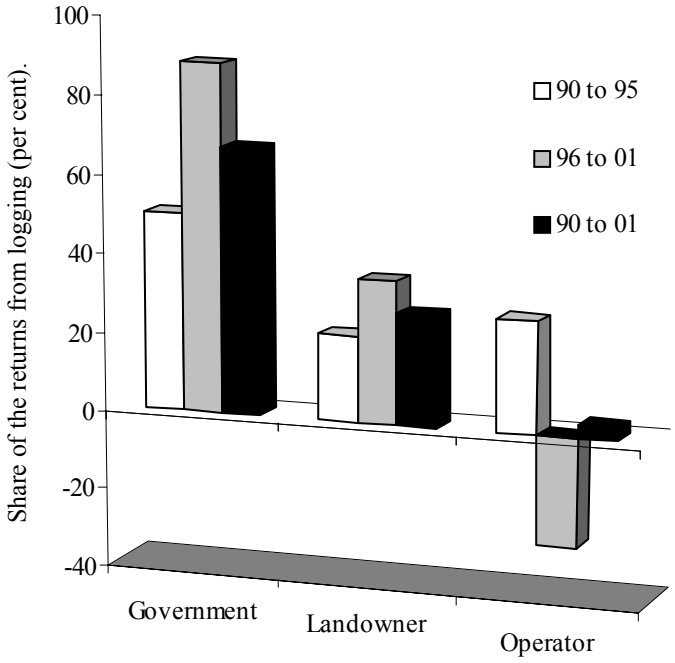
REVIEW OF THE FOREST REVENUE SYSTEM IN PAPUA NEW GUINEA



Do landowners receive enough ?

Does the Government collect enough ?

Do loggers receive too much ?

FINAL REPORT OF THE FOREST REVENUE REVIEW TEAM

COMMISSIONED BY THE GOVERNMENT OF PAPUA NEW GUINEA

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Disclaimer

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TABLE OF CONTENTS

BOXES

FIGURES

TABLES

ACRONYMS

APEC	Asia-Pacific Economic Council
APT	Additional Profits Tax
ASEAN	Association of South-East Asian Nations
BoPNG	Bank of Papua New Guinea
CAF	Chinese Academy of Forestry
cif	Cost, Insurance and Freight
DTI	Department of Trade & Industry
fob	Free on board
FIRR	Financial Internal Rate of Return
FMA	Forest Management Agreement
GDP	Gross domestic product
IMF	International Monetary Fund
IRC	Internal Revenue Commission
ISO	
ITTO	International Tropical Timber Organization
JLIA	Japan Lumber Importers Association
LFA	
MDF	Medium Density Fibreboard
MLH	Mixed Light Hardwoods
NFA	National Forest Authority
NFS	National Forest Service
NTFP	Non-Timber Forest Products
PDB	Project Development Benefit
PDL	Project Development Levy
PNGFA	Papua New Guinea Forest Authority
SGS	Société Générale de Surveillance
SPO	State Purchase Option
TA	Timber Authority
TEV	Total Economic Value
TSA	Timber Supply Agreement
VAT	Value Added Tax
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

Papua New Guinea is engaged in review of the forest revenue system as part of a broader reform of the forestry sector. This sector experienced good trading conditions in the middle of the last decade, but is now adversely affected by a combination of low export prices and reduced volumes, resource exhaustion in certain provinces, poor growth rates in the two main industries using Papua New Guinea logs (saw and ply-milling), the impact of illegal logging in Indonesia, and the prospect of certification.

Government obtains its revenue from the forestry sector primarily through a tax on log exports, receiving very little in the form of corporate income tax. There is also a reforestation levy and miscellaneous State income in the form of various fees. The core of the Review Team's analysis was to determine the magnitude of the resource rent over time, its distribution among beneficiaries, and to propose an equitable and efficient system for allocating the rent in the future.

Landowners also rely on log exports for royalty and premium income, royalties being fixed nationwide at K10 per cubic metre log exported and premia being the amounts developers agree to pay that are specific to each project. Wages for logging and processing, where this occurs, are commonly not landowner benefits, as many staff may be immigrants from other regions.

A model was developed that suggested a total average cost of efficient logging will be about US$70 per cubic metre in the future, with wide local variations due to terrain and other factors, of which $39 would be the logging production cost, and $12 depreciation of logging equipment. Landowners incurred costs of over $6 per cubic metre, comprising about $2.10 for a compensation payment being an alternative asset of equal value to the productivity loss in the initial cut of the virgin forest, $3.25 for the costs of environmental disturbance to cropping, non-timber forest products collection etc., and over $1 for the costs of reforestation and subsequent land management. In the preferred system of the model, $9 per cubic metre remains for logger's normal profit. For an fob (free on board) export price of $90 per cubic metre this would allow the Government (including provincial governments) and the landowners to capture 70% of the difference between the fob price and the cost of logging, and the loggers themselves to capture the other 30% of the same difference. Historically, the loggers earned a much higher excess profit from the resource rent until 1996, when the Government took over this position.

Conclusions from applying the model rest on the assumption that there is no transfer pricing. As the Barnett Commission (1989) found this was a common practice, the Government took steps to combat it. It now employs an independent agency (Société Générale de Surveillance (SGS)) to monitor exports but this agency's mandate ends with approval of the export shipment. The Review Team conducted an investigation into log export pricing from Papua New Guinea to Japan, Korea, and China. It found some unexplained and substantial discrepancies between the declared fob prices plus freight and insurance and the destination cif (cost, insurance and freight) prices that warrant further investigation.

Several processing options including different sizes of sawmill, some secondary processing, plywood, medium density fibreboard, and a pulp mill were studied in a standard costing format. It was found that the exemption from export duty of these products imposed costs on the country that substantially outweighed benefits generated by processing. Indeed, the profitability of most types of processing was in any case very low or even negative at current international price levels. This was especially true of large-scale operations and those dependent on one type of product i.e. the integrated sawmill with secondary processing scored higher than the large secondary mills.

This first attempt to assess the true economic value of the forest estate should be supplemented by targeted empirical studies, an examination of logging case histories, and a study of how, if at all, there are flow-on benefits to landowners from export tax receipts. The level of log export duties should be reduced in the current commercial environment, and a suitable benchmark would be the US$ level that prevailed in 1995. Logs harvested from plantations created by the exporter should be exempt. Landowner royalties

need to be raised to compensate for the loss of revenue due to the reduction in the US$ value of the royalty.

The model system should allow loggers to recover the full cost of efficient operations and provide enough revenue to fund the Papua New Guinea Forest Authority. In the first instance, landowners should receive the equivalent of $6 per cubic metre and consideration should be given to having the Project Development Benefit neutral with respect to changes in the kina. Thresholds for the application of export duty should also apply. Government and the landowners should secure 70% of the resource rent, and the principles underlying these considerations should be universal enough to apply to non-timber forest products too.

At present there is insufficient actuarial evidence of the risk of default to propose any changes in the system of performance bonds for forest operators now used.

PART 1 INTRODUCTION

Papua New Guinea is engaged in a review process of the forest revenue system. The review is part of a broader reform of the forestry sector and includes amendments to the Forestry Act to improve governance and accountability, an Independent Review of timber harvesting applications in process during the current moratorium on granting of new concessions, and a proposed Forestry and Conservation Project supported by the World Bank.

1.1 NATIONAL ECONOMY

1.1.1 Demography

Papua New Guinea's forestry sector must be viewed against the backdrop of the whole economy, which is essentially dual. The formal sector is predominantly urban, but the informal sector supports about 80% of the population through subsistence and small holding activities. Population densities, even in the Highlands Region where figures reach from 23 to 52 perkm^2, are still low enough to permit a 20-hour working week to provide sustenance even in the context of a total fertility rate of 4.6 children per woman and a population growth rate of 3.1% per annum. Smallholders have increased their proportion of national commodity production in the last two decades, reaching 82% of the total for coffee, 75% for cocoa, 83% for copra, and 68% for rubber. Only for oil palm are smallholders the minority producers (32%). But major forestry activities are concentrated in provinces such as Western, Gulf, Sandaun, West and East New Britain, where, except for some rubber and much oil palm in New Britain, cash crop plantations are not yet present. In the case of the Western and Southern Regions, the forestry provinces are also those with the lowest population densities of 2 to 8/km^2, so forest operations have the potential for major local social and economic impact, depending on the degree to which local labour is employed.

1.1.2 Growth

Nominal GDP at K9.8 billion in 2000 indicates a GDP/capita of US$744. This had been as high as $1,208 in the halcyon mid-years of the last decade, when the economy had benefited from the end of the "strong kina" era, the October 1994 float leading steadily down to the present exchange rate. Recent activities by the Bank of Papua New Guinea in the money market suggest that the preferred rate is above the 28 US cents mark, but the currency is now below this point. Growth, which had been negative in 1997-8, returned to 3.2% in 1999, as the country emerged scathed from the Asian financial crisis, but the estimate of 0.8% for 2000 indicates that the official projection of 3.1% for 2001 was highly optimistic. In fact in 2001 the economy was in recession. Components of lower growth performance have been the decline in coffee and copra production and prices, and in crude oil extraction rates, with further reduced log exports also a factor. Examining the trend of sectors over the last decade the smoothed annual growth rates have been 4.6% per annum for the whole economy, 10.7% per annum. for minerals, 6.0% per annum. for manufacturing, and just 3.1% per annum for agriculture, forestry and fishing. But such rates conceal the sharp fluctuations that afflict commodity-dependent economies; for example the mineral sector GDP contribution in real terms contracted 26.0% in 1997, but expanded 16.8% in 1998.

1.1.3 Sectoral Performance

The relative importance of the sectors within Papua New Guinea's economy, and specifically forestry, can be gauged by contributions to GDP, to export revenue, and to employment. In 2000, the minerals and oil sector accounted for 28.8% of GDP and 77.3% of exports, both these contributions having grown by 20.5% and 27.5% respectively over the previous year. But the factors behind these improvements – higher copper and crude oil prices, increased gold production at Porgera, Ok Tedi and Misima, improved labour productivity and the kina depreciation – must be viewed against the planned dates for mine closures, declining reserves, and lower ore grades in some case. Low share prices for the mining companies reflect investor pessimism on observation of the absence of new exploration activity.

Manufacturing, with 8.9% of total GDP in 2000 and 7.5% of total exports, is an important sector, with forests contributing through sawn timber, plywood, veneers, furniture, and woodchips. It is true that the contribution has not grown in the last decade (9% of GDP in 1990), but this observation is in relative terms, and due to the expansion in minerals, as the absolute value of manufacturing production *has* increased. But most manufactures are primary processing operations on local food crops such as palm oil, copra cake, black tea, sugar, canned meat and fish, and coconut oil based cosmetics. Consequently they are still vulnerable to commodity market fluctuations such as the recent effect of increased palm oil production in the Philippines and Indonesia and increased palm oil production in Malaysia.

1.1.4 Employment

The importance of the non-mining primary sector is, as mentioned in the opening paragraph, its provision of a livelihood for over 80% of the population. Although its share of GDP fell in 2000 due to depressed coffee and copra prices, it still comprises 25.6%, only a slight decline from 29% in 1990. The employment in this sector is small, owing to the major subsistence component, and indeed because of this there appears to be no official estimate of the size of the labour force, or of the rate of unemployment (a figure of 60% for this latter statistic quoted in the media for the National Capital District is so extreme as to suggest there is no proper base on which to make a calculation). Formal private sector employment statistics tend to be published as indices, and the trend since the base year 1989 is very flat, except for mining, which has risen over 50% i.e. 3.8% per annum.

So the population increase of 3.3% per annum is not being absorbed by increased job opportunities, except for the fraction provided by mining. Given the life expectancy at birth of 58 years and assuming that survivorship from the infantile mortality rate of 79 per 1000 live births gives a slightly longer life expectancy for those who reach age 15, the labour force from 15 to 55, say, may be composed of perhaps a million workers in the subsistence sector plus another 1.5 million hidden unemployed in rural areas, and a formal private sector workforce of 800,000, of whom about 30% may be seeking work. Such a total estimated labour force of 3.3 million out of the population of 5.1million (2000 census) also conceals demographic shifts and regional production changes which have led to a fall in employment in the Highlands region over the last five years of 19.0%, but a rise in Lae of 11.8% and in Madang and Wewak of 57.7%. The paucity of derived demographic data on employment makes the calculation of employment multipliers for specific industries such as forestry a daunting task.

1.1.5 Trade

During the last decade Papua New Guinea has maintained a healthy and growing balance of visible trade surplus, K3,034 million in 2000, the sum of surpluses with all individual trading partners. However, international reserves, which have been increasing, still cover only 4.6 months of imports. Moreover, the total balance of payments situation is affected by a deficit of K2,049 million on invisibles, leaving a lower balance of K973 million on the current account and a residual surplus of just K359 million when the capital account deficit is included as well. Exports are dominated by the mineral sector, especially crude oil (33%) and gold (34%), with 77.3% of the total K5,813 million, and the main commodities in the agricultural total of K838.5 million are coffee and palm oil. Logs now comprise only 4.9% of export revenue, but in 1995 they had exceeded the value of the output of the sum of all other agricultural commodities. It is interesting to note that no other export commodity from Papua New Guinea has suffered so great a fall (55%) in its international benchmark price as tropical logs during the last four years. Even in kina terms, the trend line for logs is flat to slightly rising, whereas others, except rubber, show stronger rising trends in kina unit values.

After Australia, which accounts for 56.2% of imports and 52.0% of exports, the next largest trading partners, Japan and the USA, account for 7-8% of trade respectively. APEC nations account for 83% of exports and 86% of imports, with ASEAN trade figures below 5% of the total for both directions. Australia also dominates foreign equity holdings in Papua New Guinea, with about 64% of the total, mainly in mining, and foreign equity generates about 33% of GDP. The next two largest countries of

origin of foreign investment are the United Kingdom (6%), and Malaysia (4%). The latter country is very important in the forestry sector, although its investors are also active in other areas, such as retailing and the media. Some 10-14% of foreign equity technically originates from companies domiciled in tax havens such as Bermuda and the Bahamas, so the shares of some major investors are likely to be higher in reality, with the current privatisation process leading to further increases. But the process of privatisation has slowed, introducing the risk of international aid agency support being delayed until the end of the process is much more predictable.

1.1.6 Inflation & Interest Rates

Little need be said about the level of the inflation rate (15.6% between 1999 and 2000), as the consumer price index is strongly influenced by the continued depreciation of the kina (7.65% in 1999-2000), especially if the underlying inflation rate is considered (11.8% in 1999-2000), since this excludes the effects of Government policy decisions on excise taxes and valued added tax. By September 2001 the inflation rate had fallen below 10%. Interest rates also reflect the overall monetary position, with Treasury Bills at 14-15% per annum (they were over 20% per annum a year ago), and weighted average lending rates at 17.3% in 2000 (forestry loans at commercial banks are relatively low in total), with ordinary passbook savings accounts yielding 2.5 to 5.25% per annum, and commercial 180-day bank deposits at 8.5% compared to nearly 17% last year).

1.1.7 Exchange Rate

The kina was devalued in September 1994 and then floated the following month. A sustained depreciation occurred, the rate of decline only recently slackening. Further falls are likely. One cause appears to have been the downward trend in foreign exchange inflows, at times almost exhausting international reserves, although these are now at $370 million (November 2001) following IMF balance of payments support. The other problem has been the dependence on domestically financed deficits that have increased import demand. Papua New Guinea generally has a high degree of dependence on imports.

1.1.8 Government Finance and Taxation

However, the fiscal operations of central government are of particular relevance to this study, owing to the contribution of the log export tax, in 2000 25.9% of all taxes on trade, 15.8% of all indirect taxes, 5.8% of all tax revenue and 4.5% of total government revenue including foreign grants. Significant import duties also protect domestic processing. The budget deficit in this year was 192.3 million kina, of the same order of magnitude as the log export tax revenue at 133.9 million kina (Department of Trade & Industry figure – SGS figure is 135.9 million kina). National expenditure is broken down into recurrent and development expenditures, with both divisions further allocated between national and provincial categories, and interest payments (of course recurrent) accounting for most of the residual 17% of expenditure.

Apart from the provincial government allocation of about 18% of the total and another 1% for provincial projects, there are no sub-national targets for national expenditure, so the log export tax, along with other revenues from the sector in the shape of excise taxes, company taxes, and personal and VAT taxes paid by employees, may be allocated to any part of the economy, or used to pay interest. The budget deficit is financed through the domestic banking system, plus external concessional and commercial financing, the proportions varying year by year. To summarize, revenue is obtained from tax (77%), grants (17%) and 6% other sources, to be spent on national departments (39%), provincial governments (18%), development projects (26%), and interest, etc (17%). Debt is primarily domestic, comprising two-thirds of the K419.9 million interest payments paid in 2000.

Company tax rates differ by industry, and by residence or non-residence, and also for new and existing companies (petroleum). There is also an additional profits tax for mining, petroleum, and gas projects but forestry falls in the general category at 25% and 17% withholding tax on dividends for resident

companies, with non-resident companies at 48% and 0% for corporate and dividend withholding tax respectively. The position in non-forest industries is of interest and relevance as a possible model for forestry. Personal income taxes are progressive from 25% to 47% (over K95,000 per annum) for residents and similar, but with a zero threshold for the lowest rate, in the case of non-residents. Since the minimum adult wage is 24.68 kina per week, a worker would need to earn nearly five times this amount to reach the lowest taxable bracket, so it may be assumed that national workers in forest industries will furnish negligible or nil revenue to government as personal taxation.

This thumbnail sketch of the national economy, although limited, is relevant as it gives a framework for assessing the effects of any proposed changes in their widest sphere of influence, and also serves as a reminder that the Government has commissioned this work.

1.2 THE FORESTRY SECTOR

1.2.1 Resource Characteristics

Although the total land area of Papua New Guinea, 462,840 km^2, is known with reasonable precision, as are the areas of each province and region, it is a relatively static feature, changing only slowly with geo-morphological processes of erosion and deposition. But imprecision begins with the estimate of the forested area, and increases with efforts to measure the important categories of forest, such as protection forest and production forest, not only because of physical changes in the forest, but also because of economic, administrative and political influences on forest use over time.

The last published Annual Report of the Papua New Guinea Forest Authority for 1995 and the National Forest Plan of 1996 have some data on forest areas, not necessarily mutually consistent. The total area of forest was then assessed at 39.4 million hectares (ha), of which conifers at higher altitudes accounted for about 1mill ha. Protection forests totalled 1.66 million ha, and montane forests or those that suffered seasonal inundation, another 17.45 million ha, could also be considered unsuitable for wood production. Other areas not considered included 6.71 million ha, part of which would have comprised conversion (salvage) forests and also de-forested areas, or even non-forested areas, suitable for reforestation and afforestation. (54,000 ha of plantations were in existence at that stage). The significance of the remainder, the production forest, lay in whether it had been acquired by the PNGFA i.e. a Forest Management Agreement had been entered into with the landowners or whether it was still just “potential” production forest. By 1996, 3.72 million ha of operable forest had been acquired, and another 5.03 million ha acquired of inoperable forest, according to the National Forest Plan, but according to the 1995 PNGFA Annual Report only 6.13 million ha had been acquired of which 4.42 had actually been allocated to developers.

Forest resources are widely distributed, have variable characteristics, involve extensive customary (private) ownership, and are renewable to some degree. Inventories of the forest resource have been developed on the basis of establishing the potential for commercial operations.

Forests are distributed across the country from sea level to high altitudes. They are essentially private forests, whose owners utilize them for various purposes, ranging from commercial to subsistence application. Only about 15% of forested lands are considered of commercial potential, given resource characteristics, location and access situations, environmental restrictions, and other limiting factors. The Rapid Resource Appraisal carried out in 1995, whose findings were endorsed by the National Forest Board, indicated an annual sustainable volume figure of 4.2 million cubic metres. Various other estimates have been made, however it appears that this figure has some formal recognition.

A general characteristic of PNG forests is the multiplicity of species. There are only a few exceptions, for example, the *Calophyllum* forests of Manus Island, the *Terminalia* forests of Bougainville, the *Mersawa* forests of Morobe south coast and the conifer forests of the Cromwell Mountains and various locations in the Highlands. This creates generally low competitive advantage in comparison to the *Dipterocarp*

forests of the main production areas of South East Asia. Topographical variations and climatic conditions across the regions of PNG also affect the commercial potential of the forests, as does proximity to domestic markets or loading points for export.

PNG forests after logging demonstrate a natural "renewability" dependent on the silvicultural dynamics of the tree species present, and the continued exclusion of further man-made disturbances such that even in a condition of "benign neglect", there is a potential for resource renewal. However, as a general rule, the succeeding cutting cycles will not produce the same volume and species mix as the original harvest. Again, however, there are exceptions, dependent on the dynamics of the particular forest species and the continuity of favourable conditions.

There is some scope for confidence in programmes of resource replacement and improvement in rehabilitation of forest quality after logging, over time.

The World Bank is advising on a structural adjustment programme, with some worries in the private sector of the prospect of additional financial burdens in the form of value added tax and increased payments to landowners (Pleydell and Tomaselli, 1999).

In Papua New Guinea about 97% of the land is privately owned. In principle, since the 1991 Forestry Act (amended in 2000), harvesting is arranged by a process of grouping forest owners into representative resource-owner bodies who lease a sufficiently large operable area to the Government, which then is able to negotiate a forestry project with a developer. However, contracts dating back before 1991 remain in place, and will mostly expire by 2003. This has also a source of concern for the forest industry operating in the country. Logging agreements post-1991 are estimated to provide an annual allowable cut of between 3 and 4 million m^3 over a 35 to 40 year cycle.

1.2.2 Commission of Inquiry

As a result of industry concerns relating to aspects of the marketing activity of the Forest Industry Council, the Government of the day instituted a Commission of Inquiry into these activities. Monitoring of the sector markedly improved, and a general Forest Policy review was commenced. In the process of investigation, additional Terms of Reference were developed to cover sector-wide matters.

General findings were made public, the most topical being that at the time of the Inquiry, transfer pricing of logs was common, only two operators being found free of the practice. Some steps were taken by Government to achieve more transparent marketing practices.

1.2.3 New Forest Act and Policy

The last 10 years or so has been one of dynamic change. This has included the development of a new Forest Policy and the Forest Act, 1991 as amended in 2000. Institutional modifications, development of the required field systems, and large variations of market conditions have placed the sector in a condition of transition, fluctuation, and uncertainty that, unless urgently addressed, will continue for some time to come.

The early 1990s saw a change in the investment structure of the sector. Malaysian investors entered the sector strongly in the immediate post-Inquiry period. Many existing operations were acquired by purchase, broadly spread across PNG, and greatly varied in scale. These operations were in a position to take advantage of the dramatic price hike in early 1993, and volumes significantly increased in response of strong market demand. This demand has now tapered off to 1992 harvest levels.

A new Forest Policy was developed and approved by Parliament in 1991.The development process extended over a period of three years with contributions from interest groups and Government. Forest legislation was drawn from the Forest Policy. In hindsight this process could have been better managed

by continued input by the Interim Forest Management Committee which had been established to examine and report on policy issues, and which essentially developed the forest policy draft for consideration.

Administration and implementation of the new Forest Act's provisions were handled through the formal establishment of the National Forest Authority (NFA), and institutional programmes were developed. The National Forest Board bears the legislative responsibility and authority for the performance of the National Forest Service (NFS), headed by a Managing Director.

Recent studies and reports indicate that the full capacity of the NFA/NFS in management of the sector has not yet been achieved, and that further institutional support for the sector is justified. Among other things, there is a need for improved data collection and reporting mechanisms.

It is compelling to note that transition within the sector has commenced and will continue, from a number of standpoints. Not the least of these is the continuing requirement for the evolution of sector management and administration systems, which have yet to develop and mature to be effective. While improvements have been made, recent studies have indicated that there is much left to address.

External influences will also affect the evolution of the sector, especially from the market perspective and the capacity of private enterprise in the operating environment of PNG to establish and maintain a position of competitive advantage internationally.

1.2.4 Market Variations in the Last Decade

The decade's predominant landmarks were the unpredicted "spike" in export log prices experienced in 1993-5, and the current extremely low US$ prices. The former developed in response to environmental restrictions placed on old growth logging in the West Coast of the USA. At that time the US$ and the kina were close to parity, and the kina's subsequent decline has maintained prices in local currency.

Harvests increased rapidly from 1 million cubic metres in 1990, to over 3 million cubic metres in 1994. Export volumes averaged 2.5 million cubic metres until the Asian economic crisis of 1997/8, and in 1998 the volume exported was about 1.6 million cubic metres. After a slight rebound to 2 million cubic metres in 1990 and 2000, the Review Team estimates that harvests will fall below the 1998 level this year.

Government reaction was tardy. Export tax was held at a weighted average of 14.3% of fob value for most of 1993, with an increase to 17.3% until March 1994, an increase to 31.1% for the remainder of 1994, and an increase to an average level of 32% for 1996. A new structure defined in the 1996 Budget Measures uses a marginal increase in tax rates with increasing log value. At the same time, royalty was increased to K10 per cubic metre payable directly to the individual resource owners.

There is a structural decline in the sector, seen through a number of deliberate closures of logging camps, but also at this time there is a natural attrition of volumes exported due to the expiry of operating timber authorities.

Currently there is a moratorium imposed on the issue of new operating authorities until project preparations have been audited and found appropriate to the point of issue. At this stage it is not known when new operations will commence.

1.3 CURRENT STATUS OF THE FOREST REVENUE SYSTEM

1.3.1 Summary

The forest sector generates revenue for the Government mainly on the basis of a log export tax levied on a progressive scale on the endorsed fob price of the log. Other revenue accrues from a 5% withholding tax levied on royalties belonging to the landowners where forestry projects are based, but collected from

exporters by the Government. There is also a reforestation levy, payable to the PNGFA, and various premiums paid on each logging project to the landowning company. Provincial governments also receive a portion of the fob price, collected and transmitted to them by the central Government. The picture is one of diversity, as various different payments in cash and/or in kind may have been negotiated with landowners and regional governments for one project with other projects showing a different spectrum of payments, with only the K10 royalty in common.

1.3.2 Log Export Tax

The tax was introduced in 1979 with a flat 10% rate on the fob value applying across all species. On 1 January 1991 the rate was differentiated by species, with Group 1 species such as kwila, PNG mersawa, red and white planchonella assessed at 30%, Group 2 species such as taun and calophyllum at 20%, group 3 at 12% and the remainder at 9%. By 1992 the weighted average rate had risen to 14.3%. In November 1993, the rates were again raised by another 3 percentage points for the first three groups and four for the remainder, giving a weighted average rate of 17.3% in 1993. Still trailing the sharp rise in export prices the rates reached 46%, 36%, 28%, and 26% for the four species groups (1 – 4 respectively) by March 1994.

