CHAPTER 7

Wood, paper and pulp

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Introduction

South Africa's forestry value chain reflects a legacy of historical import-substituting industrialisation policies. It is a resource-based set of activities with significant local value addition and international competitiveness. Currently, there are several major changes occurring in the value chain. Dominant among these is the transformation of the forestry resource base, as the government privatises its plantation forestry holdings and simultaneously shifts afforestation to small growers. If not carefully managed, this change in the structure of timber production is liable to impact negatively on all the downstream users of domestic timber inputs. Skills development is critical to successful management of this change. However, several years into its implementation, the skills system remains inadequate.

The skills system also has an essential role to play in supporting and developing the value chain's competitiveness. This is especially true in prominent segments like pulp and paper. Despite advances, there are many systemic problems in the skills system. International integration induces firms to develop 'world class' operations. The associated pursuit of efficiencies concentrates resources and reduces subsidisation of skills development across the forestry value chain. Simultaneously, the search for these efficiencies is increasing skills demand within each segment as well as upstream and downstream from them. The analysis presented in this chapter identifies interventions to support these ongoing changes in the forestry value chain. After elaborating on the structure of the industry and its skills system, the penultimate section of the chapter details some priority policies aimed at strengthening the skills system.

An overview of the forestry value chain

The South African forestry value chain contains at least three distinct stages of production. The foundation of the forestry value chain is the renewable resource base; it consists of South Africa's forestry resources: woodlands, natural forests and plantation forests. In addition to growing timber, productive activities within the renewable resource base include livestock grazing, cover crops, and non-timber forest products (NTFP).

A second stage in the forestry value chain is primary processing; this involves initial value addition to timber resources. Sub-sectors within primary processing include wood fibre, sawmilling, pole processing and charcoal production. Following primary processing is a secondary beneficiation stage, which involves further value addition to timber inputs from primary processing. The components of

secondary beneficiation are paper and paper products manufacturing, wood furniture manufacturing, and wood product manufacturing. While timber is the unifying factor along the forestry value chain, each stage and its components depend on a unique combination of additional inputs and skills.

Employment in the forestry value chain is estimated to be near 750 000. Formal-sector output associated with timber resources totalled R15 billion in 2004. The associated exports equalled R9.35 billion in 2005, or 2.8 per cent of total exports. Net exports totalled R2.1 billion (Pogue 2007: 11). In addition, a further R15 billion was generated across the value chain through tourism, communal livestock grazing and NTFP. Lastly, although no formal estimates of its value are available, fuel wood is a significant source of informal income for many individuals who depend on it as a primary source of energy.

Renewable resource base

Woodlands account for 93 per cent of South African forestry resources by area. Currently, besides some charcoal production, these woodland resources do not feature downstream in the forestry value chain. Nonetheless, woodlands are important economic resources. Livestock grazing and tourism are significant productive activities associated with woodlands. As an input to the informal economy, fuel wood from woodlands is also substantial output. Medicinal and traditional plants as well as craft materials are further outputs from woodlands that contribute to both the formal and informal economies.

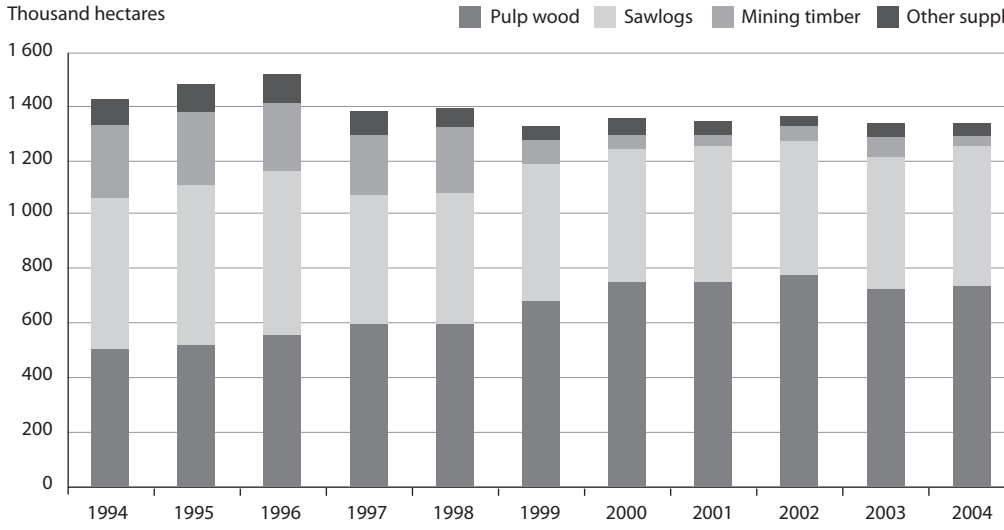
Natural forests consist of a further two per cent of South Africa's forest area. Despite the relatively small size of the natural forests, they support great ecological diversity. Timber is harvested from natural forests for wood products as are a variety of NTFP. Fern fronds, bark, bulbs and leaves are some of the more significant NTFP produced from South Africa's natural forests. Other NTFP harvested on a smaller scale are reeds, grasses, indigenous tree fruits, mushrooms, honey, thatch, seeds and moss (DWAF 2006). Ecotourism and other recreational activities are also significant economic activities connected with natural forests.

Plantations form the remaining five per cent of forests and provide the vast majority of timber inputs to the forestry value chain. Currently, there are three types of plantation forestry growers: corporates, private farmers and emerging growers. In terms of area, corporate growers manage approximately 72 per cent of South African plantation forests. Private individuals, partnerships or family trusts account for a further 26 per cent and emerging growers for the remaining two per cent (DWAF 2007; DPE 2007). Jointly, the corporate and private growers employ about half of the total workforce directly involved with the renewable resource base. The other half is part of the emerging growers' labour force (Chamberlain et al. 2005a). In addition, another third of forestry workers are engaged as contractors for the growers. Even allowing for the fact that most of the contract foresters work for corporate and private growers, the employment intensity of the small growers is pronounced.

There are three primary species of trees used in plantation forestry: eucalyptus, pine and wattle. Constituting just over half of South Africa's total plantation forest area, pine species produce softwood used in sawmilling for timber and in pulp milling for the production of newsprint, magazines and packaging. Accounting for a further 40 per cent of plantation forests, eucalyptus is a hardwood used in pulp milling for smoother paper, fluting and corrugated cartons. Eucalyptus is also used for poles and mining timber. Wattle accounts for the remaining eight per cent of plantation forest area. Also a hardwood, wattle is used in pulp milling.

