yet quantified. There is also a poor understanding of certain issues which could affect the long-term sustainability of the industry.

4. FORESTRY IN COMPARISON WITH OTHER INDUSTRIAL SECTORS

4.1 In order to obtain some perspective of the forest sector in relation to other sectors, Tables 6, 7 and 8 provide some data.

Table 7. Contribution to RSA's GDP by economic activity at current prices and at factor incomes (R million), 1994

Economic activity	Contribution to GDP (R million)
Agriculture, forestry and fisheries	17 930
Mining and quarrying	33 168
Manufacturing (incl. pulp and paper)	89 766
Construction	12 265
Electricity, gas and water	15 751
Transport and communication (includes timber transport)	28 976
Trade	61 648
Other	123 057
Total	382 561

4.2 It has been determined that the forest sector delivers a higher contribution to the GDP than the motor car and truck industries.

Table 8. Manufacturing value of sales (R million) for 1995

Industrial sector	Value of sales in 1995 (R million)
Food	41 367
Tobacco products	3 155
Textiles	10 133
Leather goods	1 548
Wood	4 390
Furniture (including articles from wood)	4 375
Paper and pulp products (and paper boards)	15 728
Printing	
Industrial chemicals	9 243
Chemical products	15 309
Plastics	15 894
Rubber products	8 083
Iron and steel	3 633
Non-ferrous metals	19 186
	7 185

Table 9. Comparison of import and export values of a selected few industrial sectors (R million) for 1996

Industrial sector	Imports (R million)	Exports (R million)
Mineral products	106191	14 531
Products of chemical industries	11 744	7 345
Plastic and rubber industries	4 439	1 474
Wood and articles of wood	830	857
Pulp and paper products	2 763	3 364
Textile and textile articles	3 976	2 601

4.3 The forest sector, however small and mainly rural, does make a significant contribution to the country's well-being when compared to other industrial sectors or economic activities.

5. UNDERSTANDING THE FUTURE GROWTH OF THE SECTOR

5.1 Background and concept

5.1.1 The forest industry is an important part of the country's economy. Because it is competitive, it can grow further without substantial support and continue to contribute to national goals. Over the last one hundred years the growing fibre demands of South Africa's industrial forestry sector have been met by expansion of the plantation estate to its present level of around 1,5 million hectares.

5.1.2 Growing domestic and overseas markets will support continued growth in the industry's output, but this expansion will at some stage or another be constrained by wood supply. Expansion could also be constrained by other factors such as:

- the industry's ability to remain competitive in a highly competitive sector
- the level, direction and timing of investment in the industry.

5.1.3 On the other hand, environmental and resource use (principally water) factors all constrain the extent to which the plantation estate can be further expanded. Future decisions concerning the extent of further afforestation will be made on an objective informed assessment of:

- the benefits to be gained for the economy from further industry expansion
- the fibre demands generated by expansion
- the feasibility of alternative strategies to meet increased fibre demand
- the resource and environmental implications of meeting additional fibre demands through afforestation.

5.1.4 Simple modelling of the industrial forestry sector can help to inform some of these decisions by indicating the likely additional fibre demands which can be expected from any predetermined increase in the value of the sector's output.

5.2 Testing the opportunities for growth

5.2.1 A reasonable assumption about the future of the sector is that its overall output structure will remain more or less as it is today, i.e. in the following proportions:

Product	Contribution to total Rand value of Forest product output (1996)
Pulp and paper	75,5%
Sawn timber	10,8%
Wood based panels	5,6%
wood chip exports	2,2%
mining timber	1,8%
poles	0,9%
other products	2,9%

5.2.2 On this assumption we can develop various projections for growth in the industry, which also allow us to make estimates of fibre requirements to meet industry's needs. Such a model is not intended to produce accurate forecasts of either fibre demand or supply, but to indicate for any predetermined (but variable) increase in the real value of the sector's output over a specified time:

- the likely scale of the additional fibre requirements necessary to support that level of output
- the implications for future fibre demand from growth in the value of the sector's output achieved by factors other than volume increase under constant real price conditions, such as could be achieved by value adding
- the likely implications for additional fibre demand of changes in recovery rates and the use of recovered waster paper as furnish for the pulp and paper industry.