At this point the weighted average rate had moved up sharply to 31.1%, but by this time the kina had been first devalued, then floated, and its steady decline caused the weighted average tax rate to rise to 33.0% in 1995 and 35.0% in 1996 without further Government actions i.e. purely through fiscal drag. It should be noted that as only exported logs were subject to the tax the weighted average tax rates also acted as effective subsidy rates for processors. Another point to bear in mind is that certain species, essentially all the commercial conifers, plus rosewood, balsa, and blackbean were prohibited from being exported in log form.

On 22 November 1995 the Government abandoned the species-based system in favour of an *ad valorem* tax on the fob value, and instituted the system now in place. As the market declined some relief was given to exporters in October 1998 when logs valued at less than K110 per cubic metre were exempted from the tax, but this only lasted a few months, as the previous system was re-imposed in August 1999. As a result of these movements the weighted average tax rate fell to 21.6% in 1998, but rose again since the tax was denominated in the weakening kina so that in the period January – September 2001, the rate was up to 33.6%, although of course absolute Government revenues exhibited a different pattern, shrinking sharply in 1998 after the Asian crisis, rising slowly to 1994 levels by 2000, then falling this year (2001) with declining volumes and prices.

The log export tax is a central feature of the revenue system and will be discussed in considerable detail in Part 3 of the report.

1.3.3 Landowners' Revenue

After a period of low values with regional and project differences, the main component of the landowners' revenue, the royalty, was applied at a flat rate of K10 per cubic metre on all logs harvested, whether exported or not. 25% is paid to the provincial government and a further withholding tax of 5% before the actual owners are paid the balance.

Landowner development premiums are also payable at a minimum level by exporters but not by processors. They are negotiated and available to all landowners in a project area, irrespective of whether it is their trees that are harvested or not.

In order to form legal entities, landowners must combine in representative bodies large enough to negotiate agreements. Incorporated Land Groups emphasise customary land dispute resolution procedures, but business groups, incorporated associations, companies and cooperatives are also legally feasible. Earlier problems with Land Owner Companies under the old legislation evidently stemmed from the non-representative nature of the management in many cases. The manner of formation of the groups

is outside the terms of reference of this study, but clearly makes a difference to the degree to which landowners can effectively and fairly manage resource payments they receive.

In an attempt to make community benefits, especially local infrastructure, more consistent and fair, and to remove the manifold differences across projects, the Project Development Levy (PDL) was announced in the 1996 Budget, but never implemented, since as a general rule legislation cannot be retrospective, and so application to existing projects proved impossible. A subsequent replacement, the Project Development Benefit (PDB) endeavours to minimise cash payments to 50% and to have the remainder allocated to community needs through a forestry committee. So far only one company has undertaken the review and introduced the PDB system.

1.3.4 Other Government Revenue

A Reforestation Levy of averaging about 50 toea per cubic metre is charged according to the National Reforestation Policy. The last available data on the unused balance is furnished in the last Annual Report of the PNG Forest Authority for 1995. 6.932 million kina was held on deposit with the PNG Banking Corporation compared to 4.484 million kina in the previous year. Annex D attempts to estimate the growth of this Fund, but no further information is available on disbursements.

1.3.5 Policy Support for Domestic Processing and Revenue Implications

Under the current forest revenue system domestic processing operations receive preference or an implicit subsidy compared to log exporters, through the exemption of export taxes on logs (and in certain cases the exemption from log export premiums for landowners) processed domestically. The Report of the Taxation Review (2000) estimated for the 1999 year, the value of log export tax revenue foregone on logs that are domestically processed, as K800,000. This however appears to be an underestimate. The Review Team estimate, based on a conservative log input for domestic processing of 500,000 cubic metres in 1999 and an average log value of K140 per cubic metre indicates the value of log export tax revenue foregone on logs that were domestically processed in 1999 was approximately K17.5 million.

Government policy over the past 25 years has generally favoured the progressive replacement of log exporting with domestic processing of forest products, so long as the activity is financially viable and environmentally sustainable. It is relevant to briefly examine the evolution of policy relating to forest industries development. The key policy shifts have been as follows:

Pre-1979 the policy was to place physical processing targets on all foreign enterprises engaged in log exports, with the underlying concept being that the higher profitability of log exports should be utilised to initially fund the capital cost, and then later to cross-subsidise processing.

In 1979, the generally low level of profitability of domestic processing was recognised and attributed in the main to market factors. That is, many species were little known and received low prices in processed form in world markets. A relaxation of restrictions on log exports was prescribed as a short to medium term mechanism to improve market acceptance and reliance on PNG species. The relaxation was combined with measures to increase log export taxes and increase domestic ownership in log exporting activities. This policy in part was responsible for a decline in exports of processed products, and a threefold increase in log exports through the 1980s. During this time the effective monitoring of the forestry sector by Government, environmental controls on logging and the level of benefits derived by landowners also declined.

Following the Commission of Enquiry into Aspects of the Forest Industry in 1989, and the Tropical Forest Action Plan Review in 1990, a new forest policy and new Forestry Act were finalised in 1991. The new forest policy signalled a move back to increased domestic processing. However, in anticipation of the new Act and policy a large number of new and poorly prepared log exporting projects were rushed through under the old Act.

The 1991 policy was further extended by the 1993 National Forestry Guidelines, that signalled: a) a complete log export ban by the year 2000; b) the introduction of fiscal incentives to promote domestic processing; and c) commitments to perpetuity of resource supply to processors and geographical dispersal of processing (the 25 Timber Supply Agreement [TSA] proposal). In 1994 a Ministerial directive under the Guidelines required all current logging operators to produce processing plans by the end of 1994. The 1993 National Forestry Development Guidelines remain the official Government policy for processing in the sector. It was intended that the Minister in consultation with the PNG Forest Authority (PNGFA) would review the Guidelines at three yearly intervals, but since 1993 no further reviews have been undertaken.

The change of Government in 1994 saw a withdrawal of emphasis on processing (but no official change to the policy and guidelines), and a strategy to maintain Government revenue from log exports. Also as part of the IMF/World Bank structural adjustment package the Government have agreed to the introduction of a new national forest revenue system including a review of whether domestic processors should pay the same tax on logs as direct log exporters.

The May 1996 "National Forest Plan" (ratified by the National Parliament in July 1996), provides in its mission statement and objectives for the use of forest resources "…to achieve economic growth, employment creation and increased downstream processing…" and, "To promote increased industrial wood processing to create employment opportunities." The Plan envisaged the commencement of five major sawmills and two plywood factories over the period 1996 to 2001.

In August 2000 the PNGFA released a draft discussion document titled "National Policy on Downstream Processing of Forest Products". This document actively promotes an increase in domestic processing. It recommends a strategy including priority of resource allocation to domestic processing, phasing out of log exports in certain provinces, a 70% processing requirement on new Forest Management Agreements (FMAs) after year 2002, and no export taxes on processed products. The document has been circulated to other relevant Government departments for comment. It is yet to be finalised and accepted by Government.

Technically the Ministry of Trade and Industry is the Government agency vested with the role of planning and promoting industrialisation. In the forestry sector however they have largely delegated these functions to the PNGFA. The Ministry of Trade and Industry has not undertaken any analysis on whether the implicit subsidy available for forest processing through the waiver of export taxes on logs is fair in comparison with direct and indirect assistance available to other sectors.

1.4 METHODOLOGY ADOPTED BY THIS STUDY

The study restricts itself to the basic tools of economics. In fact, it concentrates on the fundamental notion of scarce means to achieve ends and particularly on the opportunity cost of various courses of action.

The Government of Papua New Guinea commissioned this study. Therefore the welfare function to be maximized is that of the people of Papua New Guinea, since the Government is their representative. In particular, although the study addresses the forestry sector, and focuses on the revenue system, this welfare function means that alternative uses of public funds used in forestry, or not taxed from forestry, must also be considered.

The Review Team commences by considering the status and prospects of the forestry sector to determine its probable future importance to the whole economy. The contribution of log exports and domestic processing to Government revenue is considered, and the possibility of transfer pricing investigated, because its existence would render official data on Government revenues invalid.

The main thrust of the study, in Part 5, is the examination of resource rent created in the log export business and the allocation of that rent to the various claimants – resource owners, developers, government (national and regional). However, this analysis is preceded by a descriptive general study of the sector and a specific study of the transfer pricing issue.

PART 2 ANALYSIS OF MARKETS, TRADE AND INDUSTRY

Commencing with a descriptive overview of the world tropical timber market, focussing on logs and sawn timber, the two main forest products exported by Papua New Guinea, this analysis proceeds to examine the prospect for PNG in the context of changes in the global economy and changes specific to the sector.

2.1 PRODUCTION AND EXPORTS

During the last three decades tropical timber production has increased at a rate above the average observed for all forest products. This was basically a result of developments that took place in Asia, particularly in Indonesia and Malaysia. Nevertheless tropical timber still has a minor share in total world timber production.

Except for plywood, production stabilised at lower levels after the Asian financial crisis four years ago, as shown by Table 2.1. Exports (about 20% of production) followed the trend as tropical timber gained importance (Table 2.2). Despite the increase in log export bans, especially that of Indonesia, whose ostensible purpose was to increase domestic processing, log exporting remained significant, even after the 1997 peak.

TABLE 2.1 TROPICAL TIMBER PRODUCTION 1995 – 2000 (MILL. M³)

Product	Year					
	1995	1996	1997	1998	1999	2000
Logs	132.0	126.8	132.0	113.3	112.7	112.9
Sawn wood	41.1	40.4	40.0	35.1	34.7	37.1
Plywood	15.6	15.1	19.0	18.3	20.3	20.4

Source: ITTO Annual Review 2000

TABLE 2.2 TOTAL EXPORTS OF SELECTED TROPICAL TIMBER PRODUCTS 1995 - 2000 (MILL. M³)

Product	Year					
	1995	1996	1997	1998	1999	2000
Logs	15.0	13.2	16.0	12.8	15.1	14.2
Sawn timber	7.9	7.3	6.0	6.4	6.6	6.7
Plywood	12.4	12.2	11.0	16.6	12.5	12.5

Source: ITTO Annual Review 2000

The five main producers in 2000, Indonesia, Brazil, Malaysia, India and Gabon, contributed more than 80% of the total world tropical log production (Table 2.3).

TABLE 2.3 MAIN TROPICAL LOG PRODUCERS - 2000

Country	Volume ('000 m³)
Indonesia	27 909
Brazil	24 500
Malaysia	20 000
India	14 000
Gabon	3 914

Source: ITTO Annual Review 2000

The five main exporters of tropical timber logs in 2000 (Table 2.4), Malaysia, Gabon, Papua New Guinea, Myanmar and Cameroon, accounted for around 90% of total world exports of tropical timber logs. Papua New Guinea's share is around 14%.

TABLE 2.4 MAIN TROPICAL LOG EXPORTERS - 2000

Country	Volume ('000m³)
Malaysia	5 950
Gabon	2 779
Papua New Guinea	2 003
Myanmar	1 000
Cameroon	950

Source: ITTO Annual Review 2000

Papua New Guinea is a much smaller participant in the export markets for tropical sawn timber and plywood, whose largest producers in 2000 are shown in Tables 2.5 & 2.6. The largest exporter of tropical sawn timber is Malaysia, with 40% of total world exports, and the five major exporters (Malaysia, Brazil, Indonesia, Cameroon and Ivory Coast) contribute almost 80% of the total.

TABLE 2.5 MAIN TROPICAL SAWN TIMBER EXPORTERS - 2000

Country	Volume ('000m³)
Malaysia	2 700
Brazil	900
Indonesia	548
Cameroon	540
Ivory Coast	500

Source: ITTO Annual Review 2000

TABLE 2.6 MAIN TROPICAL PLYWOOD EXPORTERS - 2000

Country	Volume ('000m³)
Indonesia	7 768
Malaysia	3 168
Brazil	574
Guyana	94
Gabon	85

Source: ITTO Annual Review 2000

Tropical plywood production is also concentrated in a few countries, the three largest accounting for 70% of production. Japan used to be a larger producer of tropical plywood but reduced its production drastically during the last 5-10 years against Indonesian competition and through softwood substitution. It is now fourth, followed by Brazil. For exports, Indonesia and Malaysia account for 87% of the total tropical plywood exports, the latter for more when its part-ownerships of the mills in Guyana and Gabon are included.

China and Japan import half of the total world tropical log trade with Japan importing half since since 1990. The other large importers are India, Korea and France (Table 2.7).

TABLE 2.7 MAIN TROPICAL LOG IMPORTERS - 2000

Country	Volume ('000m³)
China	5 300
Japan	3 146
India	1 900
Korea	1 000
France	814

Source: ITTO Annual Review 2000

Tropical sawn timber importers are a far more diverse group of countries than tropical log importers. The largest five, shown in Table 2.8, only account for half of the world trade, with many smaller importers.

TABLE 2.8 MAIN TROPICAL SAWN TIMBER IMPORTERS - 2000

Country	Volume ('000m³)
China	1 500
Thailand	1 239
Japan	691
Taiwan (POC)	452
Italy	400

Source: ITTO Annual Review 2000

Plywood imports are, however, more concentrated, with the five importers in Table 2.9 accounting for 83% of world tropical timber plywood traded volumes. China has recently shifted back to a higher ratio of logs.

TABLE 2.9 MAIN TROPICAL PLYWOOD IMPORTERS - 2000

Country	Volume ('000m³)
Japan	4 553
USA	1 700
China	900
Korea	750
United Kingdom	600

Source: ITTO Annual Review 2000

2.2 PAPUA NEW GUINEA'S FOREST PRODUCTS EXPORTS

Log exports dominate with sawn timber occasionally making a very marginal contribution. There is also a wood chip export operation, but the chips are produced entirely from plantation timber. Some veneer is also exported, and local secondary processors also export but in general they make available limited volumes for the local market.

Table 2.10 shows the evolution of the log export market, which peaked in 1997, the year of the Asian financial crisis, at 3 million m³. Dropping sharply after the crisis, volumes briefly rose to 1993 levels before declining again. The Review Team estimates that the figure for this year, 2001, will probably only reach about 1.5 million m³.

TABLE 2.10 EVOLUTION OF PNG LOGS AND SAWN TIMBER EXPORTS ('000M³)

Products	1995	1996	1997	1998	1999	2000
Logs	2191	2651	3006	1617	1984	1993
Sawn Timber	6	17	38	26	23	25

Sources: PNG Forest Authority: Timber Digest; ITTO Annual Review 2000

The main markets for PNG logs have also altered as shown in Table 2.11. The former dominance of Japan, followed by Korea, has now given way to a scene in which China is clearly the new prime market, with Japan, Korea and the Philippines still important.

TABLE 2.11 MAIN IMPORTERS OF PNG LOGS (1,000 M³)

Countries	1995	1996	1997	1998	1999	2000
Japan	1 237	1 683	1 960	898	989	746
China	46	57	104	158	329	688
Korea	608	487	421	281	417	323
Philippines	118	269	196	147	136	96
Others	182	156	324	133	114	141

Sources: PNG Forest Authority: Timber Digest; ITTO Annual Review 2000

At the same time the composition of exporting companies has also changed, although the pattern has been relatively static since 1997, with the largest five holding companies (some with twelve or more local area subsidiaries) responsible for more than 70% of exports (Table 2.12). Malaysian companies now dominate; the one remaining national company exports less than 1% of the total.

TABLE 2.12 LOG EXPORTS BY COMPANY - 6 LARGEST; 1997 & 2000 (VOLUMES IN m^3; VALUES IN US$)

Company		2000	1997
	Volume	666 859	1 094 907
	%	33.5	36.4
Rimbunan Hijau	Value	49 654 316	127 085 699
	%	34.6	36.2
	Avg. Price	75	116
	Volume	209 574	357 916
	%	10.5	11.9
Turama Forest Industries	Value	14 851 269	41 634 222
	%	10.3	11.9
	Avg. Price	71	116
	Volume	255 776	551 847
	%	12.8	18.4
WTK Realty	Value	20 467 065	72 223 663
	%	14.2	20.6
	Avg. Price	80	131
	Volume	151 459	123 506
	%	7.6	4.1
Concord Pacific	Value	10 993 104	15 675 990
	%	7.6	4.5
	Avg. Price	73	127
	Volume	148 864	53 208
	%	7.5	1.8
Kerawara	Value	8 034 691	5 357 094
	%	5.6	1.5
	Avg. Price	54	101
	Volume	1 432 532	2 181 384
	%	71.9	72,6
TOTAL	Value	104 000 445	261 977 168
	%	72.3	74,6
	Avg. Price	73	120

Source: SGS PNG Pty Ltd; Log Export Monitoring: Monthly Report (1996-07/2001)

The five largest importers of PNG logs by country of destination, based on year 2000 statistics, are listed in Table 2.13. International trade is dominated by a relatively small number of companies. For China and Korea the five largest importers are responsible for around 65% of total imports in 2000. In Japan two companies are responsible for more than 50% of the log imports from PNG, and the five largest import almost 80% of the total.

TABLE 2.13 MAIN IMPORTERS BY MARKET OF PNG LOGS (2000)

Country	Importer Company	Volume ('000 m³)	% *
China	Wayne Wood (HK) Ltd.	110 659	14.6
	Lei Shiny Hong Ltd.	95 077	30.0
	Midoriya Mokuzai Co. Ltd.	93 441	43.5
	Ichiban Timber Products	71 735	54.0
	Far East Treasure	71 190	65.8
	Total China	687 779	100.0
Japan	Nissho Iwai Corp.	267 841	36.0
	Sumitomo Forestry Co. Ltd.	111 111	51.0
	Marubeni Corp.	82 083	61.9
	Kowa Lumber Corp.	74 419	71.9
	San-Mic Trading Co. (HK) Ltd.	45 286	78.0
	Total Japan	745 612	100.0
Korea	Eagon Industrial Co. Ltd.	55 324	17.1
	Sung Chang Enterprise Co. Ltd.	51 559	33.1
	Nam Mok Corp.	50 339	48.6
	Sung-Mok Corp.	33 481	58.8
	Guymen Enterprise Ltd.	16 106	64.0
	Total Korea	323 091	100.0
Total China, Japan and Korea		1 756 482	
Total 5 Largest / 3 Markets		1 232 651	
% of Total Exports by PNG		61.8	

* - Accumulated values by Market

Source: Review Team research

Several companies operate in more than one market. Table 2.14 presents the information on volumes of logs imported from PNG by company, without reference to the importing country. As can be observed the ten largest importers are responsible for almost 60% of all logs traded by PNG in the international market.

TABLE 2.14 LARGEST IMPORTERS OF PNG LOGS (2000)

Company	Headquarters	Volume (1 000 m³)	% *
Nissho Iwai Corp.	Japan	353.2	17.7
Sumitomo Forestry Co. Ltd.	Japan	111.1	23.3
Wayne Wood (HK) Ltd.	Hong Kong	110.7	28.9
Lei Shiny Hong Ltd.	Hong Kong	95.1	33.6
Midoriya Mokuzai Co. Ltd.	Hong Kong	93.4	38.3
Ichiban Timber Products	Singapore	90.8	42.9
Marubeni Corp.	Japan	82.1	47.0
Kowa Lumber Corp.	Japan	74.4	50.7
Far East Treasure	Hong Kong	71.2	54.3
Eagon Industrial Co. Ltd.	Korea	55.3	57.0

* - Accumulated values

Source: Review Team Estimates

Table 2.15 shows that efforts to introduce lesser known species have clearly been very limited. Ten listed species are responsible for around 55% of the trade, the most important being Calophyllum (*Calophyllum* spp.), Taun (*Pometia pinnata*), Malas (*Homalium foetidum*), PNG Mersawa, Terminalia (*Terminalia* spp.) and Kwila (*Intsia* spp.).

TABLE 2.15 MAIN SPECIES OF EXPORTED LOGS IN PNG 1997 AND 2000 ('000 M³)

Species	1997		2000		Species
	Volume	%*	Volume	%*	
Malas	320.2	10.7	205.1	10.3	Calophyllum
Calophyllum	275.2	19.9	181.3	19.4	Taun
Taun	231.2	27.6	152.5	27.1	Malas
Kwila	167.1	33.2	128.6	33.6	PNG Mersawa
PNG Mersawa	155.8	38.4	101.1	38.7	Terminalia
Red Canarium	137.4	43.0	65.4	42.0	Dillenia
Terminalia	132.1	47.4	65.2	45.3	Red Canarium
Pencil Cedar	104.9	50.9	61.2	48.4	Pencil Cedar
Dillenia	100.7	54.2	60.7	51.4	Erima
Erima	77.2	56.8	39.9	53.4	Kwila

* Accumulated percentage

Source: SGS PNG Pty Ltd/PNG Forest Authority: Log Export Monitoring Monthly Report

2.3 MARKET OUTLOOK FOR PNG LOGS AND PROCESSED FOREST PRODUCTS

It is useful as part of any revenue analysis for commodities where international prices have fluctuated widely in recent years, to briefly examine the underlying market supply and demand factors, and try to provide a guide on likely future price trends. This section can only provide a cursory overview and identify key factors in the relatively complex overall global timber market outlook. Material for this section has been drawn from a range of published (principally ITTO) and unpublished data available to the Review Team.

There have been a number of international modelling attempts in recent years to look at both the global supply and demand situation for wood. The outcome of these modelling attempts has been inconclusive. The material presented in this section attempts to separate market certainties from uncertainties.

2.3.1 The Certainties of Wood Demand

Industrial wood demand correlates most closely with population increases and secondly with economic growth rates. Consumption of industrial wood products in 1996 in the world was an average of 0.26m/3 per person. The general agreement from most of the demand models is that the average world industrial annual round wood demand will increase by around 1.5% to 2.0% per annum over the next decade i.e. 16% to 22% over the whole period.

The Asia-Pacific region is likely to continue to be the fastest growing region in the world in terms of consumption of all wood products for the foreseeable future. It will therefore increase its share of global consumption of industrial round wood relative to other regions from an estimated 22% (330 million m^3) in 1994 to 25% (500 million m^3) in the year 2010. Japan and the P.R. China accounted for 65% of world tropical timber imports in 1999 and their influence over the next 10 years is expected to continue, and, given the increasing demand from China, most probably increase.

Plywood and sawn timber demand (the two processed commodities that account for the bulk of PNG's log and product exports) are expected to face the lowest growth rates of all wood products in the Asia Pacific region over the next 10 years. Leading consultant predictions are that plywood demand, whilst recovering from the downturn following the 1997/98 Asian crisis will still not achieve pre-crisis levels. Asia – Pacific plywood demand is expected to grow by about 1.5% per year (from 18 to 21 million m^3 per year) from 2000-2010, and sawn timber demand by around 2% per year. This is a result of three forces. Firstly the relative overall declining availability of larger diameter logs suitable for peeling/sawing; secondly improved technologies for manufacturing engineered wood and panel products (principally MDF, OSB and LVL) that will shift demand away from plywood and sawn timber; and thirdly the ongoing switch to wood substitutes.

In pure volume terms the largest growth in demand will be in pulp and paper products. The annual average growth rate for these products is expected to be in the 4 - 5% range in the Asia Pacific region for the next 10 years. However the forestry impact of this growth in consumption will not be so dramatic, as there is scope for further large increases in recycling in the newly industrialised countries in the region. In addition we are likely to see the increased use of non-wood fibres to augment fibre supply.

As the supply of tropical timber products decreases, a number of countries in the Asia Pacific region that were former large producers of tropical timber products (China, Thailand, Philippines, India and Vietnam) have instigated measures to reduce wood imports through promoting substitute materials

(mainly concrete, steel, and plastics). Wood substitutes are a larger threat to tropical timber market penetration into markets than competition from alternative suppliers of wood products.

2.3.2 The Uncertainties of Wood Demand

World economic growth rates and the growth rates of countries in the Asia Pacific region cannot be predicted with any precision. The 1997/98 Asia economic crisis was not widely predicted by economists. It has had a major unpredicted impact on wood demand in the region.

Wood demand is very sensitive to the pricing of wood substitutes. During the 1993/94 tropical log price spike, solid wood products lost market share to steel and plastics. Pricing of energy and other commodities will have an important influence on wood demand and pricing.

The influence of green consumerism upon tropical timber product trade in the Asia Pacific region is a major uncertainty. Commercial logging of natural and semi-natural forests is becoming an increasing emotive environmental issue worldwide. Over the 15 years to 1997 there was a loss of 200 million hectares of natural forests in developing countries and the loss is still thought to be continuing at around 12 million hectares per year. Although commercial logging can only be directly related to about one quarter of this forest clearance it does indirectly provide access for follow-up agricultural encroachment and markets for informal sector logging. Wood certification linked to "green consumerism" is a direct product of the concern in developed countries to try and slow the level of unsustainable logging. In the main Asian markets, the influence of green consumerism on tropical timber trade to date has been small. However when examining the worldwide changes in society's perception of natural tropical forests, the demand influence of sustainability issues surrounding natural tropical forests is likely to increase in the region. This goes wider than just the environmental impacts – it requires convincing the consumers on economic and social issues as well. Managed natural tropical production forestry has still a long way to go to improve its standards, information base and image.

2.3.3 The Certainties of Wood Supply

Major supply problems of larger diameter natural forest logs are looming in Asia through the continuing over-logging and clearing of forests in Malaysia, Indonesia, and Cambodia. Reliable statistics do not exist in Indonesia and Cambodia because of illegal logging, and the figures estimated below are believed to be conservative. Also as volumes decline, the average diameter, percentage of premium species and log quality will decline while costs of production will increase making the remaining volume less competitive in regional markets (Table 2.16).

TABLE 2.16 PREDICTED PRODUCTION OF NATURAL FOREST LARGE DIAMETER LOGS FROM MAIN EXPORTING ASIA – PACIFIC COUNTRIES (MILLION M^3)

	1998	2010
Malaysia	22	12
Indonesia	50	25
Cambodia	3	1
Papua New Guinea	2	2
Solomon Islands	1	0
Total	78	40

The impact of this declining supply of larger natural forest hardwood logs is most obvious on the regional plywood industry. The Asian plywood industry is changing fast. The main changes are: a) an

increasing supply of smaller logs of lower quality, b) the ongoing shift to softwood logs (particularly as core veneer), c) the increased competition from non-plywood wood panel substitutes (particle-board and MDF) which can be produced from small diameter logs and wood/agricultural residues.

Future increases in global wood supply will largely come from plantations (Table 2.17). The annual global industrial wood supply from plantations is predicted to increase from 624 million cubic metres in 2000 to 1,043 million cubic metres in 2040 – an increase of 67%. Their predicted contribution to regional and the global wood supply is shown as follows.

TABLE 2.17 PREDICTED CONTRIBUTION OF PLANTATION WOOD TO REGIONAL AND WORLD INDUSTRIAL WOOD SUPPLY

	2000	2020	2040
	%	%	%
Asia	32	46	48
Oceania	55	66	67
World	35	44	46

Source: ABARE/Jaakko Pöyry

Within the Asia Pacific area, the major increases in large diameter log supply that will directly compete with the tropical timber product trade, will be from the plantation forests of New Zealand, Australia and Chile (Table 2.18).