The growth cycles for all of these trees vary by sub-species, management practices and natural environmental influences. Other factors being equal, a tree that will be used for its fibre in pulp milling or as wood chips will have a growth cycle about half as long as a tree used for sawlogs. Figure 7.1 indicates changing management objectives for plantation forests between 1994 and 2004. It shows that pulp

FIGURE 7.1: *Management objectives for plantation forests, by area, 1994–2004*



Source: FSA 2006

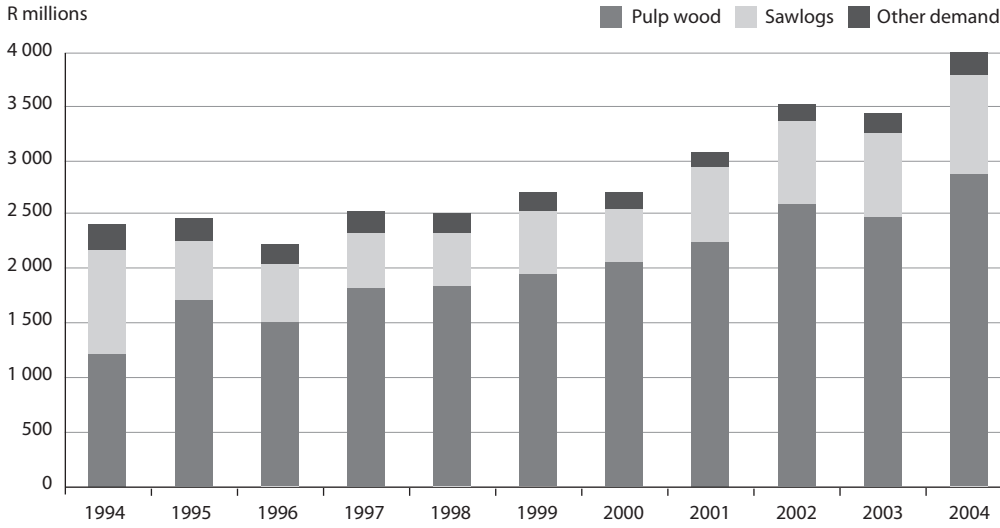
wood has risen in importance as a management objective over this period, and although sawlogs have remained relatively constant, mining timber has decreased.

The plantation forestry sector is characterised by a strong degree of vertical integration with downstream sectors. Therefore plantation owners also tend to be significant primary processors, and involved in secondary beneficiation. While historically state plantations were important timber sources, in 1997, the government undertook to withdraw from plantation forestry. This ongoing privatisation involves the state retaining ownership, but leasing its holdings. While these leases are focused on promoting black economic empowerment in the sector, they typically involve an established partner with downstream linkages.

Figure 7.2 shows plantation timber sales between 1994 and 2004. During this period, total sales grew at a compound real annual growth rate of 4.6 per cent. Pulp wood increased from 47 per cent of market value in 1994 to 68 per cent in 2004. In contrast, sawlogs decreased from 35 per cent of market value in 1994 to 22 per cent in 2004. South African consumption of sawn timber is relatively low by international standards. Since the early 2000s, the domestic building industry has dominated sawlog demand. However, overfelling and increasing demand for sawn timber have created a situation in which demand for sawlogs appears to be exceeding supply (Crickmay et al. 2005b).

In the pulp wood market, pulp mills account for approximately 60 per cent of demand by volume, chipping plants for 35 per cent and board mills for the remaining 5 per cent (Crickmay et al. 2005a). Because of the high capital costs, demand from pulp and papers mills tends to increase in a stepwise fashion as they pursue economies of scale within the mills. Board mills have shared in some demand growth from the domestic building industry, increasing at a compound annual rate of two per cent between 2002 and 2004. While demand for wood chip exports grew in real terms at a compound annual growth rate of 18.2 per cent between 1994 and 2002, increasing rand strength led to a real annual decline of 3.1 per cent between 2003 and 2006.

FIGURE 7.2: *Sales of forest timber (real 2000 rand values), 1994–2004*



Source: FSA 2006

Some fundamental challenges face the forestry resource production system. First, there is the privatisation of state timber plantations. Historically, state plantations were a primary source of sawlogs, whose normal planting-to-harvest cycle is around 35 years. However, for a private firm to lock up its resources for 35 years is difficult, especially in an environment of relatively high interest rates. This is compounded by a regulatory environment in which companies with sufficient internal economies for these types of investments have faced anti-competitive challenges.[1] Second, under current afforestation practices there are only about 100 000 net hectares available for afforestation (Chamberlain et al. 2005b). These 100 000 hectares are less than the net 140 000-hectare increase proposed in the Department of Trade and Industry's (DTI) Industrial Policy Action Plan (DTI 2007). Third, new afforestation is targeted at small plantation community growers. These growers' current timber output is very small and does not appear likely to supply large quantities of timber for downstream users (Pogue 2007: 105).

Many difficulties confronting the renewable resource base are consequences of the established production system. Nonetheless, alternative productive structures exist locally and internationally that could alleviate the majority of these challenges to the sector. An important change would be breaking the large plantation and innovation system paradigm. If available alternative production techniques such as natural regeneration were used, and other alternatives developed, the associated decreases in investment barriers and economies of scale could significantly increase viable land for afforestation and facilitate community-based growing processes (Zwolinski & Groenwald 2004).

Similarly, systematic development of integrated livelihood enterprises among community-based growers would support the long growth cycle of timber production through symbiotic shorter-term revenue options that offer additional linkages with the formal economy. These complementary enterprises would be likely to involve NTFP, and cover crops as well as short-rotation timber and non-timber

1 Blom N, Komatiland faces stiff fine if tribunal finds it abused market dominance, *Business Day Online* posted 14 November 2007. Accessed 14 November 2007, http://www.businessday.co.za/

tree/shrub plantations (Pogue 2007: 63). Fuel wood and livestock fodder can be important products derived from these non-traditional plantations, and with innovations in established practices, downstream users could also utilise short rotation timber.