5.3 Scenario development

5.3.1 Two growth scenarios for additional wood fibre demand were generated for the years 2010 and 2020:

- a "moderate" rate of growth in the value of the sector's output of 3% per annum, a rate which matches the historic rate registered over the period 1979/80 to 1994/95 a phase of considerable expansion
- a "high" rate of 5% per annum.

5.3.2 For either scenario the following changes to the model were applied and the reductions in net wood fibre demand calculated:

- a 1% per annum increase in the real unit prices of pulp and paper, sawn timber and board products as could occur through value addition
- a 2% per annum increase in the real prices of pulp and paper, sawn timber and board products
- a 1% per annum increase in the rate of recoveries achieved for sawn timber from increasing the existing recovery rate of 45% to an estimated 55% by 2016
- a 1% per annum increase in the use of recycled paper as a fibre source for the pulp and paper industry resulting in the existing utilisation rate of 23% rising to 29% by 2020
- the diversion of fibre destined for export chip markets to the manufacture of pulp and paper.

5.3.3 The results of the modelling exercise are shown in table 9.

Table 10. Possible future wood fibre requirements to 2020

Growth Scenario	1995	2010	2020
	Millions m ³		
Moderate growth			
Base case wood fibre demand	17,0	26,8	36,0
Net additional fibre required	0	9,8	19,0
Reduction in base case wood fibre demand achieved through:	0	2,6	5,8
• 1% per annum increase in value addition	0	8,0	14,1
• 2% per annum increase in value addition	0	0,7	1,6
• 1% per annum increase in sawn timber recovery rates	0	0,7	1,6
• 1% per annum increase in the contribution of recycled paper	0	0	5,5
• Diverting wood chip exports to domestic pulp and paper production			
High growth			
Base case wood fibre demand	17,0	35,1	57,2
Net additional fibre required	0	18,1	40,2
Reduction in base case wood fibre demand achieved through:	0	3,5	9,2
• 1% per annum increase in value addition	0	6,4	16,4
• 2% per annum increase in value addition	0	0,9	2,5
• 1% per annum increase in sawn timber recovery rates	0	0,9	2,5
• 1% per annum increase in the contribution of recycled paper	0	0	8,7
• Diverting wood chip exports to domestic pulp and paper production			

5.4 Key conclusions regarding future fibre demands from the model

5.4.1 A number of significant conclusions regarding the future possibilities and potential of the forest industries can be drawn from this analysis. These are:

- considerable growth in the value of the industry's output and its net contribution to the national economy is possible
- increased value addition (even of modest proportions) offers the opportunity to significantly increase the value of the industry's output and hence its contribution to national economic objectives without creating concomitantly large increases in fibre demands. This statement denies neither the existence of value addition nor the limitations to and difficulties in extending it further
- similarly, the redirection of wood fibre presently exported as wood chips into domestic value adding industries offers the potential for the industry to significantly increase the value of its output without creating additional fibre demands
- improvements in recovery rates and increased levels of recycling can make a contribution to lowering new net wood fibre demands associated with a growing sector, but these gains are not substantial.

6. STRATEGIC ACTIONS

6.1 Goal

6.1 To put in place those measures which promote the development of the industrial forest sector so that it contributes fully to the future economic and social well-being of South Africa, within the parameters of acceptable social and environmental impacts.