TABLE 2.18 PREDICTED PRODUCTION OF PLANTATION FOREST LARGE DIAMETER LOGS FROM MAIN EXPORT ASIA – PACIFIC COUNTRIES (MILLIONS M^3)

	1998	2010
Australia	7	8
Chile	10	16
New Zealand	10	18
Total	27	42

The large diameter log production from the Pacific North West forests of Canada and the United States is not expected to increase in supply. At the best these forests are likely to continue at its present level of supply to the Pacific Rim countries of around 24 million m^3 (in round wood equivalents). Other commentators expect a slow decline in terms of its export supply and competitiveness within the region.

By the year 2010 China's domestic supply of large diameter logs is expected to be almost exhausted. Currently China's forests produce about 50 million m^3 per annum of sawlogs and peeler logs. Another 10 million.m^3 per annum are imported of which 50% is currently sourced from Russia. A number of estimates have been made of the future imports following the 1998 harvesting bans. All predictions agree that large diameter log imports will increase.

The Russian Far East forests are still holding enormous supplies (perhaps 20 billion m^3) with an annual allowable cut of 100 million cubic metres per annum. The current cut is around 20 million m^3 per annum. The certainties are (a) that Russia's Far East production is slowly increasing and, (b) that its problems of high production cost, inadequate infrastructure and high risk investment climate are not likely to change quickly, and will continue to restrict rapid increases in supply.

Trees grown outside forests (mainly small farm woodlots, agricultural trees such as rubberwood, and home garden trees) are becoming an increasingly important source of larger diameter industrial logs. This is already evident in China, Malaysia, Thailand, India and Vietnam. Estimates of this source of wood are unreliable, but based on limited surveys it is estimated to already be as high as 20 million cubic metres per annum for the five countries and increasing rapidly.

2.3.4 The Uncertainties of Wood Supply

Unreliable supply data will continue to create uncertainties. The most important in terms of unreliable data is the widespread prevalence of illegal logging. In countries such as Indonesia estimates indicate that illegal logging could be supplying around half of the annual log cut. Illegal logging has the following important, but difficult to quantify, impacts on markets. Firstly illegal logs are generally sold at lower prices than the officially sanctioned harvest, and therefore distort the prices of wood products in both domestic and international markets. (Currently the most obvious example that impacts on PNG is Indonesia's over production and under-pricing of plywood that is partially sourced from illegal log production. This plywood has undermined the wood paying capacity of other log importing plywood producers in the Asian region). Secondly illegal logging depletes the long-term forest growing stock, and volumes available for second and subsequent harvesting cycles are likely to be greatly reduced, or in many cases through over-cutting, regeneration will be poor and slow, and a second harvest may be uneconomic. This makes long term supply estimates from natural forests exceedingly difficult. Thirdly a high proportion of the illegal logs end up supplying products for the domestic markets, and statistics relating to domestic demand are under-reported. This has resulted in several producing countries changing much more rapidly than expected, from being net exporters to large net importers of natural forest timber products. Examples include the Philippines, Thailand, and Vietnam.

Another uncertainty is the number of Asia's smaller fast growing plantation forests, that were intended to be harvested before age ten for pulpwood, that are unlikely to find an economic pulpwood market. Many plantation forests over the past 10 years have been planted in wrong places (usually too far from reliable pulpwood markets), and for non-commercial reasons (eg. re-greening and creation of employment). The consequence is that many such forests are growing into larger diameter logs that will eventually find their way into the sawlog and veneer log markets and directly compete with natural forest logs. Thailand, Malaysia, Indonesia, Vietnam, Laos and the Philippines all have a large number of examples of such plantation forests. The area of these "sawlog plantations by default" is currently estimated at 500,000 hectares in these six countries and a major saw milling industry is being developed upon small hardwood plantation logs.

A new but still uncertain influence on future wood supplies in the region is the growing interest in "carbon forests". These are plantations established to absorb atmospheric carbon and offset the impacts of global warming from industrial greenhouse gases. Carbon emission trading could result in major distortions to the forest industry. If accepted we could see major investments in tree crops. They will be established at the lowest overall aggregate cost including land, planting, and maintenance. Their location may have little relevance to the geography of industrial processing options or markets. There will be a tendency to plant for high volume growth of fibre with lesser emphasis on quality for end use or silvicultural manipulation. Ultimately this could lead to a global oversupply of low quality fibre with consequent price and hence market implications.

Increased globalisation through improved transport systems, lowered tariffs and "branding" in marketing are important but uncertain influences. Substitution of tropical timber products by temperate hardwoods and coniferous species has been more rapid than predicted, particularly where tropical timber products are being utilised as a utility commodity. With the reduction of larger diameter logs within the Asia-Pacific region, the region is increasingly sourcing logs and sawn timber products from non-traditional sources. For example Scandinavian and Southern United States saw-millers have significantly increased their market shares for sawn timber products in Japan and other Asian markets over the past five years.

2.4 CONCLUSIONS AND IMPLICATIONS FOR PAPUA NEW GUINEA

Three main conclusions for Papua New Guinea emerge from this market analysis:

- There is a need for considerable care when trying to understand and interpret the various supply and demand modelling attempts in recent years. The whole procedure of forecasting the future wood supply-demand balance and its impact on prices is extremely complex. The Asia Pacific region will continue to remain the largest wood deficit region in the world, but unfortunately little of the wood supply and demand modelling in the region provides adequate separation of larger diameter tropical logs from smaller diameter logs from other sources.
- There is a general consensus that the supply of larger diameter logs will decrease, but little consensus on whether the other market forces (principally economic growth, changing technology, substitution, green consumerism) will allow the decrease to be translated into increased prices.
- In the short term, the impact of illegal logging, particularly by Indonesia, is expected to continue undermining prices for PNG logs.

PART 3 TRANSFER PRICING

In this section we examine firstly the revenue aspect, namely the administrative control procedures currently exercised by the Government to prevent transfer pricing, a major term of reference for this study. Secondly, the log production costs incurred by exporters are considered, and the overall profitability of the industry.

3.1 ADMINISTRATION

Since log exports are a significant source of Government revenue, and a major source of cash income for the forest owner, the tax base needs to be verified i.e. export shipments must be checked to ensure volume, species and grades are correctly stated, and the quoted price conforms to the prevailing market price. Since May 1994, the Government has contracted an independent external inspection agency, SGS PNG Ltd., to undertake log export monitoring and to report discrepancies to the PNGFA. Control procedures, however, remain vested with the PNGFA. The parent company, Société Générale de Surveillance (SGS) S.A., headquartered in Geneva, has been operating trade inspection services for over a century, and now states that it monitors about 5% of world trade. Its commercial activities are confined to inspection, ISO quality systems training and certification, health and safety standards and similar activities but it has no manufacturing, trading, or financial operations that could compromise its independence. In recent years it has also begun, through an affiliate, to work on certification of forests as sustainably managed.

The SGS PNG Ltd. services to the Government of Papua New Guinea include:

- Provision of log tags to be affixed to end of each log by producers themselves at the time of scaling at the log landing in the forest according to PNGFA regulations;
- Checking all logs for species and grade, and scaling a 10% sample for volume at the pre-shipment stage;
- Monitoring ships to verify the species, grades, and volumes of logs actually loaded;

One further service is technically required but could not yet be implemented because of constraints imposed by the Bank of Papua New Guinea:

- Verifying commercial invoices and Bills of Lading before they can be presented against a Letter of Credit

Exporters are therefore required to obtain from the PNGFA a separate price and volume endorsement for each saw/veneer log group 1 species, for each log group among the other group, and another for the low grade logs. These are all required for every shipment, to obtain a log export permit (PNGFA) and license (Department of Trade & Industry), and to comply with the monitoring and control operations. They are supplied with the SGS log tags and must use the official numbered PNGFA Log Scaling Record Sheets. The legal rights of SGS to inspect shipments are solely those granted under contract to act as an agent of the PNGFA.

The bar-coded log tags cost the producer 50 toea each, and have two tear-off sections for removal at the time of shipment, one for the SGS inspector, and one for the exporter. After receiving a buyer's offer, the exporter must secure PNGFA endorsement before signalling acceptance, a procedure that is supposed to be completed in two working days where no item of the proposed sale is questioned. Each of the seventeen species in Group 1 (see Annex D for list) must have its individual price endorsed but species in Groups 2, 3, & 4 may be submitted for endorsement with average group prices. An explanation can be sought for submitted prices that are below prevailing norms, but this rarely happens. Assembling a log shipment is a slow process, and the actual volume may not be known accurately until loading is

complete, but even at an early stage it should be known to within ±10%, and ship clearance is very rarely delayed.

Shipments may be either of saw/veneer logs or of low grades (old logs/rejects/small logs), or plantation logs. Mixed shipments composed of these types also occur, in which case the exporter must separate logs both on paper and on the wharf. Saw/veneer logs are freshly cut, have a minimum mid-diameter of 40cm, and reasonably good form. In the case of low grades the PNGFA Project Supervisor must certify in writing the reasons for down-grading, which can be due to over-age (more than three months since felling), rejection by buyers more than twice, or under-size (less than 40 cm. mid-diameter). The PNGFA Marketing Branch assign to each set of price endorsements for each shipment a unique reference number, allowing the shipment to be traced through to completion, and the endorsement is valid for two months. The endorsement entitles the log exporter to apply for a Log Export Licence (DTI), which again details volumes and species, and a Log Export Permit (PNGFA) and to proceed with preparing the shipment. SGS PNG is notified of the impending shipment by the exporter independently of the Licence and Permit application procedures, and the exporter must allow a minimum of ten working days to permit SGS PNG to undertake the inspection. Moreover, 95% of the shipment must be available for SGS PNG inspection within five working days or 72 hours if the shipment is less than 10,000 m^3 and the statement of logs to be exported is on a computer diskette. The Statement of Logs to be exported (now usually computer-generated) is to include species, length, average diameter and calculated volume with defect volume, if any. Both the exporter and the SGS PNG inspector sign this document.

Exporters are encouraged to declare 10% more logs than will be exported since the buyer's representative may reject some, and replacements can be made in time for the final load-out statement. The pre-shipment SGS PNG inspection includes a 10% random sample (including from the recommended buffer for rejects) and if the shipment does not meet the PNGFA's criteria a discrepancy notice will be issued. Generally such discrepancies involve a mis-declaration or mis-identification of species (this must be 100% correct) and undeclared logs noted at pre-shipment or on loading (a 10% sample must be correct to within ± 3.0% of the sample volume). Individual shipments range from less than 1,000 to more than 7,000 m^3, and nowadays rarely exceed US$400,000 in value each. In terms of shipment volumes the discrepancy is about twice as likely to be over-loading as under-loading.

In September 2001, when the total volume inspected was 81,391 m^3, the volume containing discrepancies was 14,689 m^3 or 18%. This comprised 13 of 19 shipments, 68%. The corresponding figures for December 1997, by way of comparison, are 20% and 64% respectively, on a much higher volume – 178,100 m^3 – but there has been a sharp decline in overloading since this particular type of discrepancy began to be published in SGS PNG monthly reports.

During the inspection of shipments by the buyer's representative, logs may of course be rejected, and replacements may be made. The declaration of more logs than the ship will load allows for the replacements to be made without any delay and the "Statement of Logs to be Exported" to be altered accordingly. However, paper trimming may also occur and is permitted for all Malas (*Homalium foetidum*) logs and for a further 2% of non-Malas logs. Paper trimming means to alter the length and thus the volume recorded downwards without physically trimming the logs. Physical trimming of logs requires the presence of the SGS PNG inspector. After the resolution of any Discrepancy Notice that might have been served, the PNG Project Supervisor may give permission for loading. However, the PNGFA Boarding Officer at the Declared Customs Port may hold up final clearance where there is an inconsistency of more than ± 10% for any group 1 species of for the 2, 3 or 4 species groupings. Clearance finally rests with the PNGFA Marketing Branch and the Customs Officer. Of course under-loading and over-loading may have legitimate reasons such as the decision of a vessel's Master to weigh anchor and sail when freight weight limits are reached.

The complex process of following all the steps detailed above means that the log exporter is forced to operate on the spot market i.e. shipment by shipment, since any long-term agreement with a buyer for say, a harvesting season's supply, would naturally be undertaken at lower unit prices, the difference being the discount granted to the trader who would commit his company to advance purchases (a bulk

discount). Such a lower unit price would raise suspicions of transfer pricing in being out of line with the spot market, although in fact it would be perfectly normal commercial practice. This would theoretically appear to be a competitive disadvantage to PNG exporters but in practice it may not be so as it is not known whether buyers would be willing to afford them this facility, since PNG is a smaller supplier than Sarawak (but still 35% of Sarawak's log volumes), and such suppliers are typically observed to be "out on a limb" in the spot market after buyers have confirmed their main security of supply with the largest exporters.

3.2 TRANSFER PRICING INVESTIGATION

Transfer pricing, *sensu stricto*, is the method of determining internal prices to be used in the transfer of goods and services between the different divisions or sites of the same company or organization. Economic theory suggests that the most efficient benchmark for setting such prices is the open market arm's length price for the good or service in question. Indeed, some vertically integrated companies give their divisions freedom to purchase or sell outside the company if they are able to achieve better prices, quality, or other attributes of the good or service than is offered to them by a division of their own holding company.

However, when goods and services are traded internationally, opportunities may arise for tax evasion in exporting countries by declaring lower-than-market fob prices, and conversely in importing countries by declaring higher-than-market cif prices for use as deductible costs in tax returns. Where a multinational company is trading across an international border but within branches of the same holding company, arms' length transactions may be even less likely, and the different rates applied of national taxation systems could also be exploited. The objective is to maximize group after-tax profit.

Plainly the practice is not restricted to the forestry sector, but the Review Team was requested to examine specifically the possibility of tax losses to Government occurring in the PNG forestry sector as a result of transfer pricing. Its existence or otherwise obviously affects all conclusions to be drawn from an analysis of forestry revenue since the true value of many commercial parameters may be greater or less than that determined.

3.2.1 Types of Transfer Pricing and Information Sources

The issue of transfer pricing and its implications for the forest revenue system have been under discussion within the forestry sector and in other government agencies for the last two decades. The first references are found in reports prepared in the 80's (APM, 1983; Webber, 1988). In fact documents of that period make reference to several areas of concern, including the sub-optimal returns on international markets, loss of tax revenues and royalties through transfer pricing, inadequate investments in value-added processing, malpractice in aspects of resource management, and others. These and other issues were said to have generated widespread dissatisfaction with the forestry sector, and resulted in a Commission of Inquiry ("Barnett" Report, 1989). This Commission found the practice in all but two forestry companies operating in Papua New Guinea.

Actions were taken based on recommendations made by the Commission, but it seems that to some extent most problems have persisted. More recent studies (FORTECH, 1998), point out that transfer pricing, for example, is still a problem and PNG has not been able to capture the full benefits from its log exports. Transfer pricing activities are recognised as a common practice in most developing countries, where external investors and even local investors search for alternatives to reduce payment of taxes within the country in order to increase profits and also to repatriate or relocate capital. Its occurrence and magnitude is usually proportional to the economic and political uncertainties within a certain country or region, but it can also be affected by other market conditions.

The problem is not simple to attack, and in each case (economic activity, product, country, etc.) there are specific features that need to be fully understood. The forestry sector is probably of the more complex type.

Transfer pricing occurs on two different fronts: over valuation of imported goods and services, and under valuation of exported goods and services.

Forest operations in many tropical countries, and this includes PNG, are heavily dependent on imported capital goods, and also consumables and services. In importing goods and services transfer pricing can take place through:

- Over-pricing of imported equipment and machinery and spare parts;
- Over-pricing of consumables and other imported items;
- Transfer of overhead costs from headquarters and the costs of unrelated business activities to local operations;
- Over-pricing of services, and expatriate consultancy work.

On the export of forest products transfer pricing issue include mainly:

- Mis-declaration of species;
- Mis-declaration of grades;
- Under-measurement;
- Under-pricing;
- Re-issuing of documents/double invoicing.

Under-pricing is one of the most frequently used forms and in this case several alternatives apply, including:

- A direct agreement between buyer and seller on an extra payment to be made in addition to the formal invoice presented by the exporter to the exporting country authorities;
- Selling logs to a offshore parent company that will then re-invoice or re-export for a substantially higher price;

The relative importance of each type of transfer pricing depends on several aspects, including the country, product, distribution channel, economic situation and others.

In this work we have examined export-based transfer pricing only, owing to the terms of reference and time constraints. It is important to note that discrepancies discovered may be due to transfer pricing by *importers* or to other reasons.

The information used in the transfer pricing investigation was collected from several sources, including:

- Reviews of published data and information, including general trade of tropical timber, specific information on the trade and market for PNG timbers, price data along the last 3-4 years;
- Visits to several organisations/institutions for collection of data and interviews with persons working in the trade and industry, or with knowledge of tropical timber markets and related issues. This included visits to Japan, China, and Hong Kong as most logs imported by China are traded through Hong Kong trading companies.

Particular attention was given to the Log Export Monitoring Monthly Report, prepared by SGS PNG Ltd (see section 3.1). The document is made available to PNGFA every month and includes a set of 21 different reports, with details of volume, values, species, grades, exporters, importers, etc. There is also information on discrepancies identified.

Attention was also given to existing regulations and other mechanisms established by the Government in special the Procedures for Exporting Logs. The Procedures cover aspects related to price approval, export permit and licence and also aspects related to monitoring and control. Their contents are described in section 3.1.

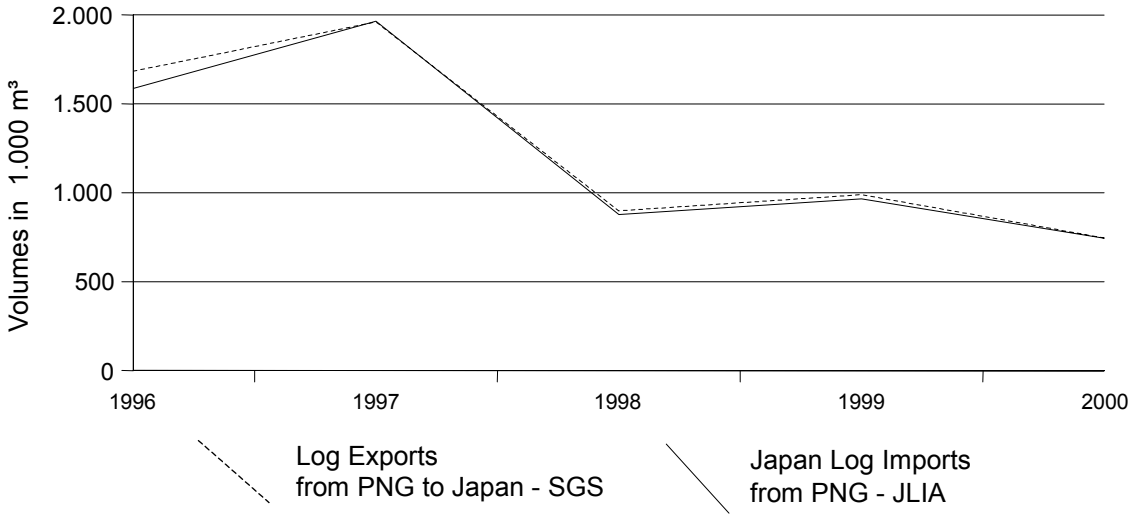
Another component analysed was the State Purchase Option (SPO) mechanism. The SPO is a mechanism that enables the PNGFA to sell up to 25% of an exporter's output if it believes it can receive a higher price. In principle this should be a deterrent to artificial under-pricing, but in practice it is little used in a declining market and the option has not been exercised for some time. The SPO could also serve other aims including market intelligence and market development from the national point of view.

3.2.2 Volumetric Information

Volume discrepancies reported monthly by SGS are of course by definition detected and must be rectified through payment adjustments. The existence of SGS activity throughout the country implies that under-measurement at the export port is an unlikely method of transfer pricing. However, one past study suggested that PNG logs when re-scaled in Japan could be re-assessed at 10% less volume, in some case, and on average approximately 5% (APM, 1983). Highly trained professionals, licensed by the Government as independent log identifiers and scalers, undertake the scaling in Japan. From the Japanese importer's point of view, the volume that counts is the volume as measured on rescaling in Japan, as this determines the volume that the importer has for sale in the country. The importer has an incentive to scale conservatively if his buyer is linked into a cost-plus situation on a unit volume basis, as is typically the case with a large trading company. FORTECH (1998), working with information of logs exported to Japan from January 1995 to July 1997 (around 63% of all PNG log exports), calculated that on average the recorded volume of logs imported into Japan from PNG was around 3.2% larger than the volume of logs exported from PNG to Japan. Such small scaling error differences are not statistically significant if the null hypothesis is that transfer pricing is occurring through under-measurement. On the other hand, and more importantly, the result implies that scaling differences cannot be adduced as evidence to account for a discrepancy in prices per unit volume.

The Review team re-examined the scaling issue, by comparing observed volumes exported by PNG, as reported in the Monthly Report of SGS (PNG source) with those reported by the Japan Lumber Importers Association (JLIA). The JLIA information is based on the Trade Statistics of the Japanese Ministry of Finance (Figure 3.1). The trend lines show even less difference than that suggested by the previous studies, and the Review Team concludes that there is no evidence for transfer pricing via volumetric mis-measurements in the Japanese market, and, as a logical corollary, that there is no evidence that different scaling modes can account for discrepancies in prices per unit volume at a given pricing point.

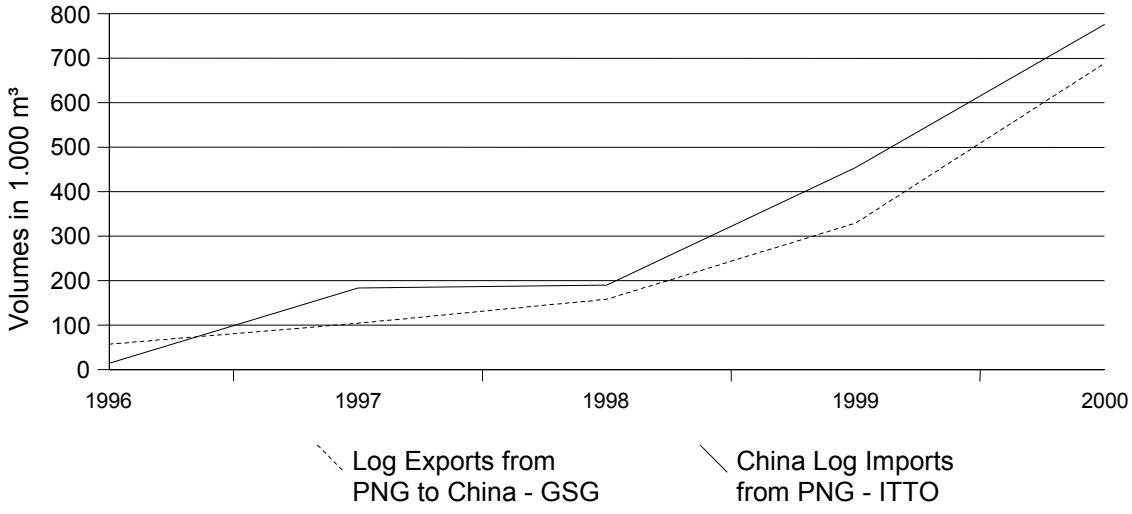
FIGURE 3.1 LOG EXPORTS FROM PAPUA NEW GUINEA TO JAPAN (SGS VS. JLIA FIGURES)



Sources: Log Exports: SGS PNG Pty Ltd; Log Export Monitoring: Monthly Report (1996-2000); Log Imports: JLIA – Japan Lumber Importers Association: The Trade Statistics, Ministry of Finance, Japan

The situation is not the same when analysing log exports to China (see Figure 3.2). The volumes reported as exported to China by PNG (based on SGS PNG reports) are lower than the volumes reported by China (ITTO source) as imported from PNG. Table 3.1 shows that these differences are large and show no pattern.

FIGURE 3.2 LOG EXPORTS FROM PNG TO CHINA AND CHINA LOG IMPORTS FROM PNG



Sources: Log Exports: SGS PNG Pty Ltd; Log Export Monitoring: Monthly Report (1996-2000); Log Imports: ITTO Annual Review 2000

TABLE 3.1 VOLUME DIFFERENCES IN SGS PNG EXPORT AND CHINESE IMPORT FIGURES

Year	Volume Difference	
	m^3 *	% **
1996	-43 595	-76%
1997	+78 918	+75%
1998	+31 618	+20%
1999	+125 504	+38%
2000	+88 397	+13%

* China - PNG

** Calculated Based on PNG Exports

The Review Team identified several possible reasons for the differences, but probably the main reason is that Chinese statistics are unreliable, a problem encountered in several studies. In order to improve forest products statistics information ITTO has supported China with a project, through the Chinese Academy of Forestry (CAF) to help establish a market information service. Nevertheless this is not an easy task, especially in so large a country, and in spite of progress made the current statistical data still have several inconsistencies.

In order to identify possible errors in the ITTO/CAF statistics (used as the basis for the China imports) during the implementation of this study information was collected directly from the Chinese official statistics. The Chinese official statistics information checked for 1998 and 1999 for log imports was found also to be very inconsistent and did not help to improve the precision.

The inclusion of exports of PNG to Hong Kong could explain part of the discrepancies found. For example taking year 2000 information on log exports of PNG to China a discrepancy of 88 000 m^3 can be observed between the two sources of information (PNG and China). An explanation for the difference could be that logs are being re-exported by Hong Kong as in that same year the total exports to Hong Kong (based on the SGS Report) reached 53,000 m^3.

To investigate this possibility the Review Team checked the Hong Kong official statistics. This check revealed that the volume registered in the official Hong Kong statistics for logs imported from PNG was much smaller than that registered in the PNG export statistics. The official Hong Kong statistics for 2000 register only 25 m^3 of logs as imported from PNG. This discrepancy indicates the possible use of Hong Kong as a port of reference by exporting companies, and that documents are later re-issued in Hong Kong for another port and importer.

The conclusion of this assessment is that the discrepancy in volume detected for China is probably largely due to failures in the import statistics, but it is also likely that exporting documents from PNG are re-issued in Hong Kong. This would not be *prima facie* evidence of transfer pricing based on volume manipulation, but it would be a feasible method of transfer pricing. In this form, the transfer pricing starts by under invoicing at the origin, but the potential gain is quite small. Hong Kong statistics were checked in more detail. Information on international trade of logs in the Hong Kong statistics is only collected as two categories: "Tropical Wood of Specified Varieties" and "Other Non Coniferous".

Log imports of these categories are shown in Table 3.2. Most logs come from Malaysia and Gabon. As previously mentioned the Hong Kong official statistics report very small volumes imported from PNG, and the volumes reported have a large discrepancy when compared to those encountered in the PNG statistics.

Practically all logs imported by Hong Kong are re-exported. The Hong Kong official statistics from January 1999 to June 2001 show that around 99% of imported logs are re-exported to China. The rest went basically to Macao and to Taiwan.