Primary processing

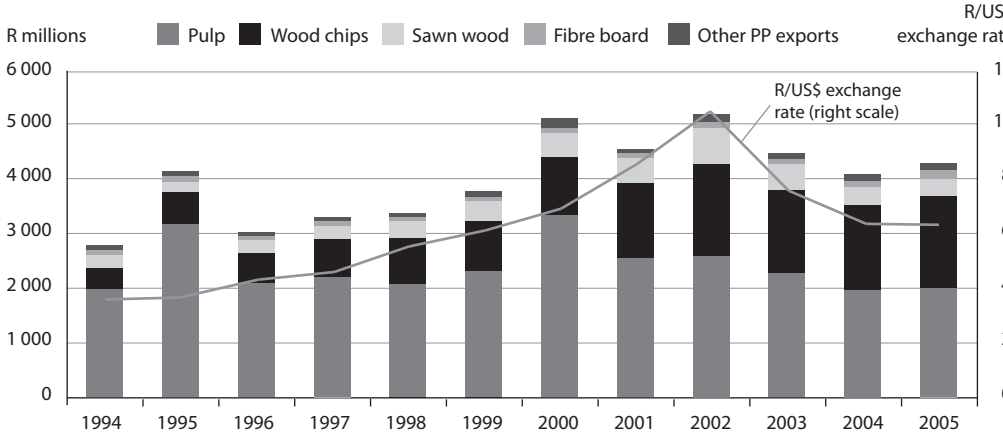
Primary processing of timber can be divided into fibre, sawmilling and other processing activities. Fibre processing encompasses pulp milling, wood chipping and fibre board production. Between 1994 and 2004, fibre processing accounted for 80 per cent of all primary processing output by value, of which pulp milling comprised 83 per cent, wood chip milling 10 per cent and board production 7 per cent. Sawmilling processes timber for lumber and mining timber. In the 1994–2004 period, sawmilling comprised 12 per cent of primary processing output. Other processing activities such as charcoal and pole manufacturing accounted for the remaining eight per cent of output (FSA 2006).

Pulp milling is the most important component of fibre processing and is integrated, through the Mondi and Sappi duopoly, with downstream paper manufacturing in South Africa and abroad. Wood chipping is a smaller, but significant, component related to the pulp and paper production stream. Export-focused chipping plants independent of the pulp mills were created in the 1970s to check the domestic buying power of Mondi and Sappi (Chamberlain et al. 2005b: 77). However, it was only with the reintegration of South Africa into the international economy after the end of apartheid that demand for wood chips became significant. Figure 7.3 documents the growing value of wood chip exports since 1994.

Currently, chip milling is not limited to non-integrated growers as it has become an established outlet for pulping timber supplies that exceed domestic pulp processing capacity. As a result, Mondi operates one of the largest chip mills, but it plans to use this chipping capacity in future pulping. Given the latent demand for wood chips by pulp mills, all wood chip exports could eventually form part of the domestic value chain. Nonetheless, Japan is currently the primary market for South African wood chips. In fact, between 2003 and 2006, Japan purchased 98.6 per cent of all South African wood chip exports.

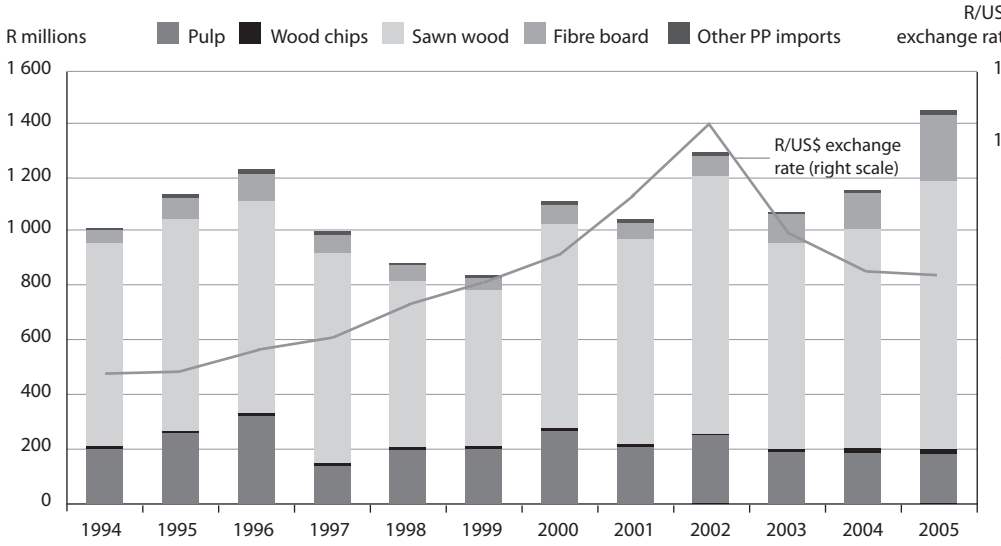
Three distinct types of sawmill can be distinguished within sawmilling: formal sawmills, low-cost mills and micro mills. Formal mills produce about two-thirds of South Africa's sawn timber, which is all kiln-

FIGURE 7.3: *Primary processing exports (real 2000 values), 1994–2005*



Source: Quantec 2007

FIGURE 7.4: *Primary processing imports (real 2000 values), 1994–2005*



Source: Quantec 2007

dried and graded by the South African Bureau of Standards (SABS). Consolidation for greater efficiencies has characterised the formal mills. Between 1988 and 2004, the number of formal mills declined from 188 to 45, but the remaining mills produce more lumber than before (Crickmay et al. 2005b). Low-cost mills constitute 27 per cent of sawn timber output. These mills are continuously operating location-specific mills that often kiln-dry their timber, but do not necessarily produce SABS-graded timber. Micro mills produce the remaining seven per cent of domestic lumber output. These mills are mobile processing facilities that often work fire-damaged areas. Typically they produce wet or air-dried timber for local communities, pallets and cable drum manufacturers.

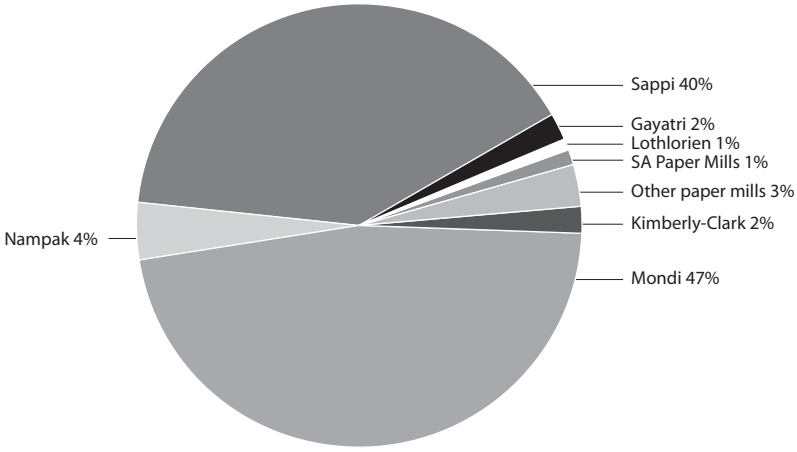
A primary constraint on the sawmilling industry is sawlog availability. As mentioned above, there is a growing shortage of sawlogs in South Africa that is liable to continue to increase unless alternative production systems are developed. Figure 7.4 illustrates that significant sawn wood imports are not a recent feature. Nonetheless, particularly as building demand has increasingly dominated domestic demand, the need for sawn timber imports appears likely to grow. If this increasing need for imported sawlogs continues, it will be likely to impact disproportionately upon the small and micro mills, because of the costs of importing and the associated need for greater productive efficiencies.