6.2 Indicators of achievement

6.2.1 Achievement of the following would indicate progress towards the goal:

- a clear strategy for growth for the sector, based on a thorough understanding of the relative costs and benefits of sector development, including a comprehensive fibre-supply strategy that addresses all sources (including recycling and fibre imports)
- sufficient agreement among stakeholders on the measures needed to achieve the desired growth path, and the elimination of unnecessary constraints to growth
- coherence between strategy and initiatives for the forest sector, and strategy and initiatives for industrial development, in a way which reflects macro-economic policy (e.g. in spatial development initiatives)
- a favourable climate for investment in the forest sector, including market-based roundwood prices
- agreement on effective and credible environmental management systems for the forest sector (see Chapter 12)
- the identification and promotion of the industry structure that maximises the sector's net economic contribution (see Chapter 13)
- mechanisms that favour investment in new, value-adding forest industries that achieve net economic gain for South Africa are developed and implemented (see Chapter 14)
- conditions are established that assist the sector to realise its full potential in the global market (see Chapter 15)
- substantial progress in minimising conflict between forest-sector enterprises, neighbouring communities and other rural stakeholders from the previously disadvantaged groups and in the degree of satisfaction expressed by rural stakeholders about equity of access to sector benefits (Chapter 16)
- substantial progress in addressing needs of sector-based institutions for dealing with human resources development and labour relations (Chapters 19 to 22)
- agreement on appropriate regulatory instruments for water use by plantation forests
- substantial progress in improving the research, technology and innovation system to support sustainable development of the sector (Chapter 23).

6.3 Strategy

6.3.1 Identify, promote and institutionalise stakeholder forums for negotiating and promoting the agreed course for forest-sector growth and ways of eliminating constraints to growth, on the basis of sound evaluation of the relative costs and benefits of industrial forestry.

Table 11. Recommended strategy to promote the sustainable development of the industrial forest sector

GOAL	To put in place those measures which promote the development of an industrial forest sector so that it contributes fully to the future economic and social well-being of South Africa, within the parameters of acceptable social and environmental impacts.		
INDICATORS OF ACHIEVEMENT	<ul style="list-style-type: none"> • a clear strategy for growth for the sector • sufficient agreement among stakeholders on the measures needed to achieve the desired growth path, and the elimination of unnecessary constraints to growth • coherence between strategy and initiatives for industry and forest sector development • a favourable climate for investment in the forest sector • agreement on effective and credible environmental management systems • the identification and promotion of the industry structure that maximises the sector's net economic contribution • mechanisms that favour investment in new, value-adding forest industries • conditions are established that assist the sector to realise full potential in global market • substantial progress in minimising conflict between forest-sector enterprises, neighbouring communities and other rural stakeholders • progress in addressing human resources development and labour relations • agreement on appropriate regulatory instruments for water use • improved research, technology and innovation system. 		
STRATEGY	Identify, promote and institutionalise stakeholder forums for negotiating and promoting the agreed course for forest-sector growth and ways of eliminating constraints to growth, on the basis of sound evaluation of the relative costs and benefits of industrial forestry		
TASK	RESPONSIBILITY	TIMING	RISKS
1. Create a national stakeholder forum for debate on forest-sector, industrial and macro-economic policy and strategy, and the identification and elimination of unnecessary constraints to growth.	Minister (with industry, provincial and local government, unions, NGOs)	Start: Sep 1997 End: June 1998	Some stakeholders may not participate in forum.
2. Strengthen support to the National Forestry Advisory Council as a forum for forest policy debate.	DWAF	Start: July 1997 End: Apr 1998	No risk.
3. Support and ensure province-level framework planning for forest-sector development through strategic environmental assessment	DWAF (with industry, provincial and local government, NGOs)	Start: July 1997 End: June 1998	Sufficient capacity does not exist at provincial level to undertake planning.
4. Establish adequate, competent capacity in DWAF to support progressive forest policy analysis and debate and disseminate information required to do this.	Minister	Start: July 1997 End: Mar 1999	Budgetary constraints inhibit DWAF's ability to assume its role.
5. Ensure national government funding for research towards national resource accounting and cost-benefit analysis.	DWAF	Start: Jan 1998 End: Dec 2000	Budgetary constraints inhibit assumption of new research role and lack of available expertise within DWAF.
6. Implement strategies outlined in Chapters 12 to 16, 19 to 21 and 25.	DWAF	Start: July 1997 End: Mar 2000	Risks as identified
7. Complete an economic study of opportunities for growth in the forest sector, the fibre supply options to support this growth and the economic, social and environmental costs and benefits of alternative growth paths	DWAF (with DTI, IDC, DEAT, industry, unions)	Start: Sep 1997 End: Mar 1998	No risk.
8. Identify and promote an agreed strategy for the growth of the industrial forest sector.	DWAF (with industry, provincial and local government, unions, NGOs)	Start: Sep 1997 End: Mar 1998	Stakeholders cannot reach consensus

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