Information on Hong Kong re-exports of logs is presented in Table 3.3. By comparing the volumes re-exported with those imported by Hong Kong (Table 3.2), and considering that practically no log consumption exists in Hong Kong, several inconsistencies are observed in the statistics. For this reason the information cannot be used as a basis to identify possible evidence of transfer pricing practices via volume.

TABLE 3.2 HONG KONG LOG IMPORTS (M^3)

Log Type	Source	Year		
		1999	2000	2001 *
Tropical Wood of Specified Species	Malaysia	192 819	269 909	70 370
	Gabon	39 430	33 700	17 707
	Others	61 545	49 255	20 898
Subtotal		293 794	352864	108 975
Other Non Coniferous	Malaysia	169 507	202 874	120 360
	Germany	272 233	78 680	39 481
	Other	429 366	315 883	127 514
Subtotal		871 106	597437	287 355
TOTAL		1 164 900	950301	396 330

* January – July

Source: Hong Kong Trade Statistics

TABLE 3.3 RE-EXPORTS OF LOGS BY HONG KONG (M^3)

Log Type	Markets	Year		
		1999	2000	2001 *
Tropical Wood of Specified Species	China	288 124	417 512	51 643
	Others	1 090	985	162
Subtotal		289 214	418 497	51 805
Other Non Coniferous	China	525 033	447 961	328 457
	Others	16 185	4 105	1 236
Subtotal		541 218	452 066	329 693
TOTAL		830 432	870 563	381 498

* January – July

Source: Hong Kong Trade Statistics

3.2.3 Species and Grades

All exports of logs from PNG are checked by SGS PNG Ltd. for species and grade. Their reports show some discrepancies, both in terms of species and grade, but these cannot be considered significant. It has not proved possible for import statistics to be analysed and compared with PNG for this factor, owing to difficulties in matching species and grades. (Taun and Calophyllum exported to Japan are a possible

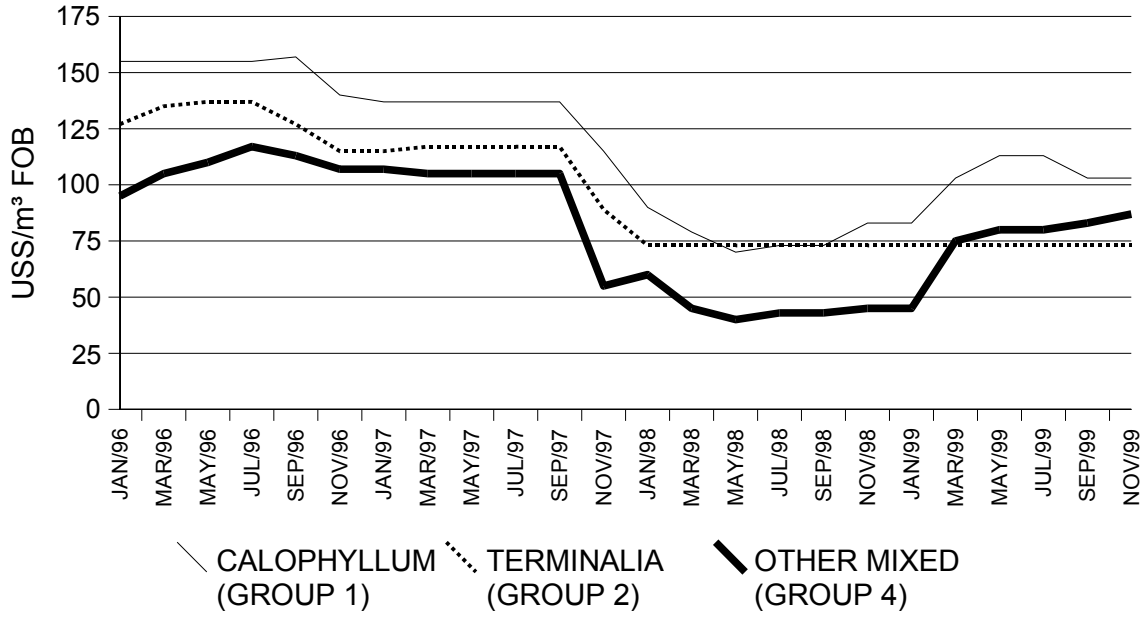
exception – next section). For this comparison, a detailed investigation lasting several months would be necessary.

One possible way to reduce tax liability is to down-grade logs to a lower bracket. During the market decline it has been noticed that the quantity of lower grades being declared has increased. This is not commercially logical, since as prices decline the least-valued species should tend to be left in the forest as they will be the first to reach the point where the marginal cost of harvesting them exceeds their marginal revenue contribution.

3.2.4 Pricing Information

Figure 3.3 shows three years of price data from the ITTO Market Information Service but only up to November 1999, as unfortunately after that date ITTO stopped reporting specific PNG log prices. So export fob price information used in the Review is based on the SGS reports. These prices are compared with import market figures. The sources are publications, country importing statistics and information made available during interviews.

FIGURE 3.3 FOB PRICES FOR PNG LOGS (1996-1999)



Source: MIS – ITTO

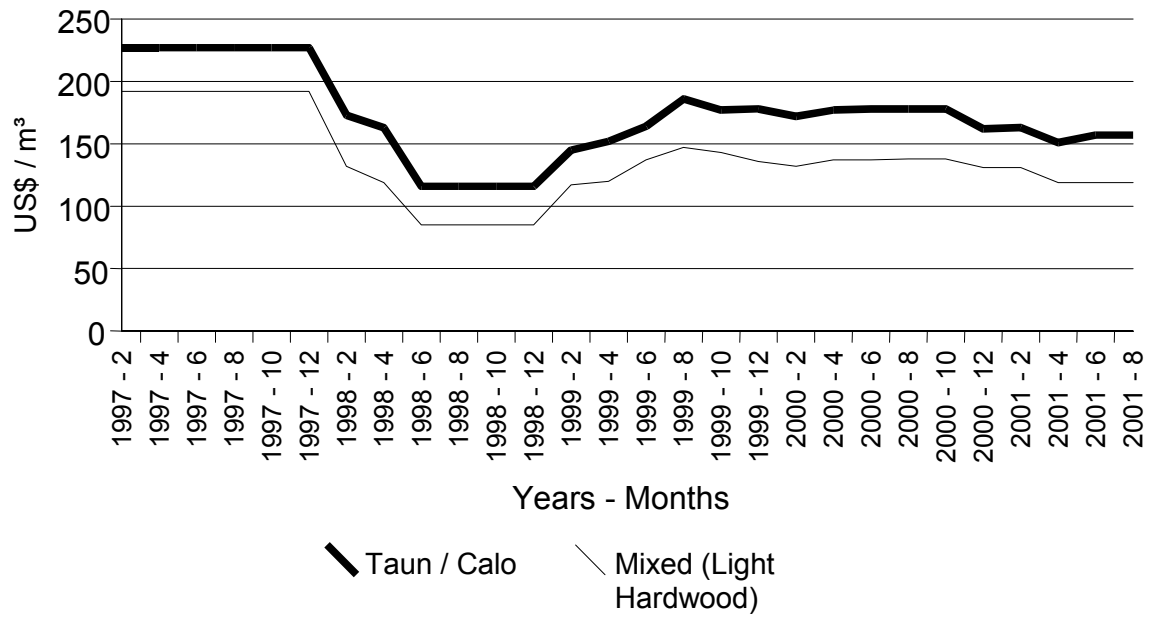
In the case of Japan, prices published in the *Nikkan Mokuzai Shimbun* (also Japan Lumber Journal and Report) are generally quoted in yen per *koku* for the cif pricing point. A *koku* was originally a measure of volume for rice, being theoretically the amount required to feed one person for one year (about 180 litres), and belongs to a decimal measurement system adopted from China in the seventh century, and used for a millennium to assess land productivity, levy taxes, and pay stipends to the non-working warrior (*samurai*) class. However, when Toyetomi Hideyoshi united the country in the late sixteenth century, he nearly doubled the traditional size of the unit, although the traditional size was still used when all units were standardised in 1891. It is true that the unit could vary by type of article being measured, and by region, but Japan officially metricated all measurements in 1959, and there is no reason now to imply that the *koku* is a unit of varying size for measuring timber. It is accepted as 0.278 m^3 when compared to the Brereton scale.

The term "nan'yō" (South Seas) is used in practically all Japanese publications to provide information on average prices for tropical logs from South East Asia and the Pacific with no specific reference to Papua New Guinea. However in the case of Taun and Calophyllum, two species exported by both Papua New Guinea and the Solomon Islands, direct reference is made. Log quality from the latter source is considered somewhat higher, but market prices should not differ greatly between these two sources. The Japanese statistics also provides price information on mixed light hardwoods (MLH) imported from the South Seas. These are basically all other tropical hardwoods species imported into Japan for veneer/ plywood production. In the case of logs imported from PNG it probably includes species outside of Group 1 (i.e. lower priced species).

Information on cif South Seas log prices from early 1997 to mid 2001 published in the Japan Lumber Report is presented in Figure 3.4. The information provided shows that cif prices per cubic metre for Taun/Calophyllum log types are on average around US$35.00 (ranging mostly from US$31.00 to US$39.00) higher than for MLH.

The differences between cif prices for higher grade (Taun/Calophyllum) and the MLH group reported in Japan were compared with differences reported for the PNG fob export prices. The comparison indicated that the differences between the two groups (first grades and MLH) are basically in the same range.

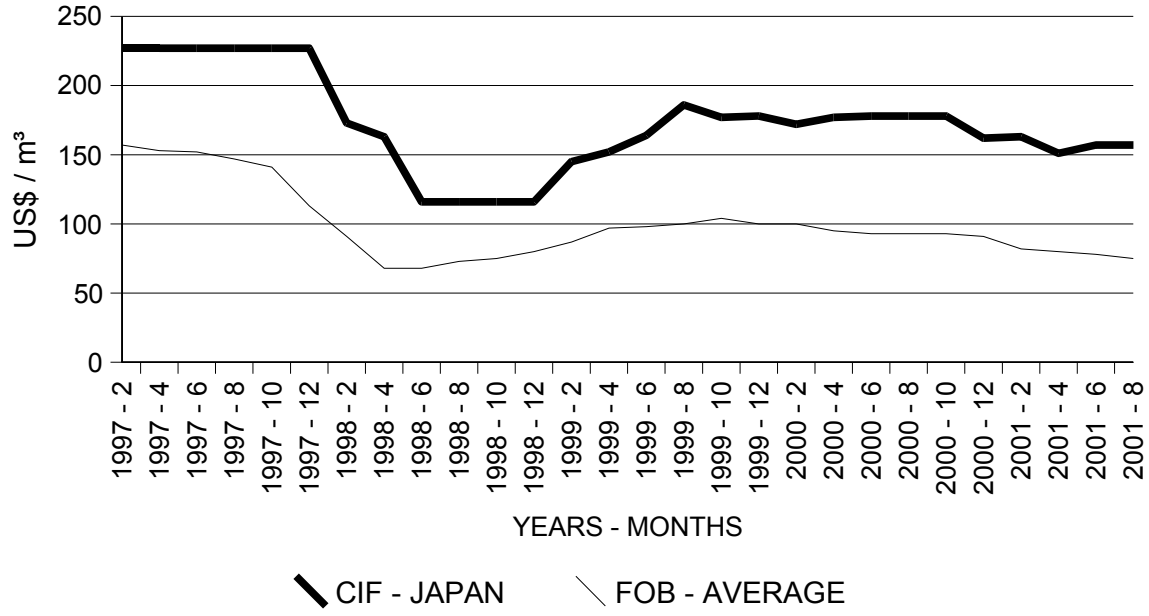
FIGURE 3.4 CIF PRICES FOR LOGS IMPORTED INTO JAPAN FROM SOUTH SEAS



Source: Japan Lumber Journal

Figure 3.5 presents a comparison between the cif prices in Japan and PNG fob prices for Taun and Calophyllum logs. Taun and Calophyllum were chosen for study as these species are very representative of PNG exports (around 30% of total exports in 2000) and also because the Japanese statistics report specific price information for them. The period analysed covers early 1999 to mid-2001. The cif prices are based on the Japan Lumber Report and the fob prices are based on SGS reports. The general trend reflects the Asian crisis period, with prices declining by around 50%, and a price recovery in 1999. As can be observed the differences between cif and fob prices varied greatly along the period, and this was to be expected when prices were falling significantly.

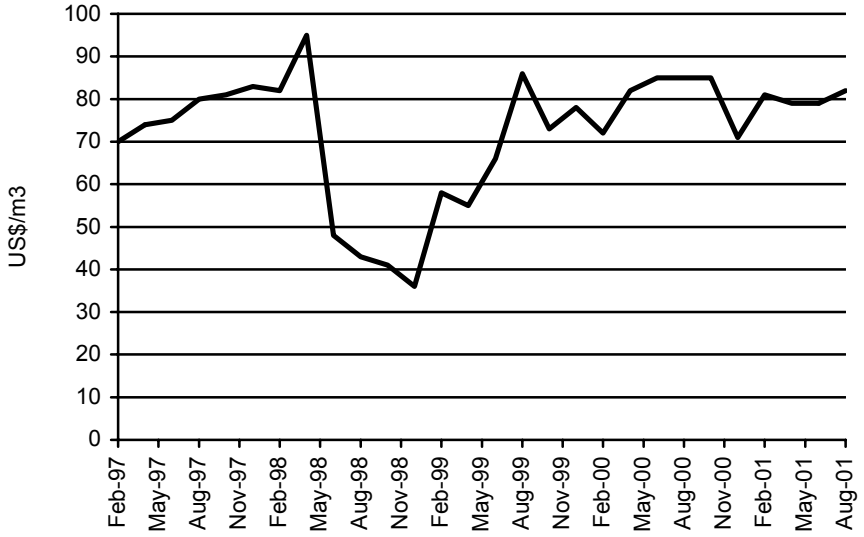
FIGURE 3.5 JAPAN CIF AND PNG FOB PRICES FOR TAUN AND CALOPHYLLUM LOGS



Sources: SGS PNG Pty Ltd; Log Export Monitoring: Monthly Report (1997-2000) - FOB;
Japan Lumber Report & Nanyozai Freight Agreement- CIF

The fluctuations of the differences between cif and fob prices reported are presented in Figure 3.6. During the high price period (before the Asian crisis) the difference between fob and cif prices was in the range of US$80.00 per cubic metre. At the lowest price level (in the last months of 1998) the difference was much smaller: around US$40.00 per cubic metre. With the recovery in price (during the second quarter of 1999) the difference between cif and fob returned to pre-Asian crisis level of around US$80.00 per cubic metre.

FIGURE 3.6 DIFFERENCES BETWEEN CIF JAPAN AND FOB PNG PRICES FOR TAUN/CALOPHYLLUM LOGS



Source: Japan Lumber Report & Nanyozai Freight Agreement

The internationally adopted definition of fob price is expected to include the log price (set by the exporter based on production/operation costs and profit margins) and the following costs:

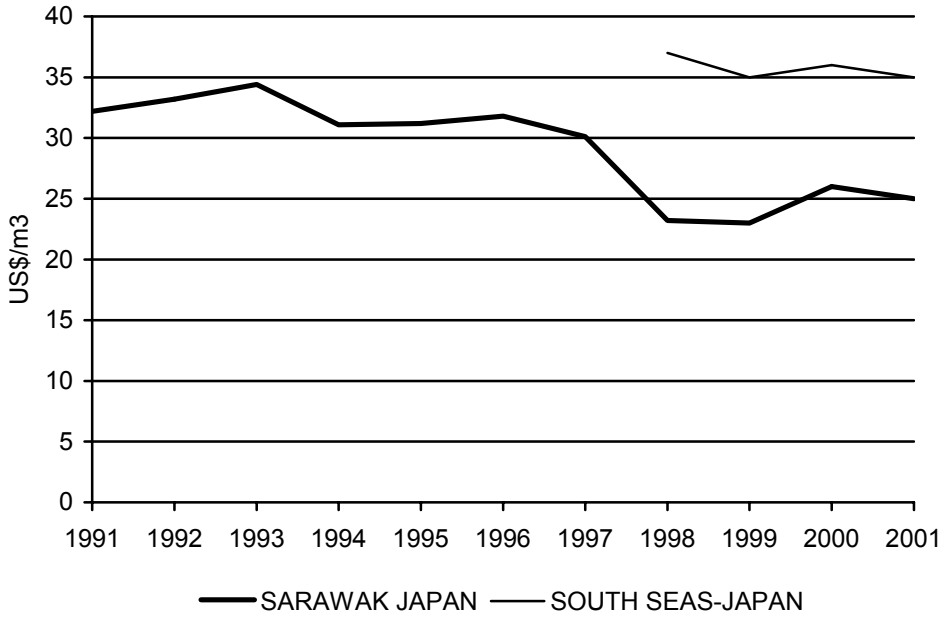
- Costs of transportation to the port and loading costs to the "free on board" point;
- Sales costs, commissions and taxes;
- Port charges, which in PNG cover: navigational aids, port dues, in/out pilotage, launch hire, customs overtime, health quarantine overtime, freight taxes, and duty on bunkers;
- Agency fees: agency fee, printing/stationery, postage/courier, phone/ fax and vehicle hire.

The cif price is based on the fob price plus freight to destination and insurance. In some cases the cif prices are expanded to the so-called "cif landed" price. The cif landed price includes all the costs from the vessel to a final destination in the port at the so-called "place of rest". In this case the costs to be added are: port costs at final destination, terminal costs and some inland freight. This can create some confusion in the use of the cif price information. Some ports, as for example in the USA, most of the cif prices reported include part of the final port destination costs (such as terminal costs). In the case of Japan this is not clear, but it may be assumed that at least part of final destination costs are included in the cif prices reported.

3.2.5 Freight & Insurance

The evolution of log freight costs is presented in Figure 3.7. The data is based on the Japan Lumber Journal and the Nanyozai (South Seas Timber) Freight Agreement, and includes freight costs for logs shipped from Malaysia (Sarawak) and for logs shipped from other regional destinations including Papua New Guinea. As can be observed freight rates were also affected by the Asian crisis. The freight costs dropped in 1998, and started to recover in 1999. For South Seas log freight costs it was only possible to collect information for the last 2-3 years, but the same trend would be expected.

FIGURE 3.7 EVOLUTION OF LOG FREIGHT COSTS TO JAPAN (ANNUAL AVERAGE)



Source: Japan Lumber Report & Nanyozai Freight Agreement

The higher freight costs for non-Sarawak South Seas logs are explained, according to the Nanyozai Freight Agreement, by several reasons including larger shipping distance, smaller vessels and dispersed loading points with small volumes. As the difference is very large the existence of more competition from chartered hulls (ship-owners not part of the liner cartel) in the case of Sarawak, may be responsible.

3.2.6 Taun & Calophyllum Example

Table 3.4 presents the average fob (PNG data based on SGS reports) and cif prices in Japan (based on Japan Lumber Report) for the period January to July 2001. In the preparation of this table freight costs were based on the Nanyozai Freight Agreement and a flat rate of 3% over the fob log price was used to estimate the insurance costs.

TABLE 3.4 PRICES AND COSTS FOR TAUN AND CALOPHYLLUM LOGS EXPORTED FROM PNG TO JAPAN (AVERAGE JAN-JULY 2001)

Price at	US$ / m^3
fob PNG (SGS)	81.50
cif JAPAN (JLR)	157.00
cif – fob	75.50
Freight Costs (NFA)	35.00
Insurance	2.45
Difference	38.05

Further investigations are obviously needed to examine the possible reasons for the difference:

- Fob and/or cif prices used as bases for this study are not correct;
- Freight and insurance costs have been underestimated;
- There are other costs in the chain that have not been considered;
- There are other factors that need to be taken into account.

A discussion on each possible reason for the difference identified follows.

Fob price information was obtained from SGS reports, and is actually based on export documents. According to the PNG Procedures for Exporting Logs, there is a price approval mechanism in place (see section 3.1). It is very unlikely that this source of information would be a significant source of error. Further investigation has indicated that the only possible source of error could be related to differences in log grade, within a certain Group.

Japan is known for being more selective when importing goods, and this general rule also applies for logs. Contacts made by the Review Team with Japanese importers have re-affirmed this fact. If that is the case, the average prices reported in Table 3.4 may not apply for Japan, as Japanese importers would be paying more for higher quality logs. A more detailed investigation has shown that this is not the case. The following pieces of evidence support the conclusion that Japanese importers are not paying a premium for possibly higher quality requirements for PNG logs than other importers.

Observation 1:

Table 3.5 shows the average fob price for PNG Grade 1 and for the total volume of logs exported to several markets from 1997 to 2000. As can be observed fob prices for Grade 1 logs exported to Japan, or even average prices for the total volume exported to Japan, are very close to the average price for all PNG log exports.

TABLE 3.5 VOLUME AND AVERAGE FOB PRICE BY MARKET

Market		2000		1999		1998		1997	
		GR. 1	Total	GR. 1	Total	GR. 1	Total	GR. 1	Total
Japan	Vol. 1.000 m³		745,6		988,7		897,9		1.960,2
	US$/m³	83	76	92	80	77	68	98	120
Korea	Vol. 1.000 m³		323,1		416,7		281,1		421,2
	US$/m³	74	67	78	69	65	56	83	107
China	Vol. 1.000 m³		687,8		328,9		157,9		104,4
	US$/m³	87	71	99	78	81	63	106	115
Philippines	Vol. 1.000 m³		96,2		136,2		147,0		196,0
	US$/m³	73	61	77	64	66	51	88	88
Hong Kong	Vol. 1.000 m³		53,2		34,2		39,2		129,4
	US$/m³	91	84	103	92	117	131	90	161
Taiwan	Vol. 1.000 m³		47,9		41,0		24,4		88,4
	US$/m³	68	58	81	58	--	51	90	81
Others	Vol. 1.000 m³		38,8		38,1		69,1		106,5
	US$/m³	73	86	--	102	63	93	167	134
Total	Vol. 1.000 m³		1.992,5		1.983,9		1.616,6		3.006,2
	US$/m³	83	72	91	77	78	66	98	117

Observation 2:

The SGS reports also make available information on volumes and values exported by company. Some companies operating in PNG have connections with trading companies in Japan, or even if that is not the case export mostly to Japan. The analysis showed that these companies have not paid a higher price for the logs. This corroborates the previous comment that Japan is in fact not paying a premium for the logs, or at least not to the extent that it could be the source of significant errors in the fob prices.

The Review Team also investigated in more detail possible distortions or errors in the cif price information. Table 3.6 provides information on average cif tropical log prices imported from PNG based on the Customs Clearance and also the deviation in percentage from the Taun/Calophyllum cif prices reported.

TABLE 3.6 AVERAGE LOG CIF PRICE IN JAPAN (CUSTOM CLEARANCE)

Year	Total		Average CIF Japan	
	Volume (m^3)	Value (1,000 US$)	US$ / m^3	%
1998	860 604	96.516	112.15	-19
1999	942 943	122.375	129.77	-29
2000	718 817	94.395	131.31	-32

% - Difference from the Taun/Calophyllum cif Prices Reported

The information presented in Table 3.6 does not allow any conclusion to be made in the absence of grade/species composition data. In any case it seems that the difference between the cif prices for Taun/ Calophyllum logs (superior grade) and the cif average price for all logs imported from PNG is of a similar size to the same relationship applied to the fob price. Taking as an example the year 2000 average fob price data for Taun and Calophylum, the overall mean price difference is around 30%.

Three aspects need to be considered at this stage:

- Freight cost is constant regardless of the log grade, and as a result the calculated difference between the price for the higher grade logs and that for the average should be smaller, at most around 20%;
- The Japanese market does not pay a premium, but buys mostly higher quality grades. Under this condition the difference detected also should be smaller, as the average price reported for all species was not weighted by volume.
- Japan is not paying a premium for PNG logs, but Taun and Calophyllum is also imported from Solomon Islands, and logs of this origin are regarded as of superior quality. There is some evidence that in this case a premium exists (see section 3.2.7).

Another approach was to consider the information on log wholesale prices in Japan (Table 3.7). The data presented is based on prices paid in September, 2001, in Nagoya, for Calophyllum and mixed species logs.

TABLE 3.7 WHOLESALE PRICES OF LOGS – NAGOYA, JAPAN

Groups	Aug/01	Sep/01
Calophyllum	169	169
Mixed species	147	147

Source: Nikkan Mokuzai Shimbun (06/09/01)

The wholesale prices (loaded on truck) for Calophyllum logs in Japan in August and September reached US$169.00/ m3. This is 8% above the cif prices reported for Japan, a relatively low margin considering all costs involved (port charges, handling costs, taxes, administration of the operation, etc.) and profit margins.

This re-affirms the following facts:

- A part of the local costs is in fact registered inside the cif prices for logs imported into Japan, and prices reported are “cif landed”. It is estimated that the addition of such internal costs could make the “cif landed” cost up to 10% greater than the true cif price.

- Higher quality logs from other sources inflate average prices. Imports of higher quality Taun and Calophyllum logs the Solomon Islands could have an impact on average cif prices reported. Evidence of higher priced logs from the Solomon Islands is presented in Item 3.2.7 (Korea prices). In any case again is not easy to quantify the impact of higher grade logs in the average price, as the proportions are unknown. In any case even assuming that 30% of the logs would be Solomon Islands "regular grade" logs, the impact on the average price would be less than 10%.

The Review Team also investigated the possibility of having under-estimated the freight and insurance costs. The freight costs used in this study was based on Nanyozai Freight Agreement and based on this fact it is very unlikely the freight costs have been underestimated. On the contrary, the freight price information obtained from the Agreement is considered to be too high and some exporters might be using charter vessels outside the Agreement.

Some exporters and importers have mentioned that in PNG, due to difficulties in operations, payment of "demurrage" to port authorities is common. Depending on the delay and on the demurrage charges, this could increase freight costs substantially. Even so, importers would accept having to pay for higher freight, so this would not be reflected in cif prices. The percentage used for insurance costs (3%) in this report seems to be appropriate. The total impact of insurance on the cif price is very small.

Some importers have mentioned that cif prices include a financial cost. The point made is that exporters are normally paid against documents (a few days after loading) while trading companies in Japan sell logs in the domestic market for payments on 180-day or even 270-day terms. This requires large working capital. There is no doubt that the amount involved is significant (probably over US$ 50 million), but at the present low interest rate in Japan the impact on costs is very small. Furthermore is unlikely that cif reported prices are affected by the interest rate. The impact is only expected to be over the wholesale or final client price.

3.2.7 China, Hong Kong, & Korea

Both the quantity and quality of Chinese information is poor. Several sources of information were consulted, but most proved too inconsistent to use. Table 3.8 does present an amalgam of some data, however. It does not cover specifically the logs imported from PNG, but gives a relatively good indication of market prices. Several sources of information were used, including the China Statistics Yearbook 2000, China Products Market Information- an ITTO/China Academy of Forestry (CAF) publication, and data from the Census and Statistics Department of Hong Kong.