Secondary beneficiation

In the forestry value chain, there are three distinct manufacturing segments of secondary beneficiation: paper and paper products, wood products and wood furniture. Since the late 1990s, building growth has supported wood product manufacturers. Paper manufacturers have seen increasing internationalisation of their operations. Wood furniture manufacturers appear to be increasingly focused on niche production for domestic and international markets as import competition increases.

South Africa's paper-milling capacity is also dominated by Mondi and Sappi; there are few other companies with significant capacity. Figure 7.5 shows capacity by company. The 7 enterprises included in the figure own 21 mills, which account for 97 per cent of the total 2.94 million tons of domestic paper-

FIGURE 7.5: *South African paper milling capacity, by company, 2005*



Source: PAMSA 2007: 7

milling capacity. Paper milling is concentrated along the KwaZulu-Natal north coast and in Gauteng. Paper mills that are not located near to pulp mills tend to use a higher recycled-paper content in production.

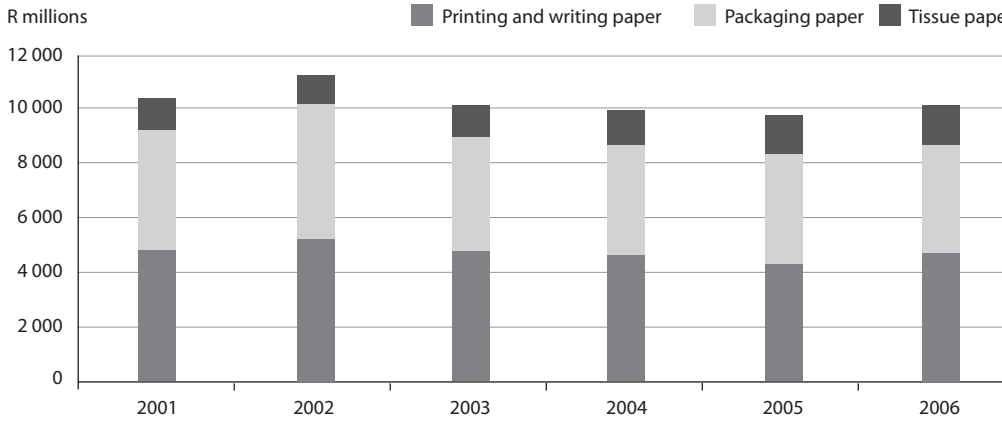
The tonnage of South Africa's paper production output has grown at a constant rate. In the 7-year period between 1999 and 2006, tissue paper output grew at a compound annual rate of 3.9 per cent, followed by packaging paper at 3.5 per cent, and printing and writing paper at 3.4 per cent. Over the same period, packaging papers accounted for 53 per cent of output, printing and writing papers for 40 per cent, and tissue papers for the remaining 7 per cent of output (PAMSA 2007: 7).

The value of paper output between 2001 and 2006 is indicated in Figure 7.6. Printing and writing paper accounted for 47 per cent of paper sales, followed by packaging paper with a further 41 per cent and tissue paper with the remaining 12 per cent of sales. In contrast to the growth in the volume of paper produced, real paper sales were largely constant.

The real values of paper exports are reported in Figure 7.7. Correlation between exports and the exchange rate may indicate that South African paper competes on a commodity price basis internationally. In terms of composition, paper and paper products appear to be an increasingly significant component of recent exports. Paper and paper product exports accounted for 70 per cent of total exports during the period, with other non-corrugated and non-container paper and paper product exports accounting for the remaining 30 per cent.

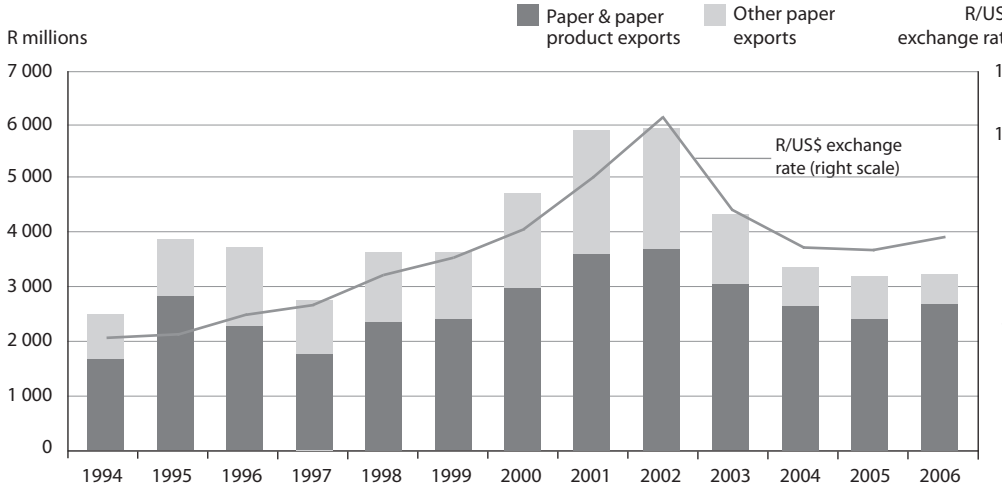
The composition of paper imports is shown in Figure 7.8. Given that domestic paper production has increased, the constant growth in paper imports appears to indicate that paper imports are not a substitute for domestic production. This suggests that increasing income, as indicated by sustained GDP growth, is an important market driver. In this context, domestically produced paper products are apparently not a suitable substitute for imported products. While skills and technological capabilities may contribute, high fixed costs associated with establishing new productive capacity may also form a considerable barrier to South African paper manufacturers' ability to meet this growing demand.