TABLE 3.8 CIF LOG PRICE INFORMATION – CHINA AND HONG KONG

Products	Year			
	1998	1999	2000	2001
China - All Tropical Logs *	124	122	--	--
China – Lauan/Keruing**	--	--	--	160 – 178
Hong Kong – Mixed Species ***	--	99 – 101	101 – 103	99 – 104

* Average price – Source: China Statistic Yearbook (2000)

** Guangzhou Province – Source: China Forest Products Market Information – ITTO/CAF

*** Malaysian Supply – Source: Census and Statistics Department / Hong Kong Trade Statistics

The average prices reported in the China Statistics Yearbook for all tropical logs for 1999 are in line with prices reported by Japanese sources previously presented. This is not the case for the 1998 prices that are higher than expected, as in that year international prices of logs were depressed by the Asian crisis. The

price information for Lauan and Keruing logs reported in the ITTO/CAF bulletin for Guangzhou Province is in the same price range as those reported by the Japanese sources.

The largest distortion found is in the price information for Hong Kong. The average log cif prices for all species imported from Malaysia, including those classified by the Hong Kong Census and Statistics Department as Tropical Logs of Specified Species (code 24751) and logs classified as Other Non-Coniferous (code 24752), are much lower than those reported in Japan and other markets. As previously discussed Hong Kong is not a log consumer and most of the logs are re-exported to China. Based on the data collected during the interviews with persons involved in the trade and timber industry in Hong Kong and China, the difference between the import price and export price of logs is estimated to be between US$30.00 and US$40.00 per cubic metre. This covers costs and profit of the trading company.

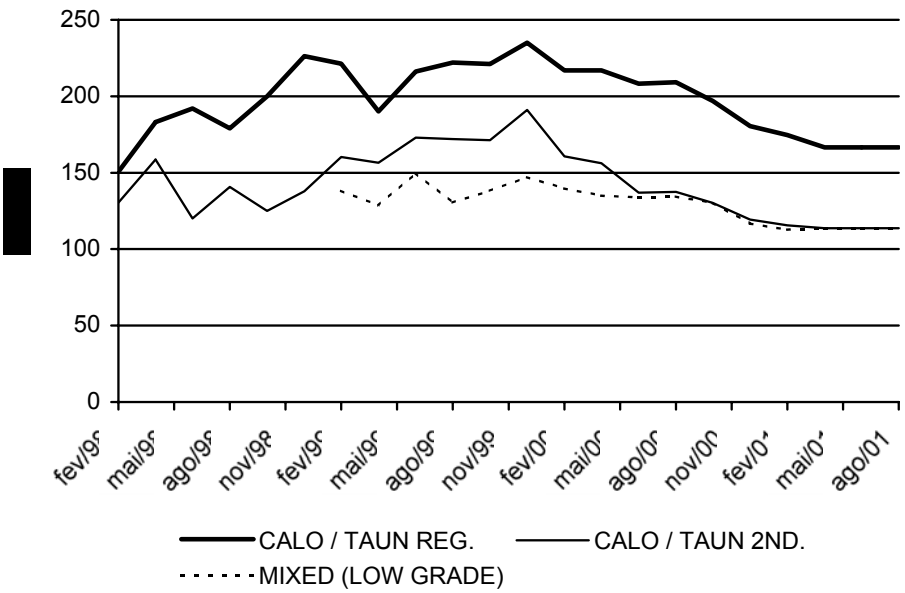
Korea is the third largest market for PNG logs, but due to time constraints this market was not visited by the Review Team. Cif log price information for Korea, based on ITTO MIS reports, is presented in Figure 3.8. Korea also imports large volumes of logs from the Solomon Islands, where there are Korean companies operating. Log grading in Korea is slightly different from other markets. Logs graded as "regular" are mostly from the Solomon Islands. The Group 1 PNG logs would probably fall mostly in the category named "second". As can be observed from the data presented in Figure 3.8 the higher quality of the "regular grade" logs is reflected in higher prices. Based on the 1999 data cif prices for regular grade logs imported by Korea were around 30% higher than the cif prices for the same species imported into Japan. The cif prices in Japan for that year were similar to those reported by Korea for "second" grade. The premium paid for regular logs dropped to 18% in 2000 and to only 7% in 2001. The reasons for such a change are not clear. Among the possible explanations are:

- The price information is not reliable;
- Log grading has changed over the period;
- The prices have been manipulated.

The last is the most likely. This would be a result of recent investigations in the Solomon Islands that identified evidence of under-invoicing. The level of under-invoicing revealed was of the order of 25 to 30% of the declared fob value (Price Waterhouse, 2000). Based on these facts, and bearing in mind no field visit was undertaken in Korea, no general assessment is made of prices in this market.

However, cif log prices reported for Korea do serve as a basis to analyse the reasons for the discrepancies detected in Japan.

FIGURE 3.8 CIF PRICES FOR TROPICAL LOGS IMPORTED BY KOREA



PART 4 FINANCIAL MODELLING

4.1 LOG PRODUCTION COSTS

The log production costs have been updated as part of the Review. The resulting averaged costs are shown in Table 4.1 below. In this table the costs have been compared with the FORTECH 1997 costs.

TABLE 4.1 SUMMARY OF AVERAGE LOGGING COSTS BY COST CATEGORIES

Cost Category	*FORTECH Analysis 1997*						*2001 Review*	
	Actual costs by Scenarios							*Current 1/ Kina Equivalent*
	Manus	*Gulf*	*N. Britain*	*Morobe*	*Sandaun*	*Average*		
	US$/m3						*US$/m3*	*K/m3*
Wages 3/	3.78	3.76	4.72	3.74	4.99	4.20	**4**	**15**
Fuel & Oil 3/	4.66	5.28	10.06	7.92	11.08	7.80	**8**	**28**
Repairs & maintenance 3/	4.52	5.34	10.57	7.82	11.23	7.90	**8**	**28**
Operational overheads 4/	3.48	4.51	5.54	4.84	5.57	4.79	**4**	**13**
Stevedoring & port charges 4/	6.00	15.00	6.00	6.00	3.00	7.20	**6**	**21**
Sub-total	*22.44*	*33.89*	*36.89*	*30.32*	*35.87*	*31.88*	***29***	***105***
Depreciation 2/	7.56	10.26	12.12	14.00	11.71	11.13	**12**	**43**
Head office overheads 4/	13.33	12.22	17.33	13.33	18.86	15.01	**10**	**36**
Sub-total	***43.33***	***56.37***	***66.34***	***57.65***	***66.44***	***58.03***	***51***	***184***
Allowance for 15% return over 7 years	*(FORTECH discussed a 20% return over 5 years)*						**9**	**32**
Total Costs Before Return to Landowners and Log Export Tax							**60**	**216**

Notes:

1/ Currency conversion US$ to Kina 0.28

2/ Depreciation based on an average of 7 year life for fixed assets

3/ Based on FORTECH 1997 figures

4/ Based on costs collected during 2001 Review

The FORTECH 1997 log cost analysis was a relatively exhaustive undertaking, involving in excess of three person months. Our current review was by comparison, a rapid assessment based on analysis of management accounts and discussions with management of major logging companies, (collectively understood to account for approx. 60% of current log export cut). Accordingly unless significant cost variances were identified, the FORTECH costs have been accepted. The analysis indicates that the 1997 wage, fuel/ oil and repairs/ maintenance figures are still a reliable indicator of current costs. It had been our expectation that fuel and oil costs may have risen and that salaries and wages should have declined in US$ terms over the intervening four years. This was not borne out in the analysis and variations in these costs were found to be small. Our analysis however indicates that there have been reductions in US$ terms in the cost associated with operational overheads, stevedoring/ port charges, head office overheads and royalties/ levies.

The resulting updated average logging cost before export tax of K216 per cubic metre must be treated as an estimate based on "average" PNG conditions and current costs. As an average, it cannot be directly applied as a reliable cost indicator of any single operation, as productivities, log stocking per hectare, terrain, weather, distances to ship loading, age of equipment, agreement conditions for landowner benefits, compliance with the PNGFA Logging Code of Practice, overheads and other cost factors vary considerably from one operation to another.

For the calculation of depreciation and return on investment, the Review analysis included a project level costing (Table 4.2) for a 250,000m^3 per year operation based on new equipment with an estimated capital cost of K68 million spread over an average of 7 years, including with a two year build-up period to reach full operating capacity.

TABLE 4.2 FOREST INDUSTRY LOGGING COSTING MODEL

YEAR				*Planning*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
				Phase Yr 0	*All Values in '000 K unless stated otherwise*						
KEY OPERATING ASSUMPTIONS:											
Log Input Volume - m3					140,000	200,000	250,000	250,000	250,000	250,000	250,000
Operating Level - % of capacity					50	75	90	90	90	90	90
Operating hours/ week (9 months of year)					50	70	70	70	70	70	70
Employees - # PNG				50	230	350	400	400	400	400	400
Employees - # Foreign				10	20	25	30	30	30	30	30
CAPITAL COSTS											
Machinery and equipment				60,000							
Buildings and site				2,000							
Tugs/ barges				6,000							
PRODUCTION											
Typical Production volumes by grade/%											
Grade: 1	45%				63,000	90,000	112,500	112,500	112,500	112,500	112,500
Grade: 2	10%				14,000	20,000	25,000	25,000	25,000	25,000	25,000
Grade: 3	20%				28,000	40,000	50,000	50,000	50,000	50,000	50,000
Grade: 4	25%				35,000	50,000	62,500	62,500	62,500	62,500	62,500
Total Production					140,000	200,000	250,000	250,000	250,000	250,000	250,000
REVENUE											
US$ Conversion	0.28	US$/m3	K/m3								
Average FOB value		59.25	211.61		**29,625**	**42,321**	**52,902**	**52,902**	**52,902**	**52,902**	**52,902**
AVERAGE OPERATING COSTS											
US$ Conversion	0.28	US$/m3	K/m3								
Salaries & Wages (PNG) (Note 1)		1.85	6.61		950	1445	1652	1652	1652	1652	1652
Salaries & Wages (Foreign) (Note 1)		2.35	8.39		1399	1749	2098	2098	2098	2098	2098
Repairs & maintenance materials (% foreign 90%)											
(see Note 1)		7.90	28.21		3950	5643	7054	7054	7054	7054	7054
Fuel & oil (see Note 1)		7.80	27.86		3900	5571	6964	6964	6964	6964	6964
Logging operational overheads (% foreign 50%)											
(see Note 2)		3.50	12.50		1750	2500	3125	3125	3125	3125	3125
Stevedoring & port charges (see note 2)		6.00	21.43		3000	4286	5357	5357	5357	5357	5357
Sub-total		*29.40*	*105.00*		*14949*	*21194*	*26250*	*26250*	*26250*	*26250*	*26250*
Head office overhead (see note 2)		10.00	35.71		5000	7143	8929	8929	8929	8929	8929
Sub-total		*39.40*	*140.71*		*19700*	*28143*	*35179*	*35179*	*35179*	*35179*	*35179*
Royalty/ premium/ landowner benefits (see note 2)		7.28	26.00		3640	5200	6500	6500	6500	6500	6500
TOTAL COSTS BEFORE DEPRECIATION AND EXPORT TAX		46.68	166.71	68,000	23,340	33,343	41,679	41,679	41,679	41,679	41,679
NET CASH FLOW				**-68,000**	**6,285**	**8,979**	**11,223**	**11,223**	**11,223**	**11,223**	**11,223**
IRR				**1.15%**							

NOTES:

1. These cost items have been based on the FORTECH 1997 (Volume 3) using average costs for the 5 actual cost examples presented. Costs have been cross-checked against industry data collected and although small differences arise, the variations are not considered to be significant.
2. Costs have been updated using averaged industry data collected during the study.

MARGIN FOR PROFIT CALCULATION		*Log values*		
	IRR	*US$/m3*	*K/m3*	
a **Base case IRR**	1.15	**59.25**	**211.61**	Based on SGS ave. Sept 01 prices
b Price to get zero IRR	0.00	58.65	209.46	
c Price to get IRR	15.00	67.68	241.71	
d Price to get IRR	20.00	71.25	254.46	
e **Calculation of price/m3 to give 15% return (c-b)**		**9.03**	**32.25**	
f Calculation of price/m3 to give 20% return (d-b)		12.60	45.00	

To calculate indicative profitability of logging under the current Log Export Tax schedule, the average logging cost and export tax payable have been deducted from the fob value of logs. This analysis is shown in Table 4.3.

The analysis indicates that when average costs are applied, log exports are unprofitable for all price levels of logs. However the level of loss increases for lower value logs. Table 4.3 should be read in the context of considerable variability in costs as mentioned above. The obvious question to follow this analysis is however, why do logging companies continue operations when facing apparent loss making situations? Part of the answer lies in the separation of "sunk" costs from "cash ongoing costs". In the short term logging can continue, provided the "cash ongoing costs" are met. When depreciation and head office overheads are treated as "sunk" costs, the analysis shows that for logs with an fob value of greater than US$55 per cubic metre, logging companies can possibly justify continuing logging until equipment replacement is required. This also assumes that head office overheads can be transferred to other more profitable activities of an integrated company. This would not apply for a stand-alone logging company.

TABLE 4.3 CALCULATION ON INDICATIVE AVERAGE PROFITABILITY UNDER CURRENT LOG EXPORT TAX SYSTEM

FOB Log Value Conv. US$/Kina = 0.28		Approximate logging average cost (incl. royalties and related charges)[1]	Export tax based on current schedule	Calculated profit (loss) on log export	Depreciation & head office overheads	Calculated profit (loss) after removal of depreciation & head office overheads
US$ / m^3				Kina / m^3		
120	428.57	209.46	230.50	-	79.00	67.61
110	392.86	209.46	205.50	-	79.00	56.90
90	321.43	209.46	155.50	-	79.00	35.47
80	285.71	209.46	130.50	-	79.00	24.75
75	267.86	209.46	118.00	-	79.00	19.40
70	250.00	209.46	105.50	-	79.00	14.04
65	232.14	209.46	93.00	-	79.00	8.68
60	214.29	209.46	80.50	-	79.00	3.33
55	196.43	209.46	68.36	-	79.00	-
50	178.57	209.46	57.64	-	79.00	-
45	160.71	209.46	46.93	-	79.00	-
40	142.86	209.46	36.57	-	79.00	-

4.2 OUTLINE OF PROCESSING OPTIONS

The Terms of Reference for the Review Team require an analysis of processing options whose purpose is to examine the costs and benefits to Papua New Guinea, in particular through a comparison with log exporting. The models created serve as a basis for discussions and for calculations on multiplier effects and ultimately on the economic value of the whole forest resource.

4.2.1 Financial Models for Processing

For the purposes of the Review seven financial models have been constructed. The models are intended to cover a range of relevant domestic wood processing options that are either in existence or under consideration in Papua New Guinea. The seven cost benefit models developed are:

	Annual Log input m3
1. Re-locatable eco-mill	330
2. Small commercial mill ("Wood-Mizer")	2,000
3. Medium to large sawmill	63,000
4. Integrated sawmill/ precut housing/joinery workshop	10,000
5. Export veneer mill	150,000
6. Export plywood mill	150,000
7. Medium density fibreboard	175,000

The models have been constructed initially as generic financial models to provide a base for subsequent calculations of the income and employment multiplier effects. To maintain the confidentiality of data supplied by industry the financial models presented do not purport to replicate any specific identifiable processing operation. Instead the models have been prepared from a combination of sources, including the actual data obtained from industry, FORTECH 1997 analysis, and information held by the Review Team from PNG and other countries. All the models assume a level of efficiency slightly above average to that observed in practice in PNG, but below optimum, and attainable with sound management practices. Again, as was the case for the logging modelling, the processing models are generic efficient averages and cannot be directly applied as a reliable cost indicator of any single operation, as productivities, distances from markets, mix of species, distances to ship loading, age of equipment, overheads and other cost factors vary considerably from one operation to another.

The Review Team has not been requested to provide an exhaustive study of all processing options, but it is important to recall that Papua New Guinea has had a chipping facility operating out of Madang for many years. Although the logs are only partially processed for shipment (de-barking, chipping, and drying for pulpmill furnish), such processing is sufficient to secure exemption from the log export tax. In any case, the logs are supplied by the company's own plantations and this Review will recommend that, subject to certain conditions, plantation logs should be exempt from the log export tax. Since only one company is undertaking this operation, it would not be possible to create a generic industry-wide model as has been done for other forms of processing, so this form of processing has been excluded from the analysis.

As well as providing the input data for economic multiplier calculations, the financial models have been prepared on a project cash-flow basis, to allow the calculation of indicative pre-tax and pre-financing financial internal rates of return (FIRRs) to test project financial viability. The FIRRs are expressed in constant or real Kina currency terms. As a approximate guide, a minimum of a 15% pre-tax real FIRR would be necessary in PNG to cover project risk and attract equity and loan funds.

The models have been constructed assuming on average a 10-year life (except for the small eco-mill where a 5 year life is assumed) for processing equipment. A 10-year, life with normal maintenance costed into the model, is considered to be appropriate for PNG conditions, before substantial replacement capital expenditure would be required. Accordingly the cashflow modelling is terminated at 10 years with no residual values assumed.

The "base case" calculations for the seven processing models assume current log input costs based on market values being paid for log sales within PNG. Similarly the models assume current (September 2001) domestic and export prices. Export prices have been converted using the exchange rate applying at the end of September 2001 (K1.00 = US$0.28). Costs and prices have later then been sensitivity tested to provide estimates of the impact of changing market prices and cost scenarios.

The seven models are discussed in the ensuing sections.

1. A Relocatable Eco-mill

The financial model for this mill is detailed in Table 4.4.

This costing has been based on financial calculations published by WWF[1]. The costing does not include subsidisation of inputs currently provided by donors to set up, operate and obtain certification of mills. Also the life of the mill has been reduced from the 10 years estimated by WWF, to an average life 5 years based on the judgement of the Review Team on such mills in PNG conditions. For comparability purposes with the other processing models, 50% of the wages paid have been treated as relating to logging and removed from the "Government Revenue Foregone" calculation. The resulting financial costing shows an FIRR of 18%.

[1] WWF "A Future for our forests: Strategies for community-based forestry and conservation in Papua New Guinea" (2000)

TABLE 4.4 FINANCIAL MODEL 1 – A PORTABLE RELOCATABLE ECO-MILL (BASED ON A LEWIS MILL)

Financial Model 1 - A Portable Re-locatable Eco-mill (based on a Lewis Mill)

YEAR				Construct-ion Phase	1	2	3	4	5
					All Values in '000 K unless stated otherwise				
KEY OPERATING ASSUMPTIONS:									
Log Input Volume - m3					330	330	330	330	330
Species mix: predominantly Group 1									
Operating Level - % of capacity					70	70	70	70	70
Operating hours/ week					44	44	44	44	44
Recovery rate %					45	45	45	45	45
Local market sales %					100	100	100	100	100
Employees - # PNG				0	6	6	6	6	6
Employees - # Foreign				0	0	0	0	0	0
CAPITAL COSTS									
Machinery and equipment (100% assumed new)				51					
Buildings and site				0					
Working Capital (based on 30% year 1 Costs)				9					
REVENUE									
Sales volumes - m3 airdried, RS, mixed species					*149*	*149*	*149*	*149*	*149*
US$ Conversion	0.28	US$	K						
Foreign sales FOB/m3		0	0		0	0	0	0	0
Local sales ex mill/m3		92	330		49	49	49	49	49
Total Revenue					49	49	49	49	49
Average Revenue FOB/m3 of sales					*330*	*330*	*330*	*330*	*330*
OPERATING COSTS									
Log costs per unit of output -		US$/m3	K/m3						
Note only royalty and PDB		16	58		9	9	9	9	9
Salaries & Wages (PNG) - includes felling			84		12	12	12	12	12
Salaries & Wages (Foreign)					0	0	0	0	0
Operating Supplies	(% foreign 70%)		0		0	0	0	0	0
Repairs & mtnce materials	(% foreign 90%)		20		3	3	3	3	3
Fuel & oil			38		6	6	6	6	6
Total costs before depreciation				60	30	30	30	30	30
Average Cost per m3 of sales					*200*	*200*	*200*	*200*	*200*
ESTIMATED CASHFLOW BEFORE DEPRECIATION INTEREST AND CORPORATE TAX				**-60**	**19**	**19**	**19**	**19**	**19**
Indicative Internal rate of return (5yr cash flow)				*18%*					

GOVERNMENT REVENUE FOREGONE	*US$/m3*	*K/m3*					
Assumed FOB selling price of log input	47	168					
Assumed Export tax (per m3)that would be payable under current regime	14	51					
Assumed Export tax that would be payable under current regime assuming that 80% of logs are of export form (K mill)			0.014	0.014	0.014	0.014	0.014
Assumed # of directly employed milling PNG national employees			3	3	3	3	3
Calculated revenue foregone per directly employed PNG national under current revenue regime (K/year)			**4,507**	**4,507**	**4,507**	**4,507**	**4,507**

2. A Small Commercial Mill

The small commercial mill model is based upon the operation of a "Wood-Mizer" bandmill based within 100 km of Port Moresby or Lae, sawing high value species for export markets. Parcels of individual premium species (probably not more than 10 species) would be aggregated and sold into export markets. The most likely market would be Australia. The lower grade sawn timber resulting from such sawing, is assumed to be sold into the domestic market. Log input cost is based on logs purchased from logging companies, and available at export value less export tax payable, plus cartage to the urban based mill. The sawn timber is sold rough sawn and air-dried. The base case costing for this operation shows a 22% FIRR. The financial model for this mill is shown in Table 4.5.

TABLE 4.5 FINANCIAL MODEL 2 – A SMALL COMMERCIAL MILL (BASED ON A WOOD-MIZER MILL)

Financial Model 2 - A Small Commercial Mill (based on a Wood-Mizer Mill)							
YEAR				***Construct-ion Phase***	***1***	***2***	***3***	***4***	***5***
					All Values in '000 K unless stated otherwise				
KEY OPERATING ASSUMPTIONS:									
Log Input Volume - m3					1,500	2,000	2,000	2,000	2,000
Species mix: predominantly Group 1									
Operating Level - % of capacity					45	90	90	90	90
Operating hours/ week					35	40	40	40	40
Recovery rate %					35	40	40	40	40
Export market sales %					50	60	60	60	60
Employees - # PNG					14	14	14	14	14
Employees - # Foreign					1	1	1	1	1
CAPITAL COSTS									
Machinery and equipment (30% assumed new)				150					
Buildings and site				40					
Working Capital (based on 30% year 1 Costs)				147					
REVENUE									
Utilised and sold volumes - m3 air dried select species					*525*	*800*	*800*	*800*	*800*
US$ Conversion	0.28	US$	K						
Foreign sales FOB/m3		325	1161		305	557	557	557	557
Local sales - Pt Moresby & Lae		182	650		171	208	208	208	208
Total Revenue					475	765	765	765	765
Average Revenue FOB/m3 of sales (see Note 2)					*905*	*956*	*956*	*956*	*956*
OPERATING COSTS									
Log costs delivered at mill		US$	K/m3						
US$ Conversion	0.28	60	214		321	429	429	429	429
Salaries & Wages (PNG)					35	35	35	35	35
Salaries & Wages (Foreign)					30	30	30	30	30
Operating Supplies	(% foreign 70%)		5		3	4	4	4	4
Repairs & mntnce materials	(% foreign 90%)		10		5	8	8	8	8
Fuel & oil			2		1	2	2	2	2
Electricity			5		3	4	4	4	4
Packing/ local transport to export port			100		53	80	80	80	80
Other Factory Overhead Costs			25		13	20	20	20	20
Other General & Admin/Mktg Overhead Costs			50		26	40	40	40	40
Total costs before depreciation				337	490	651	651	651	651
Average Cost per m3 of sales					*933*	*814*	*814*	*814*	*814*
ESTIMATED CASHFLOW BEFORE DEPRECIATION INTEREST AND CORPORATE TAX				**-337**	**-15**	**114**	**114**	**114**	**114**
Indicative Internal rate of return (10 yr cash flow)				*22%*					

GOVERNMENT REVENUE FOREGONE	*US$/m3*	*K/m3*				
Assumed FOB selling price of log input	75	268				
Assumed Export tax (per m3)that would be payable under current regime	33	118				
Assumed Export tax that would be payable under current regime assuming that 80% of logs are of export form (K mill)			0.14	0.19	0.19	0.19	0.19
Assumed # of directly employed milling PNG national employees			14	14	14	14	14
Calculated revenue foregone per directly employed PNG national under current revenue regime (K/year)			**10,114**	**13,486**	**13,486**	**13,486**	**13,486**

3. A Medium to Large Sawmill

The financial model for this mill is presented in Table 4.6

TABLE 4.6 FINANCIAL MODEL 3 – A MEDIUM TO LARGE SAWMILL BASED ON HIGHER VALUE SPECIES

Financial Model 3 - A Medium to Large Sawmill Based on Higher Value Species							
YEAR			***Construct-ion Phase***	***1***	***2***	***3***	***4***	***5***
				All Values in '000 K unless stated otherwise				
KEY OPERATING ASSUMPTIONS:								
Log Input Volume - m3				21,000	42,000	63,000	63,000	63,000
Species mix: predominantly Group 1								
Operating Level - % of capacity				30	60	90	90	90
Operating hours/ week				44	44	44	44	44
Recovery rate %				40	42	45	45	45
Local market sales %				30	30	30	30	30
Employees - # PNG			50	200	250	300	300	300
Employees - # Foreign			20	30	25	20	20	20
CAPITAL COSTS								
Machinery and equipment (100% assumed new)			9,000					
Buildings and site			3,000					
Working Capital (based on 30% year 1 Costs)			1,704					
REVENUE								
Sales volumes - m3 airdried, RS, 10 prime species				*8,400*	*17,640*	*28,350*	*28,350*	*28,350*
US$ Conversion	0.28	US$	K					
Foreign sales FOB/m3		250	893	5,250	11,025	17,719	17,719	17,719
Local sales ex mill/m3		110	393	990	2,079	3,341	3,341	3,341
Total Revenue				6,240	13,104	21,060	21,060	21,060
Average Revenue FOB/m3 of sales				*743*	*743*	*743*	*743*	*743*
OPERATING COSTS								
Log costs		US$/m3	K/m3					
10 prime species		50	179	3750	7500	11250	11250	11250
Salaries & Wages (PNG)				294	564	851	851	851
Salaries & Wages (Foreign)				750	625	500	500	500
Operating Supplies	(% foreign 70%)		10	84	176	284	284	284
Repairs & mtnce materials (% foreign 90%)			30	200	500	851	851	851
Fuel & oil			20	105	221	354	354	354
Transfer to export port/ stevedoring			50	294	617	992	992	992
Other Factory Overhead Costs			12	101	212	340	340	340
Other General & Admin Overhead Costs			12	101	212	340	340	340
Total costs before depreciation			13,704	5,679	10,627	15,762	15,762	15,762
Average Cost per m3 of sales				*676*	*602*	*556*	*556*	*556*
ESTIMATED CASHFLOW BEFORE DEPRECIATION INTEREST AND CORPORATE TAX			**-13,704**	**561**	**2,477**	**5,298**	**5,298**	**5,298**
Indicative Internal rate of return (10yr cash flow)			*24%*					
GOVERNMENT REVENUE FOREGONE		*US$/m3*	*K/m3*					
Assumed FOB selling price of log input		75	268					
Assumed Export tax (per m3)that would be payable under current regime		33	118					
Assumed Export tax that would be payable under current regime assuming that 80% of logs are of export form (K mill)				2.0	4.0	5.9	5.9	5.9
Assumed # of directly employed PNG national employees				200	250	300	300	300
Calculated revenue foregone per directly employed PNG national employee (K/year)				**9,912**	**15,859**	**19,824**	**19,824**	**19,824**

This commercial mill model is based upon a much larger bandmill operation sited on one of the larger FMA areas. Again the mill would concentrate on sawing high value species for export markets. The lower grade sawn timber resulting from such sawing, is assumed to be sold into the domestic market. Logs are assumed to be transferred at export market value less the export tax saved. The sawn timber

is assumed to be sold rough sawn and air dried, or transferred to an urban based kiln drying and machining operation for later export. The base case costing for this operation shows a 24% FIRR, reflecting a low level of economy of scale over the small "Wood-Mizer" mill.

4. An Integrated Small Sawmill and Joinery Operation

The financial model for a small mill maximising added value processing is presented in Table 4.7.

TABLE 4.7 FINANCIAL MODEL 4 – AN INTEGRATED SMALL SAWMILL/JOINERY OPERATION

Financial Model 4 - An Integrated Small Sawmill/ Joinery Operation

YEAR				*Construct-ion Phase*	*1*	*2*	*3*	*4*	*5*
					All Values in '000 K unless stated otherwise				
KEY OPERATING ASSUMPTIONS:									
Log Input Volume - m3					5,000	10,000	10,000	10,000	10,000
Species mix: predominantly Group 1									
Operating Level - % of capacity					45	90	90	90	90
Operating hours/ week					45	70	70	70	70
Recovery rate %					45	50	50	50	50
Local market sales %					92	87	87	87	87
Employees - # PNG				25	80	145	145	145	145
Employees - # Foreign				10	3	3	3	3	3
CAPITAL COSTS									
Machinery and equipment (30% assumed new)				6,000					
Buildings and site				1,000					
Working Capital (based on 30% year 1 Costs)				457					
REVENUE									
Utilised and sold volumes - m3 kilndried select species					*2,250*	*5,000*	*5,000*	*5,000*	*5,000*
Foreign sales					200	720	720	720	720
Local sales ex mill					2,200	5,000	5,000	5,000	5,000
Total Revenue					2,400	5,720	5,720	5,720	5,720
Average Revenue FOB/m3 of sales (see Note 2)					*1067*	*1144*	*1144*	*1144*	*1144*
OPERATING COSTS									
Log costs delivered at mill		US$	K/m3						
US$ Conversion	0.28	45	161		804	1607	1607	1607	1607
Salaries & Wages (PNG)					216	435	435	435	435
Salaries & Wages (Foreign)					90	90	90	90	90
Operating Supplies	(% foreign 70%)		30		68	150	150	150	150
Repairs & mtnce materials (% foreign 90%)			30		68	150	150	150	150
Electricity					200	350	350	350	350
Other Factory Overhead Costs			15		34	75	75	75	75
Other General & Admin Overhead Costs			20		45	100	100	100	100
Total costs before depreciation				7,457	1,523	2,957	2,957	2,957	2,957
Average Cost per m3 of sales					*677*	*591*	*591*	*591*	*591*
ESTIMATED CASHFLOW BEFORE DEPRECIATION INTEREST AND CORPORATE TAX				**-7,457**	**877**	**2,763**	**2,763**	**2,763**	**2,763**
Indicative Internal rate of return (10 yr cash flow)				*28%*					

GOVERNMENT REVENUE FOREGONE	*US$/m3*	*K/m3*					
Assumed FOB selling price of log input	47	168					
Assumed Export tax (per m3)that would be payable under current regime	14	51.21					
Assumed Export tax that would be payable under current regime assuming that 80% of logs are of export form (K mill)			0.20	0.41	0.41	0.41	0.41
Assumed # of directly employed milling PNG national employees			80	145	145	145	145
Calculated revenue foregone per directly employed PNG national under current revenue regime (K/year)			**2,561**	**2,826**	**2,826**	**2,826**	**2,826**

This mill model would be based in Port Moresby or Lae, and modelled on one of several similar smaller tightly managed operations in PNG. It is assumed to saw predominantly Group 1 species, but also saw a small volume of lower group species for utility timber. A timber treatment (dip diffusion),

pre-cut housing, joinery, and furniture manufacturing operation are assumed to be included on the same site as the sawmill. It is assumed a small volume of furniture componentry is exported. 40% of sawmill output is utilised in added value processing activities. The mill is assumed to buy logs on the open market. Logs are purchased at approximately export market value less the export tax saved, plus cartage. The base case costing for this operation shows a 28% FIRR, reflecting a well managed added value operation servicing the domestic market.

5. A Large Export Orientated Veneer Mill

This fifth option is based on a rural based large rotary veneer mill, producing sufficient output to transfer directly to export charter vessels without the need to transfer veneer to a provincial export wharf. The operation is based on two (or three if older equipment is installed) veneer peeling and drying lines operating 24 hours a day. Log input is presumed to be predominantly Group 1 & 2 species for face/back veneers, and Groups 3 & 4 for core veneer. Logs are transferred at approximately export market value less the export tax saved and other costs saved.

The market for rotary veneer is largely for the production of plywood in Asian markets (mainly Korea, Japan, Taiwan & China). Production and the competitiveness of plywood in these markets have been heavily influenced by the over-supply of plywood from Indonesia (and to a lesser extent Malaysia) in recent years. In addition, to reduce cost, thicker plywood in Asian markets is increasingly being made from a combination of cheaper softwood veneers (usually from plantation grown logs) for core, with the more expensive natural forest hardwood veneers being reserved for face/ backs. Accordingly the international market prices for veneer have been driven down to levels over the last 5 years, which allow only the most efficient low cost producers to survive. The future market prospects for veneer will continue to be closely linked to Indonesia's plywood production levels and the increasing supply of plantation grown softwood logs.

The base case costing (Table 4.8) for a veneer mill of 150,000m^3 per year log input, shows an 8% FIRR. This level of return is insufficient to attract open market finance. It would not under current market conditions provide an adequate return for the replacement of fixed assets over a 10-year life.

TABLE 4.8 FINANCIAL MODEL 5 – A LARGE EXPORT ORIENTATED VENEER MILL

Financial Model 5 - A Large Export Orientated Veneer Mill

YEAR				*Construct-ion Phase*	*1*	*2*	*3*	*4*	*5*
					All Values in '000 K unless stated otherwise				
KEY OPERATING ASSUMPTIONS:									
Log Input Volume - m3					50,000	100,000	150,000	150,000	150,000
Species mix: predominantly Group 3 & 4									
Operating Level - % of capacity					30	60	90	90	90
Operating hours/ week					120	140	140	140	140
Recovery rate %					35	40	45	45	45
Face/Back %					20	25	35	35	35
Core Veneer %					80	75	65	65	65
Local market sales %					Nil	Nil	Nil	Nil	Nil
Employees - # PNG				250	300	400	500	500	500
Employees - # Foreign				80	80	60	50	50	50
CAPITAL COSTS									
Machinery and equipment (90% assumed new)				65,000					
Buildings and site				8,000					
Working Capital (based on 30% year 1 Costs)				3,512					
REVENUE									
Sales volumes - dried veneer - m3					*17,500*	*40,000*	*67,500*	*67,500*	*67,500*
US$ Conversion	0.28	US$	K						
Face/backs Ave.Price/m3FOB		260	929		3,250	9,286	21,938	21,938	21,938
Core Ave.Price/m3FOB		150	536		7,500	16,071	23,504	23,504	23,504
Total Revenue					10,750	25,357	45,442	45,442	45,442
Average Revenue FOB/m3 of sales					*614*	*634*	*673*	*673*	*673*
OPERATING COSTS									
Log costs at mill		US$/m3	K/m3						
85% groups 3 & 4		36	129		6429	12857	19286	19286	19286
Salaries & Wages (PNG)					1014	1352	1690	1690	1690
Salaries & Wages (Foreign)					2000	1500	1250	1250	1250
Operating Supplies	(% foreign 70%)		20		350	800	1350	1350	1350
Repairs & maintenance materials	(% foreign 90%)				200	500	3000	3000	3000
Fuel & oil					600	1100	1500	1500	1500
Transfer to export port/ stevedoring			20		350	800	1350	1350	1350
Other Factory Overhead Costs			15		263	600	1013	1013	1013
Other General & Admin Overhead Costs					500	500	500	500	500
Total costs before depreciation				76,512	11,705	20,009	30,938	30,938	30,938
Average Cost per m3 of sales					*669*	*500*	*458*	*458*	*458*
ESTIMATED CASHFLOW BEFORE DEPRECIATION INTEREST AND CORPORATE TAX				**-76,512**	**-955**	**5,348**	**14,504**	**14,504**	**14,504**
Indicative Internal rate of return (10yr cash flow)				*8%*					

GOVERNMENT REVENUE FOREGONE	*US$/m3*	*K/m3*					
Assumed FOB selling price of log input	47	168					
Assumed Export tax (per m3)that would be payable under current regime	14	51					
Assumed Export tax that would be payable under current regime assuming that 85% of logs are of export form (K mill)			2.2	4.4	6.5	6.5	6.5
Assumed # of directly employed PNG national employees			300	400	500	500	500
Calculated revenue foregone per directly employed PNG national under current revenue regime (K/year)			**7,255**	**10,883**	**13,060**	**13,060**	**13,060**

NOTES:

1. Assumes a rural based rotary veneer mill with transfer of output direct for export in charter vessels.
2. The operation is assumed to concentrate on predominantly Group 1 and Group 2 species for face and Groups 3 & 4 for backs and core material.

TABLE 4.9 FINANCIAL MODEL 6 – A LARGE EXPORT PLYWOOD MILL

Financial Model 6 - A Large Export Plywood Mill

YEAR				Construct-ion Phase	1	2	3	4	5
					All Values in '000 K unless stated otherwise				
KEY OPERATING ASSUMPTIONS:									
Log Input Volume - m3					50,000	100,000	150,000	150,000	150,000
Species mix: predominantly Group 3 & 4									
Operating Level - % of capacity					30	60	90	90	90
Operating hours/ week					120	140	140	140	140
Recovery rate %					40	45	50	50	50
Local market sales %					20	20	20	20	20
Employees - # PNG				300	350	500	625	625	625
Employees - # Foreign				100	120	75	60	60	60
CAPITAL COSTS									
Machinery and equipment (90% assumed new)				80,000					
Buildings and site				10,000					
Working Capital (based on 30% year 1 Costs)				4,521					
REVENUE									
Sales volumes - m3					*20,000*	*45,000*	*75,000*	*75,000*	*75,000*
US$ Conversion	0.28	US$	K						
Export 6mm+ BB/CC Gde/m3FOI		180	643		10,286	23,143	38,571	38,571	38,571
Local sales 6mm+		220	786		3,143	7,071	11,786	11,786	11,786
Total Revenue					13,429	30,214	50,357	50,357	50,357
Average Revenue FOB/m3 of sales					*671*	*671*	*671*	*671*	*671*
OPERATING COSTS									
Log costs at mill		US$/m3	K/m3						
85% groups 3 & 4		36	129		6429	12857	19286	19286	19286
Salaries & Wages (PNG)					1183	1690	2113	2113	2113
Salaries & Wages (Foreign)					3000	1875	1500	1500	1500
Operating Supplies	(% foreign 90%)		110		2200	4950	8250	8250	8250
Repairs & maintenance materials	(% foreign 90%)				250	625	4000	4000	4000
Fuel & oil			35		700	1575	2625	2625	2625
Transfer to export port/ stevedoring			20		400	900	1500	1500	1500
Other Factory Overhead Costs			18		360	810	1350	1350	1350
Other General & Admin Overhead Costs					550	550	550	550	550
Total costs before depreciation				94,521	15,072	25,832	41,173	41,173	41,173
Average Cost per m3 of sales					*754*	*574*	*549*	*549*	*549*
ESTIMATED CASHFLOW BEFORE DEPRECIATION INTEREST AND CORPORATE TAX				**-94,521**	**-1,643**	**4,382**	**9,184**	**9,184**	**9,184**
Indicative Internal rate of return (10yr cash flow)				*-3%*					
GOVERNMENT REVENUE FOREGONE		*US$/m3*	*K/m3*						
Assumed FOB selling price of log input		47	168						
Assumed Export tax (per m3)that would be payable under current regime		14	51						
Assumed Export tax that would be payable under current regime assuming that 85% of logs are of export form (K mill)					2.2	4.4	6.5	6.5	6.5
Assumed # of directly employed PNG national employees					350	500	625	625	625
Calculated revenue foregone per directly employed PNG national under current revenue regime (K/year)					**6,219**	**8,706**	**10,448**	**10,448**	**10,448**

NOTES:

1. Assumes a rural based mill with transfer of output direct for export in charter vessels.
2. The operation is assumed to concentrate on predominantly Group 1 and Group 2 species for face and Groups 3 & 4 for backs and core material.
3. The very competitive current market situation caused by oversupply of plywood from Indonesia and Malaysia, has a major influence on profitability

6. A Large Export Plywood Mill

This sixth option is based upon an extension of the fifth option into a PNG based integrated veneer and plywood production mill, rather than exporting the veneer to be made up into plywood offshore. Again the mill is assumed to be producing sufficient output to transfer directly to export charter vessels without the need to transfer plywood to a provincial export wharf. As explained above for veneer, the market for plywood has been heavily influenced by the over-supply of plywood from Indonesia (and to a lesser extent Malaysia) in recent years. Plywood made from tropical hardwoods sourced from "south sea logs" has to compete directly with Indonesia's log cost, labour cost and productivities. The only alternative for higher cost producers to compete, has been to incorporate high technology peeling, clipping, veneer handling, glue spreading and pressing techniques that would be unattractive in PNG because of the high level of higher cost foreign technical staff that would be required to maintain such equipment in rural areas. Accordingly the costing (Table 35) is based on more conventional older technology.

The model assumes that a small volume (20% of output) of lower grade plywood would be sold in the domestic market. The base case costing for the plywood mill of 150,000m3/ year log input, shows a negative FIRR. This is largely attributable to the current over capacity of production in the region and PNG's relatively high cost structure.

7. A Medium Density Fibreboard Mill

Medium density fibreboard (MDF) was first introduced into North America in the 1970's. Production commenced in New Zealand in 1980 and during the 1980's spread to Europe, Latin America. Most recently, during the 1990's production has spread through Asia with Malaysia and Indonesia becoming major exporters.

MDF is one of the fastest growing segments of the international wood products market. Growth in demand during the 1990's averaged 10%/year. MDF is slowly replacing solid wood, particle-board, plywood and block-board in many building interior joinery and furniture end use applications. Worldwide production during the mid 1990's however exceeded demand, and profitability of MDF manufacture has suffered since.

The source of wood for MDF manufacture is important, and for export production a single species, light coloured and relatively low density wood source is preferred. MDF would therefore need to source wood from either short rotation fast grown hardwoods (most likely eucalyptus or acacia), or from the residues of sawing or peeling a very restricted mix of species of plantation timbers. A net stocked plantation area of approximately 12,000 ha. (assuming an average annual growth increment of 15m3/ha/year) of predominantly one species would be required.

The production of MDF is a technology intensive rather than labour intensive process, with highly automated computer controlled fibre production, glue mixing, forming and pressing processes. The supply of resins and energy are the main manufacturing costs after the wood cost.

The FIRR model (Table 4.10) assumes that a small volume (10% of output) of MDF would be sold in the domestic market. The base case costing for a mill of 175,000m3/ year log input, (small by international standards) shows a negative FIRR. This is largely attributable to the current over capacity of production in the region and PNG's relatively high cost structure for energy, imported resin and foreign technical staff.

A Pulp Mill

The Review terms of reference require that a processing model for wood pulp be considered. The design of pulp mills has changed significantly over the 1980's and 1990's. Mill sizes worldwide have more than doubled during these twenty years, from an average size new mill in the 1980's of 250,000

tonnes/year of output to new mills at year 2000 having a minimum capacity of around 600,000 tonnes/year to be competitive. A 600,000 t/year mill would require a log input level of 2.8 to 3.0 million m3/year of predominantly one specie – more than PNG's total annual cut of all species. A plantation forest of approximately 200,000 ha. of stocked area, in one location, would be required to support an internationally cost competitive new stand-alone pulp mill.

The main reasons for such large capacities to remain competitive, are in the technologies applying to cooking of wood fibres, bleaching and waste fibre recovery. Pulp mills have also increased in automation with reduced personnel.

TABLE 4.10 FINANCIAL MODEL 7 – A MEDIUM DENSITY FIBREBOARD MILL

Financial Model 7 - A Medium Density Fibreboard Mill								
YEAR				***Construct-ion Phase***	***1***	***2***	***3***	***4***	***5***
					All Values in '000 K unless stated otherwise				
KEY OPERATING ASSUMPTIONS:									
Log Input Volume -single line - m3					97,000	175,000	175,000	175,000	175,000
Species mix: plantation grown eucalyptus/acacia									
Operating Level - % of capacity					50	90	90	90	90
Operating hours/ week					140	168	168	168	168
Recovery rate %					50	57	57	57	57
Local market sales %					10	10	10	10	10
Employees - # PNG				200	100	130	130	130	130
Employees - # Foreign				400	100	70	70	70	70
CAPITAL COSTS									
Machinery and equipment - all new				240,000					
Buildings and site				15,000					
Working Capital (based on 30% year 1 Costs)				8,939					
REVENUE (see note 4)									
Sales volumes - m3					*57,059*	*109,375*	*109,375*	*109,375*	*109,375*
US$ Conversion	0.28	US$	K						
Export grade 12 - 21mm/m3 FOB		180	643		28,061	57,713	57,713	57,713	57,713
Local sales		210	750		3,638	7,481	7,481	7,481	7,481
Total Revenue					31,698	65,194	65,194	65,194	65,194
Average Revenue FOB/m3 of sales					*556*	*596*	*596*	*596*	*596*
OPERATING COSTS									
Log costs at mill		US$/m3	K/m3						
Plantation eucalyptus/acacia		25	89		8661	15625	15625	15625	15625
Salaries & Wages (PNG)					500	650	650	650	650
Salaries & Wages (Foreign)					3000	2100	2100	2100	2100
Operating Supplies	(% foreign 90%)		140		8787	15313	15313	15313	15313
Repairs & maintenance materials	(% foreign 90%)				250	4375	4000	4000	4000
Fuel, oil, electricity			90		5649	9844	9844	9844	9844
Packing materials			12		753	1313	1313	1313	1313
Transfer to export port/ stevedoring			10		628	1094	1094	1094	1094
Other Factory Overhead Costs			10		628	1094	1094	1094	1094
Other General & Admin Overhead Costs			15		941	1641	1641	1641	1641
Total costs before depreciation				263,939	29,797	53,047	52,672	52,672	52,672
Average Cost per m3 of sales					*522*	*485*	*482*	*482*	*482*
ESTIMATED CASHFLOW BEFORE DEPRECIATION INTEREST AND CORPORATE TAX				**-263,939**	**1,902**	**12,147**	**12,522**	**12,522**	**12,522**
Indicative Internal rate of return (10yr cash flow)				*Negative*					
GOVERNMENT REVENUE FOREGONE		*US$/m3*	*K/m3*						
Assumed FOB selling price of log input		25	89						
Assumed Export tax (per m3)that would be payable under current regime		4	13						
Assumed Export tax that would be payable under current revenue regime (K'millions) (see note 3)					1.3	2.3	2.3	2.3	2.3
Assumed # of directly employed PNG national employees					100	130	130	130	130
Calculated revenue foregone per directly employed PNG national under current revenue regime (K/year)					**12,991**	**18,029**	**18,029**	**18,029**	**18,029**

Smaller older technology pulp mills are still operating around the world, and can be purchased second-hand and conceivably relocated to PNG. Such mills would invariably have high operational costs, poor environmental safeguards, provide a lower return to wood growers and need a high level of Government subsidy to export.

4.2.2 Sensitivity Analysis on Base Case Financial Models

Sensitivity analysis has been undertaken on the seven generic financial models. This analysis is presented in Table 4.11. The analysis includes changing the market price, wood input cost and total costs of production.

TABLE 4.11 SENSITIVITY ANALYSIS – IMPACT ON FINANCIAL VIABILITY BY CHANGING KEY VARIABLES

Sensitivity Analysis: Impact on Financial Viability By Changing Key Variables							
	Processing Options						
	1	***2***	***3***	***4***	***5***	***6***	***7***
	Portable/ Relocatable Eco-mill	***Relocatable Wood-Mizer Sawmill***	***Medium/ Large Sawmill***	***Integrated Sawmill/ Precut Housing/ Joinery***	***Export Veneer Mill***	***Export Plywood Mill***	***Medium Density Fibreboard***
Sensitivity Tests Undertaken	***Financial Internal Rate of Return (FIRR) Percentage (%)***						
Base Case FIRR	**18**	**22**	**24**	**28**	**8**	**Negative**	**Negative**
Increase sales revenue by 5%	24	32	29	32	11	1	Negative
Increase sales revenue by 10%	29	41	34	35	13	4	Negative
Decrease sales revenue by 5%	13	11	19	25	4	Negative	Negative
Decrease sales revenue by 10%	6	Negative	12	22	1	Negative	Negative
Increase log cost by 10%	16	9	18	26	5	Negative	Negative
Decrease log cost by 10%	21	35	30	30	10	Negative	Negative
Increase operating cost by 5%	14	12	20	27	5	Negative	Negative
Increase operating cost by 10%	10	1	15	25	3	Negative	Negative
Decrease operating cost by 5%	21	32	29	30	10	0	Negative
Decrease operating cost by 10%	27	41	33	32	12	3	Negative
Increase investment cost by 10%	14	20	22	26	6	Negative	Negative
Decrease investment cost by 10%	23	25	27	32	10	Negative	Negative
Base Case Input Log Cost US$/m3	16	60	50	45	36	36	25
Input log cost to achieve a 15% FIRR US$/m3	19	64	57	73	25	10	-45
Difference: Indicative "Extra Ability to Pay" From Processing Option - US$/m3	3	4	7	28	-11	-26	Nil

In summary the analysis indicates that:

- The four saw milling options show higher profitability under all tests than the three board product options;
- The small integrated sawmill/added value processing operation remained the most profitable under all tests;
- The larger saw milling option under option 3, is less sensitive to small changes in market prices for sawn timber and log input prices than smaller mills;
- The export veneer mill FIRR remains positive, but financially unattractive under all sensitivity scenarios modelled;
- The export plywood mill FIRR changes from negative only under the 4 most optimistic sensitivity scenarios;
- The MDF FIRR is negative under all sensitivity scenarios modelled, and is unlikely to be an option for PNG.

When the log input cost is tested, to provide a 15% FIRR, all four saw milling options can afford to pay marginally higher log prices. This calculation of "wood paying capability" indicates that none of the board manufacturing options can afford to pay current log prices, yet alone any increase in wood cost.

4.2.3 Government Revenue Foregone Through Processing of Logs

As an initial indicator of the support level provided by Government for wood processing in PNG, a calculation of revenue foregone for each PNG national salary or wage position established has been estimated. The calculation is based on the current log export tax schedule. The analysis for each model is shown on the bottom of each of the Tables 4.4 to Table 4.10 and summarised in Table 4.12.

TABLE 4.12 ESTIMATE OF REVENUE FOREGONE BY GOVERNMENT FOR EACH PNG NATIONAL EMPLOYEE - POSITION CREATED IN PROCESSING

Processing Model	Total Revenue Foregone Per Million Kina millions per year [1/]	Number of Employees Per Mill #	Estimate of Revenue Foregone per PNG Employee per year Kina/Year
Re-locatable eco-mill	0.014	3	4,507
Small commercial mill	0.190	14	13,486
Medium to large sawmill	5.900	300	19,824
Integrated sawmill/ added value	0.410	145	2,826
Export veneer mill	6.500	500	13,060
Plywood	6.500	625	13,060
MDF [2/]	2.300	130	18,029

Notes: 1/ Based on current Export Log schedule

2/ Calculated assuming Log Export Tax is payable on plantation logs. Under recommendations currently before Government, it is proposed that Export Taxes on plantation grown logs should be removed.

4.3 INTERNATIONAL COMPETITIVENESS ISSUES RELATING TO PROCESSING IN PNG

It is appropriate to briefly examine selected issues relating to international competitiveness and the future prospects for processing in PNG. The principal issues included are:

- Key issues affecting the past profitability of processing in PNG;
- International competitiveness issues likely to influence future viability;
- Comments on the recent decisions by the private sector to install export veneer mills.

In 1989 approximately 500,000 m^3 or one third of the annual log harvest (excluding wood chips) was being processed domestically. By the year 2000, our estimate is that domestic processing had increased to 600,000m^3 representing approximately 23% of total log harvest. The preference or implicit subsidy to domestic processors, when compared to log exporters under the current forest revenue system, through the exemption of export taxes on logs processed domestically, has not resulted in a major expansion of processing.

A considerable amount has been written in the past, on the constraints influencing forest industries development. In summary the key issues are seen as:

- High labour cost and low labour productivity factors when compared with other tropical forest product exporting countries in the South East Asian region. This includes the high cost and heavy reliance upon expatriate technical staff;
- High cost and relatively ineffectual management (reflected particularly in the low conversion rates);
- High internal and external freight costs associated with both supplying the main urban centres in the domestic market and for exporting;
- High overhead costs affected by the remoteness, security, secondary support services and managing landowner liaison in PNG. This inflates both capital and operating costs;
- High energy costs affecting those operations that are not utilising waste wood for process heat and/or electricity generation;
- The nature and occurrence of the forest resource in PNG makes it difficult for any individual operator to process and supply significant volumes of the major market species. This is in direct contrast to the relatively homogeneous dipterocarp forests of Malaysia and Indonesia;
- Uncertainty and risk associated with resource security and the high incidence of landowner disruptions;
- The small domestic market. Generally when processing natural forest wood products for export a strong domestic market is important to utilise non-exportable lower grade and residue outputs;
- Difficulties in competing with other South East Asian producers (particularly Indonesia) where illegally logged resource, fed to producers at lower prices, enhance the competitiveness of their products sold in international markets;
- Reluctance, because of the perceived low returns and high risks, to invest in new technology.