FIGURE 7.6: *Domestic paper sales (real 2001 rand values), 2001–2006*



Source: PAMSA 2007: 10

FIGURE 7.7: *Paper exports (real 2000 values), 1994–2006*

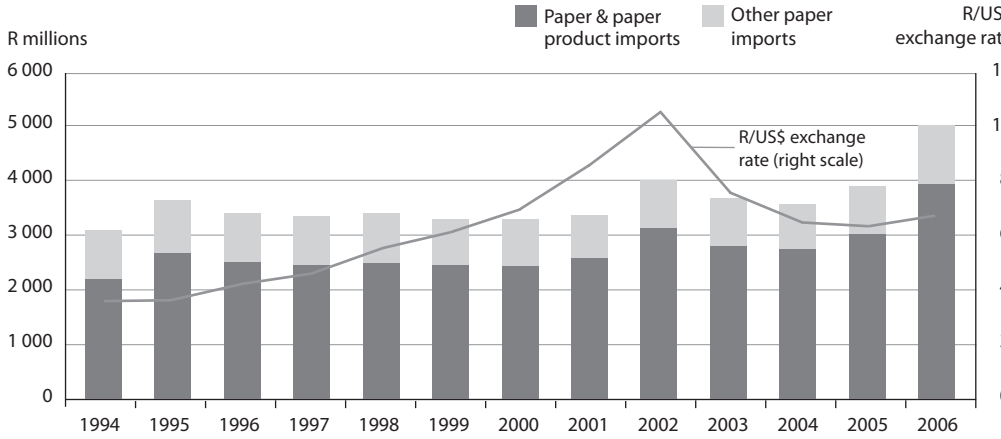


Source: Quantec 2007

The wood furniture sector relies on sawn timber inputs from the primary processing sector as well as on plastic, metal, leather and cloth inputs. The real value of wood furniture exports is reported in Figure 7.9. These exports are again closely correlated to exchange rate fluctuations. Between 1994 and 2005, the share of general wooden furniture exports increased at the expense of wood office furniture and bedroom furniture.

The composition of wood furniture imports is shown in Figure 7.10. There is little correlation between imports and the exchange rate. In fact, rand appreciation since 2002 coincides with an acceleration of wood furniture imports. Between 1994 and 2005, the value of wood furniture imports grew at a compound annual rate of 17.6 per cent. The strong growth in imports has led to a rapid decline in the

FIGURE 7.8: *Paper imports (real 2000 values), 1994–2006*

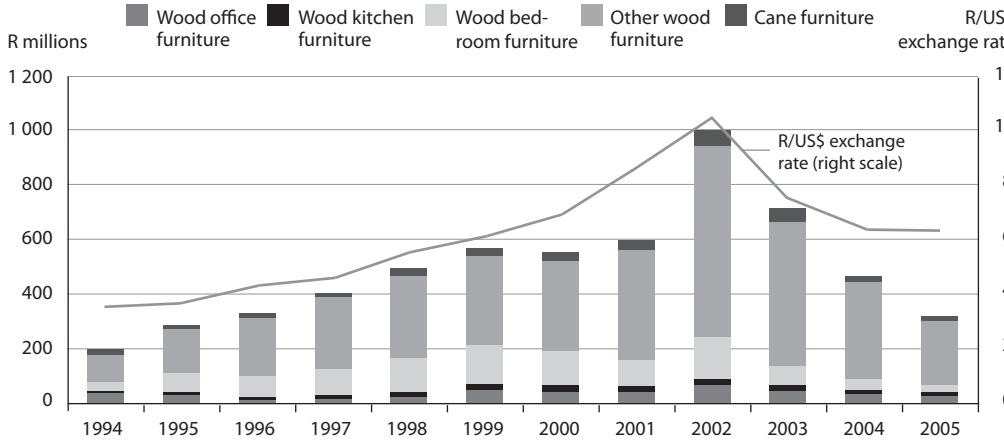


Source: Quantec 2007

sectoral balance of trade, with a trade deficit being registered for the year 2005. These trends seem to parallel those discussed for the paper market, and suggest that domestic wood furniture is an imperfect substitute for imported varieties.

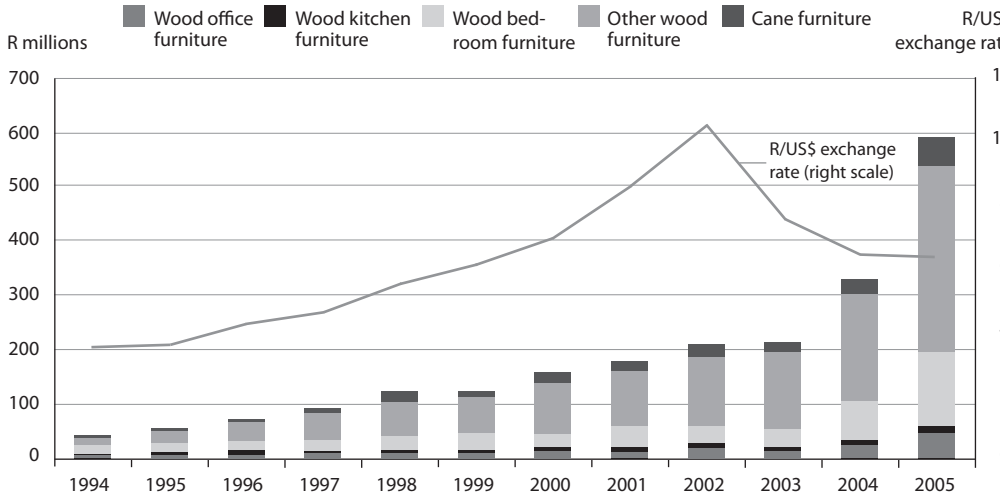
Wood furniture manufacturers are mostly small and medium enterprises. Analysis suggests that 95 per cent of the estimated 1 085 wood furniture companies are small and medium enterprises (Erasmus 2004: 68). These companies are concentrated near urban centres in Gauteng, the Western Cape and Kwazulu-Natal. Since 1994, producers have transformed their orientation from an inward market focus reinforced by trade sanctions, to an increasing focus on export markets with higher volumes and variety (Moodley 2002: 31).

FIGURE 7.9: *Wood furniture exports (real 2000 values), 1994–2005*



Source: Quantec 2007

FIGURE 7.10: *Wood furniture imports (real 2000 values), 1994–2005*



Source: Quantec 2007

A difficulty with the small and medium enterprises' (SME) predominance in the sector is that they may find it difficult to commit resources to funding R&D activities. Evidence of this is found in the R&D expenditures reported for the furniture manufacturing sector, with the 2003/04 *National R&D Survey* reporting sector R&D expenditures equal to R6.3 million and declining in the 2004/05 survey to R4.2 million (DST 2005, 2006). That gives the sector an R&D-to-revenue ratio of 0.09 per cent; nationally, South Africa's total R&D expenditures-to-GDP ratio was 0.87 per cent. In comparison, forestry and primary processing had an R&D-to-revenue ratio of 0.65 per cent.