The important question is whether these factors, and in turn, the international competitiveness of PNG's wood processing sector, are likely to improve in the future. The conclusions reached are:

- Labour cost has decreased significantly in real terms over the past 5 years as a result of kina devaluation. A continuation of this trend will not however in itself have a major impact on competitiveness, as the labour cost in a typical medium to large saw milling operation in PNG is currently around 5% of operating costs before depreciation and financing charges. An improvement in productivity and skill levels (through an increased investment in training) particularly to reduce the need for foreign supervisors and technicians, would appear to have a larger operating cost saving. Such improvements are likely in the PNG context to be of a medium to long term in nature;
- Freight, overhead/ energy costs and the small domestic market are unlikely to change significantly relative to competitors in the medium term;
- The future composition and commercial attractiveness of the PNG forest resource is likely to be relatively neutral in terms of competitiveness. On one hand the continuity of PNG's resource will work in its favour relative to the fast depleting log producers such as the Solomon Islands, Sabah and western regions of Indonesia. On the other hand, the remaining PNG resource will increasingly be in regions with lower forest stockings, higher costs and a less attractive commercial mix of species;
- The competitiveness difficulties and market uncertainty created by illegal logging were discussed in section 2.3.4. There is currently considerable international donor and NGO effort to try and improve forest governance in the most countries where illegal logging is a serious issue. However it is still very difficult to estimate <u>when</u> the problem will reduce, and at least in the short term it likely to continue to undermine the competitiveness of PNG's timber products.

In the light of the above, the recent decision by the private sector to install a large export veneer mill in the Western Province, plus the further planned mills in the East Sepik and Sandaun provinces warrants further analysis and comment. The processing cost benefit models developed as part of this Review would indicate that export veneer mills based on current market conditions are financially unattractive. The rationale for these export veneer mills is most likely to be principally associated with the following factors:

- The Panakawa mill was planned and committed during a period when export veneer prices were approximately 30% higher;
- Despite considerable publicity, the mills in the East Sepik and Sandaun provinces have not yet been irrevocably committed. Given current market conditions further delays in the final commitment are likely.

The combination of a forest with a poor species mix (a high percentage of low value group 3 and group 4 species), a weakening market for lower value export logs, and a weakening kina (ie. the weakening Kina increases the impact of the log export tax particularly on low value species through fixed logging costs and an increased percentage of FOB value payable in tax) places concessionaires with such forests in a dilemma. Either they can increasingly "high value/ reduce volume" log, with the resulting increase in average logging costs, or they can try and find an outlet at marginal cost for the lower value logs. Provided this marginal cost for transferring these logs is higher than the net log export value of such low value logs, the outcome will increase overall profit.

- Veneer production (particularly core veneer) is able to utilise a number of low value "white" non-durable hardwood species (plus short/certain defect logs of other species) that are not suitable for export. The Panakawa mill estimated that 15% of logs utilised are in this category. This again improves log recovery per hectare and lowers the average cost of logging;
- The construction of a large utilisation facility increases the political leverage for future resource allocations of neighbouring forest areas to the incumbent concessionaire;

- The whole enterprise, resource rights plus processing facilities, may be "packaged" and "positioned" in the market so that it may later be sold *in* toto as a going concern when market conditions improve. The presence of the veneer mill will increase the overall capitalisation of the resource if there is a small change in market prices;
- A large scale veneer processing facility largely overcomes the freight cost disadvantages of rural based facilities in PNG, as the output is shipped in large consignments utilising direct shipping charter vessels. Sawn timber exports by comparison, are normally transhipped to Port Moresby or Lae for export in smaller consignments on regular scheduled ships.

PART 5 RESOURCE RENT

5.1 INTRODUCTION

Resource rent is an economic term that explains the economic value of a resource. Within the forest industry resource rent is commonly defined as the difference between the sales value of the commercially attractive logs within a forest and the cost of logging. These logging costs are broadly defined to include both operating and capital costs. The capital cost is in turn calculated to include an appropriate return to the logger on their investment, being the normal rate of return earned in the economy adjusted for the risk specific to the logging sector. The resource rent so defined is also called the stumpage value or an above-normal or excess profit.

In broad terms resource rent can arise from the scarcity of a product or the quality of one resource relative to other resources. A scare timber product can command a price above the cost of harvesting if demand is sufficiently high. And a resource that has a lower harvesting cost than the marginal resource (being the highest cost resource harvested) will also earn a resource rent.

A key point from this simple definition of resource rent is that there is no resource rent when the sales price equals the cost of logging. When the sales price equals the cost of logging, the logger has an incentive to log. After all they recover all their costs. However the logger could not afford to pay anything for the timber logged. Any such payment would reduce profits below a normal level. This would see potential entrants stay away from the industry and existing loggers leave the sector over time and invest their funds elsewhere in the economy (where they can earn the normal rate of return).

The resource owner can only charge for the logs and ensure logging over the long term when there is resource rent. That is, over the long term the resource owner can only charge when the sales price exceeds the cost of logging. The level of resource rent can be thought of as setting the upper limit on the charge or price set by the resource owner as the price charged by the owner cannot exceed the level of resource rent if logging is to continue over the long term. If the price exceeds the level of resource rent the profits of the logger will be reduced below a normal level and logging will either decline or not take place at all.

If the resource owner set a price for timber less than the resource rent, the logger would earn more than a normal rate of return (as provided for in the calculated cost of logging). In a simple model the logger only needs a normal rate of return to be attracted to the industry, so the resource owner would be giving away too much.

Resource rent is a concept that attracts attention because it provides a guide as to the level of charges that should be paid by logging companies.[2] This section provides estimates of the level of resource rent earned in the industry and how this rent has been distributed over time. These estimates provide a precursor to a discussion of an appropriate distribution of rent and means for distributing that rent to land owners, logging companies and government.

Subsequent sections of this report extend the above simple explanation of resource rent. In particular, later sections explain why the economic value of a forest resource is broader than just its financial value as defined above. Recognition of the non-financial values of a forest means that a deeper analysis is required, and a broader range of considerations comes into play.

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[2] The resource rent concept has figured prominently in the previous reports on the forest revenue system. See for example Shedden Agribusiness (1991, p 49-93), Fortech (1998b), General Woods and Veneers Consultants International, Nawitka Resource Consultants (1994, pp 5-8) and Levantis and Livernois (1998). Hyde and Sedjo (1992) and Vincent (1990) also provide a good discussion of the resource rent concept as applied in forestry.

5.2 THE FOREST REVENUE SYSTEM AND RESOURCE RENT

The forest revenue system has two important roles. The most obvious role is the distribution of the revenue from logging. A second important role is the encouragement of the desired rate and form of logging. A revenue system can be used to send signals to landowners and government about how the sector should be evolving over time in response to external market factors and the changing needs of the nation. A revenue system can be used as a force for efficiency and positive change by, for example, discouraging logging of areas where the true, full cost to the community of logging is very high (such as in fragile habitats with high conservation value).

The resource rent concept can be used to develop an understanding of how well the revenue system performs these roles.

If charges are too low, loggers will have an incentive to over exploit the resource. Whether they are able to do so will depend on the constraints imposed by the regulatory regime of the Papua New Guinea Forest Authority. For some time the maximum level of logging allowed under timber permits etc has exceeded the sustainable level. This suggests that if the forest revenue system had provided too much rent to logging companies, there would have been over-logging.

Ideally taxes and charges should be levied in such a way as to ensure all commercial trees are logged (subject to all non-financial costs of logging being met). If for example a tax were set at K10 per cubic metre, logging companies would tend to leave unlogged trees with a resource rent of less than K10 per cubic metre (i.e. any log with a price K10 per cubic metre above the logging cost). This is because, once the logging companies pay the tax, they would be unable to cover all their costs. In practical terms this would tend to mean some otherwise commercially viable forest areas would remain unlogged or see certain species or quality of trees left standing after an area has been logged. For the commercial value of the forest to be maximised, taxes and charges on each tree should be no more than the level of resource rent available from that tree.

There is an important caveat on this conclusion. A forest has alternative uses and values over and above the commercial value of the timber. As logging reduces the value of a forest (e.g. as a source of food), charges should be high enough to at least compensate for the lost alternative uses and environmental values. If not, the resource is under-valued and too much logging will take place.

The forest revenue system distributes the return from logging amongst landowners, government and logging companies. Within Papua New Guinea landowners receive most of their logging revenue via royalties and the landowners premium. In most cases logging companies also make a payment in the form of infrastructure development. The National Government receives its revenue via the export duty, company taxes and a number of smaller levies. In some cases Provincial Governments receive a small levy to help fund infrastructure. Logging companies receive that share of the resource rent left over after these payments are made to the government and landowners.

In considering the distribution of the resource rent, our focus is on the largest revenue items being export duties, landowner royalties, the landowner premium and the residual left for logging companies.

The interpretation of the export duty as a means of distributing resource rent has important implications. The international ‘norm’ is that export duties are generally seen as undesirable as they constitute a tax on business activity and reduce the international competitiveness of an economy. They are inconsistent with the direction of tax reform in Papua New Guinea which has recently seen the reduction of tariffs and the introduction of the VAT to increase the economic efficiency of the tax

system by reducing taxes on business activity and placing more reliance on taxes on consumption.[3] But the export duty on the forest sector is a special case as it is a tax on the resource rent of the sector and such a tax is justifiable from an economic perspective.[4] This review interprets the export duty in these terms.[5]

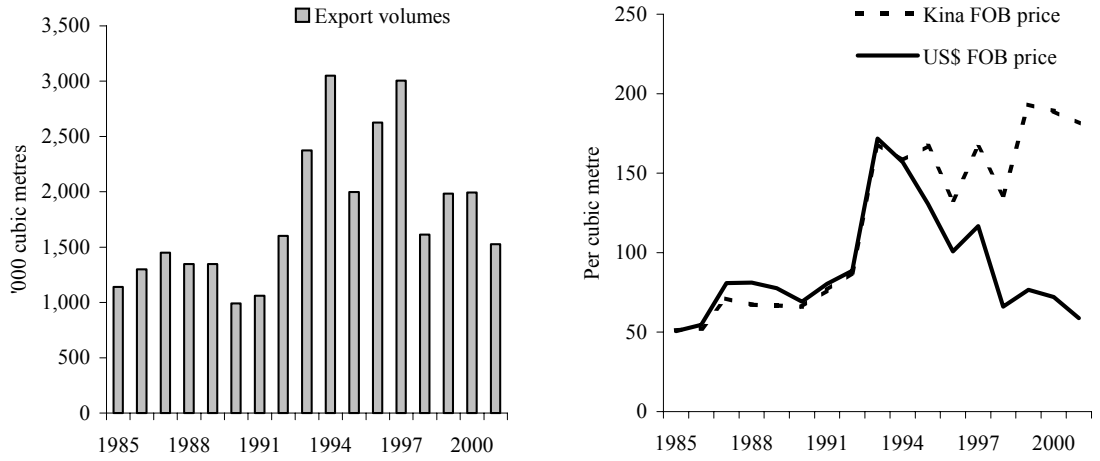
5.3 THE RESOURCE RENT ON LOG EXPORTS (IN THE ABSENCE OF TRANSFER PRICING)

This section presents estimates of the level of resource rent generated by the logging sector and the distribution of that rent assuming there is no transfer pricing. The potential effects of allowing for the presence of transfer pricing are considered in the summary of the Review's main findings at the end of the Report.

The 1990s saw a very large rise in the US$ price of logs during 1993. US$ prices remained high over much of 1994 but then eased substantially by 1998, returning to the levels seen before 1993 (see Figure 5.1). The fall in the value of the kina since 1994 has seen kina prices remain very high despite the fall in the US$ price.

The large rise in the US$ price helped trigger a surge in log exports. Log exports rose to 3 million m^3 in 1994, more than twice the typical level seen over the previous ten years. Log exports trended down over the second half of 1990s, but nonetheless remained high relative to their historical levels. The most recent data suggest that industry activity has softened over 2001. Log exports in the nine months to September 2001 were 1,145,000 m^3 compared to 1,440,000 m^3 in the same period of the previous year.

FIGURE 5.1 PAPUA NEW GUINEA LOG EXPORT VOLUMES AND AVERAGE PRICES



[3] See Bogan et al (2000), World Bank (1999) and Economic Insights (1999) for an overview of recent tax reforms.

[4] General Woods and Veneers Consultants International and Nawitka Resource Consultants (1994 p.16) argue that the export tax has the effect of reducing the domestic price of logs by the amount of the tax (because the logger is prepared to sell at a price found as the export price less the tax). In this way they argue that the export tax provides a subsidy to the local timber market and consequently is inefficient in an economic sense. This argument requires the local timber market to be part of the world timber market such that the world price (adjusted for the tax and transport costs) sets the local price of timber. For reasons developed later, the Review Team do not see this as the case and argue that the local price of timber is primarily determined by factors other than demand and supply conditions in world markets. Consequently the efficiency cost argument is not seen as relevant.

[5] The terms of reference for the review provided in Annex E present a similar interpretation of the export duty.

Note: Export volumes for 2001 are an estimate based on data for the first 9 months of the year.

Source: Annex A

Previous reports have pointed to the large profits made by the logging companies in the early 1990s. For example, calculations presented in Duncan (1995) concluded that the resource rent rose sharply in 1993 and that the logging companies captured most of the increase (p.18). Our calculations of the level of resource rent earned in the industry reach a similar conclusion. This raises the concern that the very high level of logging seen in 1993 and 1994, which was well above the sustainable level, was in part a consequence of the revenue system failing to set taxes and charges high enough as prices rose.

Our best estimates of the actual level of resource rent earned on export logs are provided in Figure 5.2. We estimate that, assuming there is no transfer pricing, the level of resource rent was reasonably low up until 1992 then rose sharply as both US$ prices and export volumes rose. Since then there has been a downward trend in the resource rent measured. In US$ terms prices have fallen and costs per cubic metre have been reasonably stable, so the resource rent per cubic metre has declined. In kina terms, the fall in kina has kept kina prices high since 1993. But most costs are denominated in foreign currencies and in kina terms costs have risen substantially.[6] The result is that the level of resource rent per cubic metre has declined in kina terms. The downward trend in export volumes has also contributed to the decline in the overall level of resource rent generated by log exports over the 1990s.

As well as changes in the level of resource rent, there have also been substantial changes in the distribution of the resource rent.

In the early 1990s, export duty rates were set as a share of the export value ranging from 9 to 30 per cent depending on the species (Shedden Agribusiness, 1991, p.39). The Government was somewhat slow to increase export duty rates as prices rose. They were increased by 10 percentage points in 1993, and a further 13 percentage points in March 1994 (Duncan, 1994, p.3). The delay in the increase in export duty rates provided logging companies a large increase in profits, but the Government then recouped a substantial amount of this as it increased the export duty rates. By 1995 the Government was capturing more resource rent than the logging companies. The Review Team's estimates suggest that, assuming their was no transfer pricing, the Government has earned more resource rent than the logging companies since then, with the gap widening substantially in recent years.

Over 1998 US$ prices continued to fall and reduce the profitability of logging. This contributed to a substantial drop in export volumes. In November 1998 the Government reduced export duty rates by foregoing any duty on the log value up to K130 per cubic metre. Prior to this, a log worth K130 per cubic metre would have been subject to a duty of K29.50 per cubic metre, and a log worth more than this would have been subject to a duty of K29.50 per cubic metre plus a set percentage of the value above K130 per cubic metre (where the percentage rose from 55 to 70 per cent depending on log value).

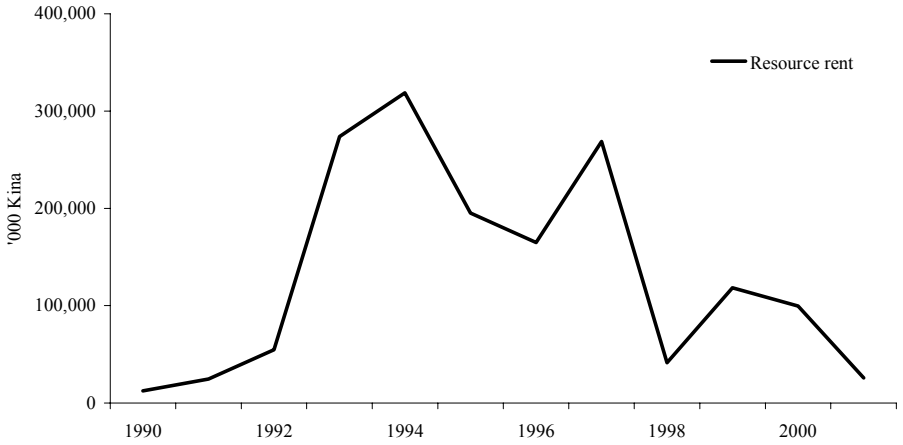
The reduction in export duty rates combined with the lower export volumes saw total duty collections fall substantially over 1998. But the Government still continued to capture more of the resource rent than the logging companies (assuming there was no transfer pricing).

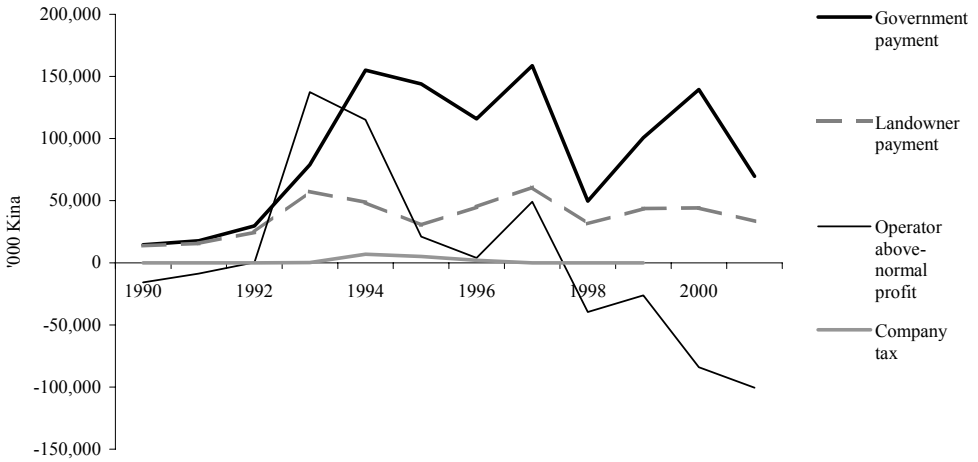
The mid-1999 Budget Statement of the next Government re-instated the previous export duty rates. Total export duty collections rose over 1999 as the higher duty rates came into effect and as volumes and prices rose. Collections have since eased. Based on revenue collections to the end of September,

[6] Note that with revenue and most costs denominated in foreign currencies, predominantly the US$, the logging industry is essentially a US$ industry.

total collections for 2001 are likely to be in the order of K90 million. This compares to the 2001 Budget estimate of K135 million.

FIGURE 5.2 THE ACTUAL LEVEL OF RESOURCE RENT FROM LOG EXPORTS (IN THE ABSENCE OF TRANSFER PRICING)





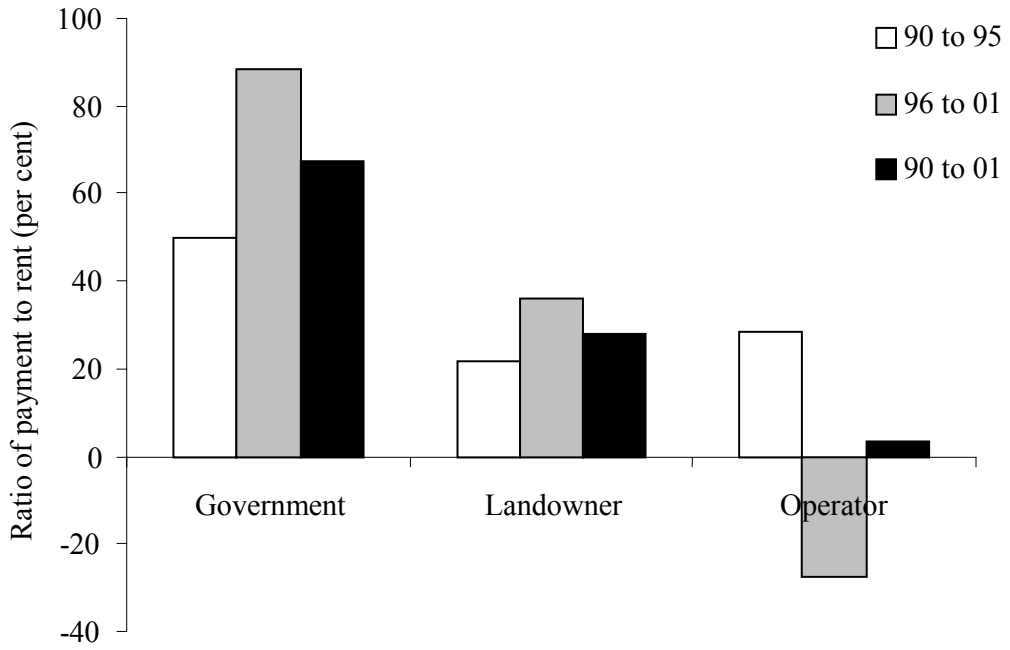
Notes: Data for 2001 are an estimate based on data for the first 9 months of the year. The estimates assume there is no transfer pricing.

Source: Review Team estimate based on the data of Annex A

Figure 5.2 also presents aggregate estimates of the resource rent captured by the landowners. Landowners have typically earned the smallest share of the resource rent from export logs (assuming there is no transfer pricing). Payments to landowners rose in 1993, but they received far less of the gains from the improvement in world prices than either the Government or logging companies. But the payment has remained reasonably stable over time in kina terms, and landowners now receive more than the logging companies. The stability in kina terms in the landowners' payment is attributable to the nature of most payments – they are set in kina per cubic metre rather than being based on the value of exports.

One implication of this analysis is that it is difficult to argue that the revenue system has given too much resource rent to logging companies in recent years. As shown at Figure 5.3, over the past 5 years revenue collections by Government and landowners are estimated to have exceeded the available resource rent (such that there is a negative ratio of the payment to landowners to rent). This means that over recent years logging companies as-a-whole have not made a normal level of profit.[7] A consequence is that is unlikely that the observed excess of the harvest rate over the sustainable yield is attributable to any adverse incentives to log created by the forest revenue system (such as appeared to exist in 1993 and into 1994 when prices rose sharply but government and landowner charges did not).

FIGURE 5.3 THE ESTIMATED PAST DISTRIBUTION OF RESOURCE RENT (IN THE ABSENCE OF TRANSFER PRICING)



[7] The general trend in company profitability shown by these estimates of resource rent was cross-checked against the financial performance reported in a sample of tax returns for timber companies (key results were extracted by the IRC). The company tax-returns examined showed a similar downward trend in profitability in recent years.

Note: The payment to the operator presented in the figure is the estimated above-normal profit, being the operator's portion of resource rent. The negative above-normal profit seen from 1996 to 2001 (Sep) means that operators were unable to earn a normal profit over the period.

Source: Review Team estimates based on the data of Annex A

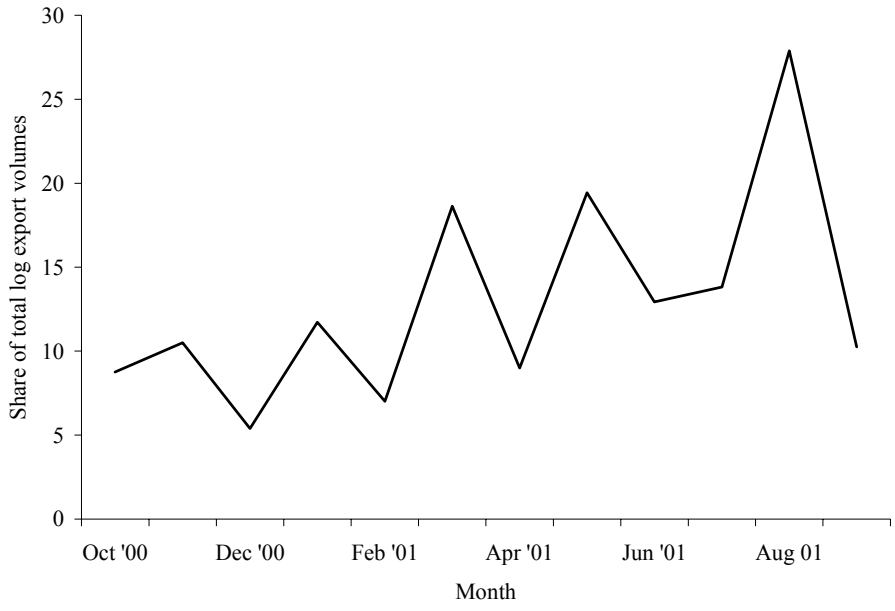
We emphasise that our calculations assume that there is no transfer pricing and that all exports are recorded at their correct value. If any of these conditions did not hold, the picture on the level and distribution of resource rent could be very different to that presented above and the logging companies may in fact be earning adequate profits.

The Review Team emphasises that the calculations assume no transfer pricing through any avenue. The investigation in Part 3 demonstrated the existence of serious and unexplained discrepancies in the international trade but did not prove these were due to transfer pricing, so the caveat remains in place. If this condition did not hold, the picture on the level and distribution of resource rent could have been and could still be different to that presented above and the logging companies might in fact have earned and could still be earning adequate profits.

We have not been able to assess whether all exports are recorded at their correct value. SGS has advised they have a high level of confidence in their monitoring. However, we were advised of a recent case where a logging ship ran aground in which the claim submitted to the insurance company reported a shipment value around twice that officially recorded. We are also aware of an official concern that there is an increase in the relative importance of lower valued logs. The concern is that this share has increased as logging companies have downgraded the classification of their logs so as to substantially lower the export duty payable (the export duty on low grade logs is much lower because the deemed FOB value of low grade logs is substantially lower than for high grade logs).

Figure 5.4 presents the share of log export volumes accounted for by the export logs classified as low grade (which are meant to be old or poorly formed logs of any species). The share of low-grade logs in total exports has been on an upward trend since October 2001, giving some support to the official concern. However, there was a major correction in September 2001. If the upward trend were to re-emerge, it would be a cause of concern.

FIGURE 5.4 THE SHARE OF LOG EXPORTS ACCOUNTED FOR BY LOW GRADE LOGS



Source: Review Team estimates based on data supplied by SGS

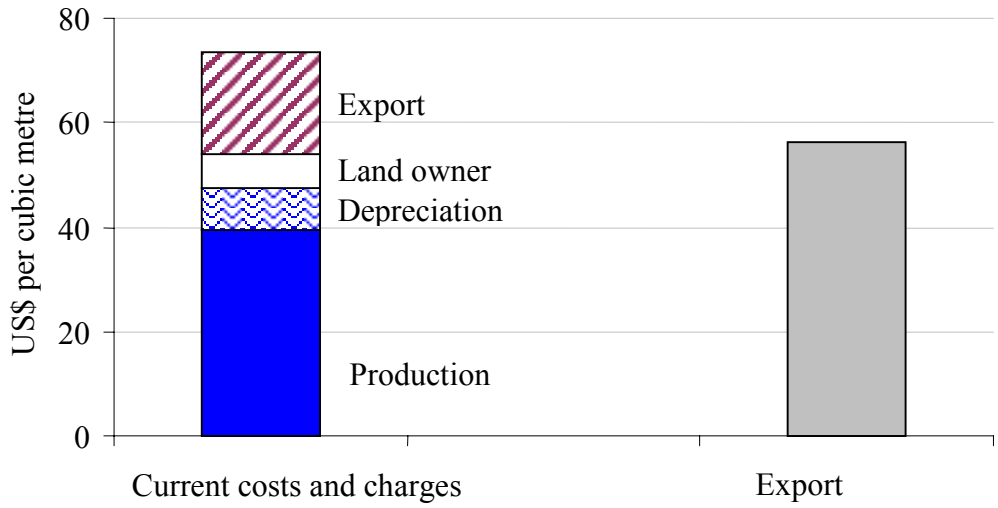
5.4 ARE LOG EXPORT DUTIES TOO HIGH?