This is not to say that wood furniture manufacturers are not innovative. Given their ability to compete in an increasingly international market it is likely that a significant quantity of innovation occurs in these firms, but it is not explicitly established as formal R&D expenditures. Interviews with wood furniture manufacturing firms also indicated that technical services were a primary resource from the national system of innovation for their operations.[2]

The recent growth of imported wooden furniture appears to indicate strengthening domestic demand. There is also a general trend in the sector internationally to connect within global value chains that require an export focus. The primary export markets for South African wooden furniture are the UK and Germany (Moodley 2002: 34). In these international markets, there is also significant competition from developing nations in Asia and Eastern Europe. In this context, international retailers are able to dictate costs, designs and quality conditions to a much greater extent.

2 Interviews for this study were conducted with the following organisations:
Forestry and primary processing: Southern African Institute of Forestry (Pretoria); Council for Scientific and Industrial Research – Natural Resources and the Environment (Durban); University of KwaZulu-Natal – Institute for Commercial Forestry Research (Pietermaritzburg); Hans Merensky Timber (Johannesburg);
Paper and pulp: Mondi (Richards Bay); Sappi (Johannesburg); Paper Manufacturers Association of South Africa (Johannesburg);
Furniture: Furniture Bedding and Upholstery Manufacturers Association (Johannesburg); Salinga Furniture (Rosslyn); U-Niche Furniture (Meyerton).

The South African forestry value chain is internationally competitive and developed to high standards. At the same time, aspects of its production system are linked to less economically developed groups. As a result of this structure, the forestry value chain is faced with significant challenges and opportunities. In mitigating the former and enhancing the latter, the skills system plays a central role.

The skills system in the forestry value chain

The forestry value chain's skill system incorporates both the formal and informal economies. While these linkages offer opportunities to improve the livelihoods of many impoverished South Africans, they also increase the difficulty of changing established practices. This section reviews some key features of the skills system within the forestry value chain, with particular attention given to differences in skill regimes. Owing to their operational integration, the pulp and paper segments are taken as a single activity.

Renewable resource base

There are an estimated 100 000 individuals working in the renewable resource base of the forestry value chain (Chamberlain et al. 2005a: 34). There are three significant productive components in the renewable resource base: traditional growers, contract foresters and emerging growers. Traditional private and corporate plantation growers utilise artificial tree regeneration in large-scale operations. This segment was the historic driver of the timber industry's growth in South Africa, but its operations are increasingly outsourced to forestry contractors. Demand and supply of skills among traditional growers are established and typically linked to one or more downstream segments in the forestry value chain.

Currently, contract foresters make up a further third of employment in the renewable resource base. During the 1980s, forestry operations such as harvesting, silviculture and transport were increasingly outsourced. Outsourcing transformed what was a permanent workforce into a highly competitive market of contracting firms whose internal competition increases upstream and downstream authority over contractors (Khosa 2000).

Many workers view the development of forest contracting as casualisation of the labour force. These workers are now employed by contractors rather than by growers, but the same work on the same plantation is being done for less pay and fewer benefits. As a result, the contract labour force is characterised by low levels of loyalty and increased alienation. The disappointment in this transformation is also reportedly manifest in arson attacks on the plantation forests (Mayers et al. 2001: 110).

Transformation efforts appear to be reinforcing upstream and downstream authority, as emerging black entrepreneurs are caught in a drive for competitiveness based on lower margins than their established white counterparts. Given this situation, forestry contracting has severely constrained opportunities for sectoral investment that might enhance efficiencies and decrease upstream and downstream market authority. Many of the new firms are formed from employees in established contracting firms who have operational knowledge, but often have limited business skills and financial training (Clarke & Isaacs 2005: 14–20).

As a result of relatively low barriers to entry, a majority of forestry contractors are SMEs. These SMEs typically lack land or other fixed assets that they can use as collateral for new equipment, so outdated and poorly functioning equipment is often retained, further contributing to inefficiencies and potential health and safety dangers. Even larger firms find it difficult to make these investments as they face a highly competitive cost-focused market (Lewis et al. 2004: 22–24).

Currently, forestry contracting appears locked into a low-skills investment dynamic. Contractors' services are important to the forestry value chain's overall productivity. Upstream and downstream markets do not seem to value the contribution that enhanced skills amongst contractors could contribute to their own products' value. As a result, there is limited demand for a transformation of the skills system. However, at least in regard to business and financial skills, there is a need to enhance initiatives for skills development if transformation efforts are to succeed.

Community-based growers constitute the final third of employment. Under current afforestation policies, community-based growers will play a greater role in the supply of timber to the forestry value chain. This should increase employment intensity across the renewable resource base. Enhancing the role of community growers will also increase employment in both the formal and informal sectors as a result of associated trade in goods like NTFP and services like tourism.

As mentioned previously, the viability of community-based growers appears to depend on development of a new system of timber production. This system will consist of small plantations playing an enabling, but dependent, role in the broader economic development of the community. Provision of 'forestry' skills to these community growers therefore needs to encompass more than a narrow focus on plantation forestry, silviculture or entomology.[3] Skills development must holistically embrace the range of livelihoods that the entire forestry environment can provide to these rural and frequently impoverished communities (Shackleton 2004).

The importance of this complementary education and training of individuals who have not historically participated in the forestry sector is recognised in the new afforestation policy. However, providing this skills development is a challenge, particularly given that the learnership and skills programmes in the sector education and training authorities (SETAs) are often highly inflexible and centrally managed, which limits their uptake within the informal sector (DoL 2007: 15). Efforts to realise skills development within the broader forestry sector have an institutional champion in the Department of Water Affairs and Forestry's Directorate of Forestry Development.

The directorate is tasked with supporting the sustainable use of forests and forest resources to serve the livelihoods of the poor. It supports a range of programmes aimed at fostering enterprise development. A few projects have already been initiated by the directorate. However, these projects have failed to reach a point of self-sustainability and it appears that they are not a viable model for the systemic development of complementary forestry livelihoods (DWAF 2006: 31).

Primary processing

Primary processing, excluding pulp milling, has a total employment of 35 000 (Chamberlain et al. 2005a; Crickmay et al. 2005a). Sawmilling is a critical source of demand for skills in primary processing. While large sawmills have a developed skills development system, enhancing production efficiencies within the more than 500 low-cost and micro mills creates substantial demand for skills development. In this regard, there is a substantial need for development of skills in the informal economy. While there have been efforts to enhance the efficiencies of low-cost and micro mills, these programmes usually deal with a few enterprises on an ad hoc basis rather than systematically developing their skills system (Pogue 2007: 91).

Entrenching the supply of skills from these pilot initiatives on a larger scale needs to be carefully considered. Otherwise, there does not appear to be a future for these mills in the forestry value chain.

3 The author would like to acknowledge J. Zwolinski from the Forestry Programme at the University of KwaZulu-Natal for highlighting this point in his comments on an earlier draft. The usual disclaimer applies.

Currently, little is being done to target these mills' linkages to areas of secondary beneficiation like furniture or building products. Skills shortages and limited networks are reportedly important reasons for not developing these potential opportunities (Heyl et al. 2000: 11). Despite its relatively small share of total output, small-scale sawmilling is a critical source of income and employment in many rural areas (Horn 2000). Therefore, skills development is necessary if a significant source of living is not to be lost to already impoverished rural communities.

Secondary beneficiation

Employment in secondary beneficiation is estimated to be 123 000 individuals. This is divided into 38 000 workers in wood products, 40 000 in pulp and paper, and 45 000 in wood furniture manufacturing (Pogue 2007: 57–58). Paper and pulp is a critical component in South Africa's forestry value chain. While the informal economy is supported by over 11 000 informal paper recyclers, the skills system associated with formal paper and pulp operations is critical to the competitiveness of the entire forestry value chain.

Following democratisation in 1994, the paper and pulp sector rapidly transformed to take on international significance. In this context the industry has identified skills training as a critical dimension of developing their South African operation's competitiveness. Historically, the industry had a strong dependency on parastatals such as Iscor and Eskom to generate the supply of operators that they needed. As the parastatal training system collapsed, the industry began to further develop its own training programmes. An early initiative in this regard began in the late 1980s at Natal Technikon, which is now part of the Durban University of Technology (DUT). Both Mondi and Sappi collaboratively supplied staff to teach the programme, which was very successful. It was so successful in skills development that its graduates were rapidly promoted out of operator occupations. Although it was a testament to the sector's ability to collaboratively provide high-quality training, the programme was discontinued in the early 1990s in an environment of changing labour legislation.

With the advent of the Skills Development Framework, the sector's training programmes were institutionally vested as learnerships within a SETA, the paper and pulp chamber of the Forest Industry Education and Training Authority (FIETA). Currently, two programmes are descendants of the collaborative training initiative developed at Natal Technikon. Building on the original programme, the DUT now offers a BTech degree in Pulp and Paper Technology at National Qualifications Framework (NQF) Level 7. The other programme is a learnership modelled on the collaborative training and distance learning structure of the Natal Technikon qualification. Using a pool of instructors from both Mondi and Sappi, lectures are offered in pulp and paper centres across the country in support of the primarily correspondence-based programme. Institutional administration of the programme and examinations are run through the University of South Africa (UNISA), where this National Diploma qualification is registered.

While bureaucratic difficulties were noted in all the learnerships that the sector has developed, the UNISA programme was highly problematic because of the co-ordination it required between the Department of Labour (DoL) and the Department of Education (DoE). The industry's drive to increase the knowledge intensity of its production led to it targeting this qualification at the National Diploma level or NQF Level 6. As a learnership, the programme had to be recognised and registered by both the DoL and the DoE. In effect, two distinct systems of skills development appear to exist, rather than an integrated system. Besides bureaucratic challenges, the change to outcomes-based education required substantial review and revision of the established curriculum. As a result, there were delays in the development of learnership registration despite their having existed before the new system came into being.

Under the outcomes-based system, mentorship is a critical component of learning. Mentorship is premised upon an existence of social capital shared by instructor and learner. In the context of equity-based advancement and transformation, there is a shortage of social capital to underpin the trust and common cause that facilitates effective mentorship. The racial division that characterised the occupational hierarchy in South Africa before democratisation appears to be a cause of this dysfunctionality. In the current system, a predominately white hierarchy is now expected to mentor individuals who were previously treated as adversaries occupationally, socially and institutionally.

In the modern learning environment, knowledge and practice are intertwined. Improved knowledge relating to competency development has shortened the time in which competencies are expected to develop. However, this expectation conflicts with traditional systems in which an individual was expected to serve a prescribed time in a particular job, regardless of skills development. This tradition leads to mentors withholding knowledge transfers to learners until 'sentences' in certain roles or occupations are completed. Another barrier to effective mentorship is a learning environment characterised by a belief that knowledge development and practical skills are separate activities. In this context, conflating learning and practice is resisted by both mentors and learners. Combined, these factors severely constrain the uptake of outcomes-based education and thereby the current learnership and skills development initiatives undertaken by the paper and pulp industry. Despite these impediments, however, the industry has managed to develop a well-co-ordinated and coherent skills development system.

The diffused production structure is a critical challenge to skills training in the wood furniture sector. Despite numerous learnerships targeting skills development, there do not appear to be strong linkages with these and established or emerging participants in the sector. A significant portion of skills training originates within the context of development policies and donor aid. Therefore it appears that the supply of skills is focused on beneficiaries' own enterprise development rather than on alignment to the needs of the numerous existing SMEs and the smaller number of large enterprises.

The structure of the wood furniture SME sector creates major challenges in identifying skill demand. There is little co-ordination among the SMEs and there are not any significant industry associations that represent their interests. In an effort to address this difficulty, some initiatives have attempted to build complementary business skills within the SMEs and their training providers that would facilitate inter-firm co-operation (Pogue 2007: 112).

A Furniture Industry Industrial Training Board previously oversaw skills training for larger and more established producers in the sector. These firms currently provide significant guidance within the wood furniture chamber of the FIETA. Skills training used to be offered directly through centres run by the training board, but currently they have been transferred to learnerships at further education and training (FET) colleges. As with general skills development in manufacturing, many of these firms are working to establish a market niche for their products in the global environment. This is a challenge because of competition from better resourced, skilled and equipped manufacturers in more economically developed countries and lower-priced labour from other economically developing nations. These factors combine to create severe challenges for all segments of the wood furniture industry.

The forestry value chain's skill system incorporates both the formal and the informal economies and therefore provides a useful illustration of problems and benefits that can be derived from these linkages. Even in segments where there are no internal linkages, there are typically upstream and downstream dependencies. Significant challenges characterise the value chain as it is currently constituted, as well as its likely structure in the future. In addressing these challenges, the skills system is a critical instrument to promote development.

Policy recommendations

The forestry value chain spans a range of activities with differing priorities and interventions. The three interventions identified below are an initial attempt to facilitate the alignment of skills training to the broader strategic priorities and growth of the value chain.

Sustainable and empowering resource base

A critical challenge facing the forestry value chain is the transformation of the historical production system. Ultimately success equates to meaningful output of timber from community-based growers. Largely marginalised communities will then be integrated into an international market. However, if the decades-long growth cycles characterising plantation timber are not to be a barrier, harmonised livelihoods need to be created to support long-run plantation timber cultivation. Realising this will require development of a new holistic timber production paradigm.

This holistic forestry production system would view traditional timber growth for downstream markets as complementary to shorter-cycle timber growth for other uses, such as fuel wood. In addition, non-timber products and services would form another basis of complementary livelihoods. In order to realise this holistic production paradigm, a concerted and systematic skills development programme must be established. These skills would ensure that communities are able to grow timber for traditional markets, but at the same time develop complementary livelihoods with business, marketing and other production skills.

Currently, a range of development programmes are working on ad hoc interventions to develop these kinds of complementary skills (Shackleton 2004: 34). However, transformation of the timber production system requires sustained development of skills and other productive resources. Identifying and delivering these resources cannot be done without ongoing consultation with the communities themselves (Tyler 2006). The development of complementary business support is critical in this regard. While a community might develop some NTFP, their impact will be minimised unless they have business support (Kapila & Mead 2002).

A new extension service model appears to offer considerable promise in delivering these skills and other services in a sustained manner. Such an extension service would perform a range of roles beyond narrow tree-growing, and focus on local specifics rather than formulated answers. This type of extension service is increasingly common internationally and would form a critical vehicle for monitoring, evaluating and learning from the experience of the community-based growers (World Bank 2007: 172–176).

Complementing and related to the skills development and extension services for the segments' transformation is the need for co-ordination among communities. Enhanced co-ordination and partnership development should also be encouraged through initiatives like diffused production competencies, in which complementary business skills are developed and fostered across a network of communities. Economies of scale for productive equipment could also be realised through this network. These community-based co-operatives could also foster social capital among communities and facilitate increased market co-ordination and authority.

Entrenching monitoring, evaluation and learning systems

Many of the key challenges facing the forestry value chain are recognised, and most are being addressed through one or more interventions. Nevertheless, the interventions are often not co-

ordinated, despite focusing on the same challenges. Frequently these interventions are also ad hoc and supply-driven, leading to solutions being pursued that are ineffective or even destructive. Further, there are difficulties associated with well-designed interventions impacting differently than intended, as well as inadequacies in resources, especially skills, for implementation.

Monitoring, evaluation, and learning (MEL) systems are a critical tool to address these difficulties and ensure that lessons from interventions become part of a learning process. There are key challenges in each segment of the forestry value chain where entrenching an integrated MEL system could deal with this critical dimension of implementation. In the resource base, an MEL system would seem to be a priority in guiding the transformation of plantation forestry and its associated increased usage of community-based growers. It would facilitate assessment of long-term development impacts as well as ensuring that the expected timber supplies are being delivered. The MEL system would also provide a critical source of information and feedback for the interventions to learn and improve their performance.

In primary processing, an important area is ensuring that low-cost and micro mills develop their production processes and business capabilities. Success in this regard is necessary if they are to remain viable in the forestry value chain, and if they are not, to become further marginalised from a production system that is increasingly consolidated around large-scale sawmills. In this regard, an MEL system would complement ongoing initiatives by creating a co-ordinating institution that diffuses information and builds awareness of these efforts' relative success and failure. The MEL system would also facilitate identification of gaps in initiatives addressing these challenges.

There are two areas in secondary beneficiation where MEL systems hold significant promise. In the wood furniture sector, an important challenge exists in ensuring that the skills supplied are meeting the demands from existing producers. Within this sector, there is also a critical challenge to ensure that complementary business skills are developed to support the current focus on production skills.

Paper and pulp is the other area where an MEL system could make an important contribution to the sector's challenges generally, and especially in regard to skills development. Despite resources and intra-industry co-ordination, skills development remains a large concern for the sector. An MEL system would make a significant contribution in addressing the challenges of skills development by generating and diffusing information and learning amongst key agents in the skills system.

Systemic development of critical skills in priority segments

The paper and pulp industry is a critical feature across the entire forestry value chain. Therefore its current efforts to enhance training and skills development must be supported and obstacles removed, to ensure its competitiveness. A collaborative skills planning model would mark a major step forward in this regard. Focusing on critical skills needed in the pulp and paper sector as a pilot exercise in priority skills delivery, this model should be useful for skills development across the forestry value chain.

Introducing innovations in relation to established planning and strategy software, this initiative would bring key agents across the skills system together to codify the structure of the skills system, identify critical delivery nodes, and prioritise interventions needed to enhance delivery. The model would also improve the skills development network by bringing together labour, the private sector and the public sector to develop evidence-based policies supported by their co-ordinated efforts. Premised on an evolving understanding of the skills system, with an inherent ability to update and re-design underlying relationships, the planning model would have flexibility and utility uncommon in traditional forecasting models.

By design, it would also incorporate systematic communications flow among stakeholders to facilitate consensus on priorities and challenges. The inclusive nature of the model's development and refinement thereby supports knowledge transfer to all stakeholders. The paper and pulp sector offers a terrific opportunity in this regard because of the concentrated ownership structure and evident commitment of the sector to finding practical solutions for skills development. Many challenges, such as overcoming barriers resulting from mentorship and needing to realise greater co-ordination across the skills system, are concerns that exist beyond the paper and pulp sector. Hence, the lessons learnt from the initiative will be significant for a much broader audience interested in dynamic issues of skills provision and policy formulation.

Conclusion

This analysis has focused on major changes occurring throughout the forestry value chain, their influence on the skills system and opportunities they have created for this system. The analysis has highlighted the transformation of this renewable resource as a critical development for the entire forestry value chain. Several years into the new afforestation policy, the new production system appears to be stagnating. Shortcomings in skills development were shown to be a critical aspect of successful management of these changes, but they must be accompanied by a broader contextualised focus on skills needs. The skills system was also shown to play a central role across the forestry value chain in supporting and developing domestic and international competitiveness. Systemic problems such as a limited culture of mentorship were identified as barriers to further changes in the skills system.

While the tremendous potential of the forestry value chain has been demonstrated, its ability to deliver growth and development is far from certain. Strong leadership is needed if the ongoing transformation of the value chain is to become a favourable development rather than a corrosive one. Interventions around the skills system identified in this analysis appear to be important steps forward in securing this promising future.

As pressure increases for action on climate change, there is a strong probability that an entrenched emissions trading scheme will be established. Afforestation initiatives could be given a significant boost if carbon projects linked to these schemes are translated into tangible and sustained benefits for tree growers. If South Africa can succeed in these efforts it can offer a renewable resource model that is inherently inclusive and dramatically in contrast to exclusive enclaves that historically feature in the region's development experience.

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