Our calculations have concluded that the logging sector has consistently generated resource rent, and continues to do so even at current low world prices. But it is also concluded that the logging companies have failed to earn a normal rate of return over recent years (assuming there is no transfer pricing or under-reporting). Our calculations suggest that the substantial revenue collected by the Government from export duties is preventing the logging companies earning a normal rate of return (assuming there is no transfer pricing or under-reporting).

As a general rule export duties should not be so high as to prevent a logging company earning a normal rate of return over time. As discussed above, the export duty, as a tax on resource rent, should only aim to capture a share of the resource rent. Our calculations conclude that at present the level of export duty collected is greater than the available resource rent. This, combined with the payments to landowners, means logging companies are in total unable to earn a normal level of profits (assuming there is no transfer pricing or under-reporting).

The current situation is summarised in Figure 5.5. This shows how on average the estimated total costs paid by the logging companies exceed the average price. The issue of how operators are able to remain in business and still try to be internationally competitive even at current low prices has been addressed in section 4.3.

FIGURE 5.5 THE CURRENT LEVEL OF COSTS AND REVENUE



Notes: The estimates assume there is no transfer pricing or under-reporting of exports.

Source: Review Team estimates based on the data of Annex A.

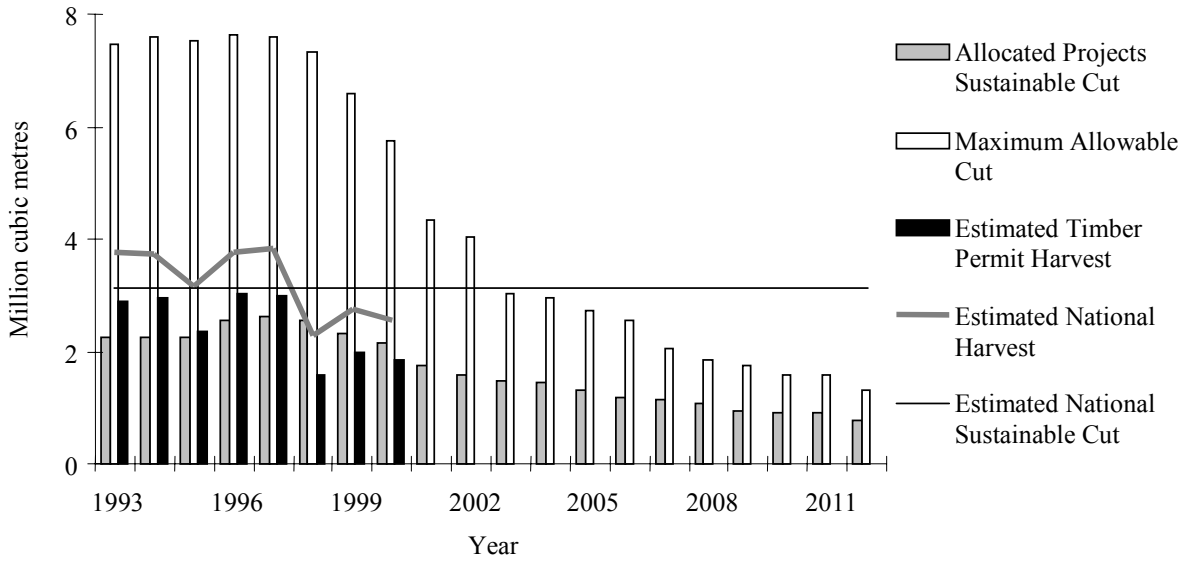
Our calculations of the financial position of logging companies provide only one means of assessing whether logging companies are profitable. Given the central importance of the profitability of logging operations to an assessment as to whether export duties are too high, alternative ways of assessing profitability have also been considered.

One alternative is to assess the current level of industry activity. As shown in Figure 5.6, log exports are now below the pre-1993 level and this may be seen as a sign that profitability has declined.

Certainly industry has advised that logging operations are being cut back because losses are being incurred. It also needs to be kept in mind that there has been a rapid decline in recent years in the availability of logs as existing allocations have been fully logged (see Figure 5.6). The declining availability would probably have reduced logging rates regardless of the level of profitability. This means that the slow down in logging does not in itself provide clear evidence that profitability is low.

The case of West New Britain provides a good illustrates of the issue. Over the year 2000 the province exported around 400,000 cubic metres of logs or 20 per cent of total log exports by volume. But in the 9 months to September 2001, the province only exported 180,000 cubic metres or 16 per cent of total log exports by volume. The Provincial Office of the Forest Service advised that as of October 2001 there were 7 large logging camps operating in the province, with 9 large logging camps having shut down over the past 2 to 3 years. Eight of these shut down due to resource depletion, with only one shutting down due to low profits.[8]

FIGURE 5.6 THE ACTUAL AND POTENTIAL LEVEL OF THE LOG HARVEST



Source: Papua New Guinea Forest Service

The rate of re-investment in an industry is often a good indicator of the state of profitability. In general firms will only re-invest when profit expectations are favourable, and when they are not re-investing it can reflect a poor outlook for profits. There has been a sharp drop-off in recent years in the purchases of heavy equipment used in logging (see Figure 5.7). It is understood that such equipment typically has a working life of around 5 years. Very few new units have been purchased in the last 4 years, suggesting much of the equipment in use has reached or exceeded its normal working life.[9] Such a run-down in capacity is seen as a good indicator that industry profitability is poor.

On balance we tend to the view that logging companies are unable to earn a normal level of profits given current export duty rates. This is in conflict with the general principle noted above that export duty rates should not be so high as to prevent a logging company earning a normal level of profits.

[8] We note that as one of the most heavily logged provinces, West New Britain is more exposed to a lack of resource availability than other provinces.

[9] It is understood that there has been an increase in the rate of refurbishment of heavy equipment, but the number of units refurbished in relatively are small.

That is, we conclude that current export duty rates are too high (assuming there is no transfer pricing or under-reporting).

FIGURE 5.7 PURCHASE OF NEW HEAVY EQUIPMENT BY THE LOGGING INDUSTRY

Note: Data have been converted to an index in order to avoid disclosing confidential information on the actual number of units purchased.

Source: Review Team estimate based on purchases of heavy equipment (excluding logging trucks) supplied by UMW Niugini Limited and Hastings Deering.

However, this conclusion does not automatically imply that a reduction in export duties is warranted immediately. It is important to consider developments in the level of taxation over time and the level of variable costs. We also emphasise that our conclusion is based on the assumption that there is no transfer pricing and no under-reporting.

With respect to the variable cost issue, it is important to recognise that a logging company can operate at a loss and still have an incentive to maintain logging rates. In economic terms, as a general principle as long as prices are high enough to cover variable costs and make some contribution to fixed costs it makes sense for a logger to continue logging. In practice that means that over the short term revenue needs to be high enough to cover the cost of non-head office labour, fuel and stevedoring and port charges, payments to landowners and export duties.

We calculate that for a typical logging operation even current low prices are sufficient to cover these variable costs. This suggests that maintaining existing export duty rates may be unlikely to have a substantial adverse impact on the rate of logging over the short term. That said, given the variability in costs among operations we would expect that some individual operations are not covering variable costs.

But current export duty rates are probably too high to ensure a sustainable industry over the long term. While it may be possible to maintain current export duty rates for the short term, they can be expected to eventually cause a problem and lead to industry contraction. This will occur as either new entrants are deterred or as existing operations allow their productive capacity to decline (e.g. by moving equipment to other countries or by not replacing equipment as it wears out).

5.5 THE RESOURCE RENT ON PROCESSED LOGS

A lack of data prevents detailed estimates of the resource rent on processed logs. Nonetheless, some key issues can be explored using the financial models of the typical processing operations outlined in Section 4.2.

One of the key policy concerns is whether the processing of logs that could be exported reduces the value of a timber resource. This issue can be explained by reference to the financial analysis of a typical processing operation as presented in Section 4.2. Processors do not pay export duty on the log input to their operation and generally do not pay landowners royalty. The financial analysis assumes the price for logs they process is set at the cost of logging exclusive of these charges. Processors can only afford to pay a higher price for their logs if the processing operation is sufficiently profitable (i.e. is earning an a normal level of profits).

A key test is whether the processor is able to pay a price that would provide the log owner the same resource rent that would be available if the timber was exported as a saw log. If this is not the case, then rent has been dissipated (i.e. the owner receives less for their logs when diverted into processing). This means processing *subtracts* value from the log.

The analysis of typical processing operations found that the large processors are unprofitable at current prices and could not afford to pay more for the logs they use. Even the smaller processing operations have very limited capacity to pay more for the logs they use. This is shown in Table 5.1 that presents estimates of the export duty that, if paid, would, at current export prices, ensure a reasonable level of profitability. The sawmills could afford to pay some export duty, but the larger processors would actually need a subsidy (i.e. a negative export duty) to be profitable.

Current export prices are low. They are 55 per cent of the average level seen since 1993, or 70 per cent of the average level seen since 1996. Table 5.1 also presents estimates of the export duty that could be paid if export prices were 25 per cent higher. At these prices the sawmills could pay a substantial export duty, with the exception of the eco mill (which only sells locally and does not benefit from the assumed higher level of export prices). But the veneer factory could only afford to pay a low export duty and the plywood mill could not afford to pay any export duty on the log input.

We estimate the average level of resource rent at September 2001 prices to be positive but less than US$5 per cubic metre on average. If export prices were 25 per cent higher, we estimate the resource rent to be around US$15 to US$20 per cubic metre. Only the sawmills (excluding the eco-mill) could pay an export duty that would return to the owner the resource rent they forego when their log is not exported. That is, only the sawmills would avoid the dissipation of rent. In contrast the veneer and plywood mills are found to be rent dissipating, with the problem most severe for the plywood mill.

The financial analysis estimates that 80 per cent or more of the logs that would be used in the production of export veneer and export plywood would be of export grade. There would be a substantial loss of resource rent from such operations. The parties that pay the cost of this dissipation of resource rent are Government and the landowners as revenue foregone.

In the case of sawmills, the rent that is not dissipated flows to the processor as profit. The presence of export duty concessions and the absence of landowner premiums on most logs used in processing means that the Government and landowners are without important mechanisms to ensure they capture a share of the resource rent. The Government and landowners have recently collected too much of the resource rent from export logs. But it also appears they have not collected enough of the resource rent from the timber used in sawmills.

TABLE 5.1 THE AFFORDABLE LEVEL OF EXPORT DUTY ON TIMBER PROCESSING OPERATIONS

	Export duty in US$ per m3 of log input					
	Portable/ relocatable eco-mill	**Small commercial mill**	**Medium to large sawmill**	**Integrated small sawmill**	**Large export veneer mill**	**Large export plywood mill**
Affordable export duty						
- at current prices	3	3	7	28	-11	-27
- if export prices were 25 per cent higher	3	28	29	33	9	-5

Note: Calculated as the export duty that could be paid on log input so as to ensure a 15 per cent rate of return on investment.

Source: Review Team estimates based on the financial models presented in Part 4

A separate issue is whether there is resource rent on those logs processed into timber products sold within Papua New Guinea. A range of above factors lead us to the conclusion that in general there is little if any resource rent earned on timber sold on the local market as processed product —

- Few local buyers demand the same high quality as export markets, such that prices are well below export prices.
- We understand that in general timber sold locally is not of export grade because timber that can be exported is sold overseas in order to capture the higher overseas prices.
- Local timber prices are constrained by the low incomes and the low valued use of timber (most timber is used for structural purposes such as in house frames, flooring and cladding).
- The presence of relatively widespread and low cost suppliers using small portable mills limits the prices that the larger mills can sell their timber for.
- Timber prices are also kept down by the large potential supply of timber relative to demand. If prices were so high as to generate significant resource rent, new supplies would readily enter the market from either large or smaller suppliers and reduce the timber price. In addition, this would see all rent competed away. We understand the ability to bring in additional sources of supply is relatively widespread, although there would be some areas where the competitive constraint is weak.[10]

[10] And this can give rise to monopoly rents in some geographic markets. This is most likely where some timber is available locally but supplies are scarce, and the cost of transporting timber from other areas is substantial.

PART 6 AN ECONOMIC COST-BENEFIT ASSESSMENT OF PROCESSING

6.1 INTRODUCTION

Loggable forests tend to be in areas with low population densities and little agricultural activity (hence the availability of timber). The high cost of transporting logs means processing operations are normally located close to logging areas, and this means that forest processing operations tend to be located in remote areas where alternative employment opportunities are scarce. These relatively remote areas in provinces such as Western, Gulf and West Sepik are amongst the most poorly developed areas of Papua New Guinea.[11] The timber processing provides important injections of income and demand into local economies and can be the only source of physical infrastructure, notably of roads, power and water, in these areas. It is also common for processing operations to directly fund the construction of community assets such as aid clinics and schools, topping up the scarce government funding available for these critical services.

So timber processing offers important benefits to the Papua New Guinea economy and the country's development.

But the timber processing industry has come at a cost. In particular, the logs used in processing are free of export duty and generally also of landowners' premium. At present tax rates, the Government and landowners together forgo 30 to 45 per cent of the value of a log that is processed rather than exported. Extensive company tax concessions are also provided to timber processors and local timber products are protected against imports by high tariffs where this may have the effect of raising the domestic price of some products.

This section considers these benefits and costs with a view to assessing whether the sector provides net benefits to the country. That is, whether the benefits exceed the costs. A key issue explored through this analysis is whether there is a case to remove or wind-back the current export duty and landowner premium concessions provided to processing.

The next sections discusses in more detail the benefits provided by timber processing. The potential costs are then discussed. The final section compares the costs and benefits and discusses the key conclusions drawn from the analysis.

6.2 THE BENEFITS OF PROCESSING

The main direct economic effect of a timber processing operation flows from the employment of national labour. This labour is drawn from landowner groups that control the timber being logged, from those living in the town or village centre where the processor is located or from other provinces. Most national labour is unskilled, working for example on the stacking of timber, handling through the processing line, tallying timber output and timber bundling and sorting. Skilled labourers, which account for in the order of 1 in 5 of national workers, are engaged as sawyers, heavy equipment operators, saw doctors, timber graders, maintenance staff, clerical staff and workshop technicians. Heavy work is typically undertaken by men while women are normally engaged in finer tasks such as sorting.

[11] See for example the regional and district profiles available in Government of Papua New Guinea and United Nations Development Program (1998) and Bourke M. et al (2001).

Landowners also benefit from the royalty paid on logs used in processing. This is set at 10 kina per cubic metre across Papua New Guinea.

Virtually all of this labour and royalty income would be spent within Papua New Guinea on food, clothing, housing, school fees etc. [12] This provides an important injection to the economy, with much flowing into the local economy in the first instance. As these funds are spent, there are multiplier benefits in other industries. Both the direct and indirect multiplier effects need to be taken into account.

The foreign labour employed in the industry also offers benefits for the Papua New Guinea economy. The workers consume local goods and services and on average pay rates are high enough to see income taxes paid.[13] These income taxes in turn fund government expenditure, where this may be spent in a variety of sectors such as education, health and roads. All these benefits must be factored in.

While many of the non-labour inputs to processing such as equipment and materials are imported, some are purchased locally and this provides an additional source of demand for local businesses. This in turn generates employment and profits in the supplying industry, and increases demand for other local inputs that in turn benefits suppliers further down the chain of supply. Some inputs such as electricity and general overheads have a high local content and can represent an important economic injection from the processing operation.

Many processors also contribute to local infrastructure. In some cases they provide the materials and labour to build schools, aid clinics and other community buildings. They often develop the local road network and provide power and water to surrounding areas. The provision of such services increases demand in the economy and has important flow-on benefits as living standards improve (e.g. education levels rise, as health improves or as better road improve access to markets). [14] We term these flow-on effects productivity effects (they are re-visited below).

Timber processing, of course, also use logs. A portion of the logs processed would have been logged even in the absence of processing as most logs used in processing are of export grade (as outlined in the discussion of the financial models, it is estimated at least 80 per cent of logs used in processing are of export grade). The payment of wages and salaries, of royalties, and the use of inputs to production etc on export grade logs are not considered a benefit of processing (as they would have occurred in the absence of processing). But some of the lower grade logs and species are only felled because they can be processed, and the additional logging that takes place of these non-export grade logs is a benefit for the economy that needs to be factored into the cost-benefit analysis. Up to 20 per cent of log input can be assumed to have resulted from logging that only takes place because of processing.

Processing also generates profits. But the industry is predominately foreign owned such that most of the post-tax profits will ultimately flow overseas. Certainly all the larger operators are foreign owned (the largest locally owned processor being the Ulamona Saw Mill Company of West New Britain that has a typical log input of around 20,000 m^3 per annum). One would expect a portion of profits to be retained locally as company tax. But the forest sector has paid very little company tax (see Figure 5.2), a probable contributing factor being the generous tax concessions provided to processing as

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12 As only a small share of national workers would have sufficient income to travel overseas to spend their wages and salaries. But is also important to recognise the high import content of consumption and the leakage this represents from the economy. This leakage is factored into the multipliers used in the cost-benefit assessment as presented below.

13 On average the wage rates of local employees are low and there is no income tax payable by local employees.

14 An important issue for public policy that is not explored in this Review is whether Government and not logging and processing companies should be the one responsible for infrastructure provision in these areas. On the one hand the Government should be better placed to plan and co-ordinate the delivery of services in an area. But on the other hand there are important efficiency benefits from the co-ordination of infrastructure provision with the availability of suitable equipment and staff, infrastructure provision by operators is important to maintaining good relations with landowers and in some circumstance operators may actually be more accountable than government.

outlined in Box 6.1. The result is that there is very little flow-through to the local economy of the profits earned from timber processing. Our analysis assumes it is zero.

BOX 6.1 EXISTING TAX INCENTIVES FOR DOWNSTREAM PROCESSING

***Export Sales Exemption*:** This incentive allows 100 per cent of the income derived from export sales of specified goods for three years to be treated as exempt income. After this period any export income which is in excess of the average of the prior years can be treated as exempt. Qualifying goods include: chopsticks, matches, paper products, sawn timber, mouldings, plywood, laminated products and wood pulp.

Export Market Development Double Deduction: The Scheme applies to expenditure on export market development for goods manufactured in Papua New Guinea. These expenditures qualify for double deduction, provided the tax saving is less than 75 per cent of the cost of the expenditure: i.e. the Government is in effect subsidising up to 75 per cent of the cost of this form of expenditure. The types of expenditure that qualify include overseas publicity and advertising, market research, tender preparation, samples, trade fair expense, overseas sales and office expenses.

***Initial Year Accelerated Deduction*:** The Initial Year Accelerated Deduction encourages companies to invest in upgrading their plant and other capital assets. Depreciation of new plant may be increased by up to 20% of the cost of the plant in the initial year. This allows the capital cost of these new assets to be written down at a faster rate then would otherwise be possible.

Tariffs on Manufactured Products: Many products enjoy the prohibitive or even greater rates of tariff protection since 1 July 1999. 25 per cent tariff rates (reducing to 20 per cent in 2003) apply to: Fuel wood and chips or particles; wood in the rough, poles, sawn or chipped; wood continuously shaped; board of wood; packing cases, boxes, crates and drums; and carpentry articles. 35 per cent tariff rates (reducing to 30 per cent in 2003) apply to: profile shapes; wooden frames; pallets, box pallets and other load boards; builders' joinery and carpentry of wood; statuettes and other ornaments; and an 'other articles' of wood category. A 50 per cent tariff rate (reducing to 45 per cent in 2003) applies to veneer sheets and sheets for plywood, while the highest tariff rate of 85 per cent (reducing to 75 per cent in 2003) applies to plywood, veneered panels and laminated wood. Other manufactured products would be eligible for protective tariff rates, subject to the approval of the Industry Assistance Board (currently *de facto* IRC).

***Zero Rating of Exported Goods*:** All Exported log products including round logs are zero-rated for VAT. Companies exporting are able to claim a refund of input credits, and so avoid paying the VAT.

Source: Papua New Guinea Inland Revenue Commission

Box 6.2 provides a profile of the features of a number of processing operations visited during the course of the Review. These visits were used to collect a variety of information, including that required to develop an understanding of the economic characteristics of a typical processing operation and to cross-check information collected from non-company sources on the economic impact of timber processing. The site visits undertaken for the cost-benefit assessment covered the only operating veneer and plywood mills and 4 of the 50 or so larger sawmills operating at present.

BOX 6.2 AN ECONOMIC PROFILE OF SELECTED TIMBER PROCESSING OPERATIONS

Bulolo Plyood Mill, Morobe Province (PNG Forest Products): The mill is the main economic activity supporting a township of around 15,000 people near Lae. The total operation employs around 700 national workers, and the unusually long life of the mill means that many staff are 2nd or 3rd generation workers. The workers have been drawn from throughout Papua New Guinea. Around half of the 700 workers occupy company housing in Bulolo township, where the company also provides schooling (for some company employees) and shops. The facility generates power for the townships of Bulolo and Wau from a hydro station (electricity is sold to non-company users) and water for Bulolo town and the immediate vicinity. The company also maintains roads in the area (including to Wau, although this support is now being cut-back) and provides

support on an ad hoc basis for nearby health and education facilities. There is reported to be very little crime in the area.

The facility sells most of its product locally, and the poor level of local demand is the major commercial issue facing the facility. The poor demand has led to a recent downsizing in plywood output (of around 30 per cent). There are also concerns in the future availability and cost of the logs used in the facility which are drawn from surrounding Government plantation. At present donor projects (eg the re-equipping of schools) are providing the main source of demand for processed products, but some recent successes have been enjoyed in the export of plywood (eg construction grade plywood to Australia and some Pacific Island nations). High tariffs apply to competing imports, but these tariff rates are being substantially reduced as part of Papua New Guinea's tariff reduction program.

Panakawa Veneer Mill, Western Province (Rimbunan Hijau): The mill employs around 700 people, 520 of which are locals. Of the 160 expatriate staff, most are from Indonesia. The mill is less than four years old with very few worker facilities available, the mill is very remote (there is no road to the closest major township of Dahru which can be accessed by air or 2 days in an outboard) and workers are engaged for 6, 12 hour shifts per week. The reasonably difficult conditions may explain problems faced by the mill in engaging and retaining staff from the surrounding area, with all but 40 of the national employees drawn from other parts of Papua New Guinea (eg Laq, Alotau, Mendi, West New Britain, the Highlands). There has been a high turnover of staff and a high absentee rate.

There is a school on-site, but no teacher at this stage (a teacher is expected next year). The company reported that is spends K15,000 to K20,000 per month on medicine for staff and the local area (including nearby Kamusie). While there is no obligation to assist non-employees, it is considered impractical not to do so and the company argues it provides health care for much of the surrounding area (although it is very sparsely populated). The company funds an expatriate doctor and two local mid-wives.

Pay rates are around 80t per hour for unskilled labour and up to K1.20 per hour for skilled labour. There are very few alternative employment opportunities in the area, with the main alternative cash crop being sago. The current logging area is around 100 km away in a direct line, or around 200 km by river (logs are barged to the mill). The use of barges to transport logs means the road network has not been as well developed as in other logging areas.

A nearby sawmill at Kamusie has been established for some time, and operates with a considerably higher representation of local employees. The sawmill employs around 100 nationals (most are from the surrounding area) and 15 expatriates, with pay rates ranging from 50t per hour (for 'trainee' unskilled labour) to K1 to K1.50 per hour for skilled labour. The typical working week is 88 hours. The township of 2,000 to 3,000 people contains a health post, school and police station, with the company reporting 50 to 80 patients visiting the health post each day.

Kwila Saw Mill, Saudaun Province (Vanimo Forest Products): The mill operates 1, 10 hour shift 6 days per week. 300 to 400 people are engaged in the sawmill operation and another 600 to 700 in the supporting logging operation. Of the mill workers, there are around 20 expatriate workers, who tend to be the higher skilled operators. Pay rates start from 60t per hour for an unskilled probationer and are K1.30 to K.150 per hour for skilled labour. The absentee rate is around 20 per cent.

The company maintains roads in the area (including the main, gravel road to the township) and has supported the construction of nearby government schools. While schools and health facilities are under-funded, they are operational and reasonably well staffed and serviced (relative to surrounding areas).

Most of the mills' labour is drawn from the province. A large share live in un-serviced squatter settlements on adjoining state land, with many houses made from kwila off-cuts. Surrounding areas are poorly serviced by Government health and education facilities (eg mobile clinics have stopped because of a lack of transport funds) and the ability to work in town provides an opportunity for children to access such facilities. This appears to be a key factor attracting labour and keeping families in town even though only one in 10 adults may be working in a group (a more typical number is 1 in 3).

Apart from Government and some trade activities, there are few alternative employment opportunities in the area (there is very little cash cropping despite the close proximity to the capital of West Papua). The province is particularly poorly serviced by road, with for example no all weather roads outside of Vanimo township and no road connection between Vanimo and the four districts of the province. This may explain the low level of cash activity in the area surrounding the mill.

The law and order situation is reported to be good in Vanimo but most other development indicators for the province are very poor.

Stettin Bay Lumber Company (Nissho Iwai and PNG Government), West New Britain Province: The company has sizeable land holdings on which most of the senior to middle level staff live, with the children of employees attending a Government school on company land. The company is the only operator in Papua New Guinea paying a Project Development Benefit. 40 per cent of this is paid in cash with the remainder allocated to an Infrastructure Development Fund to be used to fund local infrastructure.

There has been a substantial cut-back in activity recently with logging suspended in company areas on the southern side of West New Britain. The main source of logs at present is an areas being clear-felled to establish a palm oil plantation. When operating at full capacity the mill employs 500 or so people. When the workforce was scaled back, around 200 returned to other provinces, 100 moved from the company to the contractor that took over the operation of the mill and around 200 stayed with the company in non-mill positions. Of the current mill workforce of around 100, there are 9 expatriates. There is strong local pressure for the mill operator to use local labour, and most current national employees are from the local area. One shift operates 5 days a week, 8 hours per day. Pay rates for national employees range from 65 t per hour for probationers to K1 per hour for semi-skilled labour.

There appear to be reasonably good alternative employment opportunities for local labour. The main source is small holder palm oil, a result of the rapidly expanding palm oil industry in the province, but other cash crops also provide opportunities.

Ulamona Sawmill Development Corporation, West New Britain Province: The mill was purchased by 8 local landowners companies from the Catholic Church. It is a long-lived operation with some surrounding forest areas into their third cut. Most sawn timber is sold within Papua New Guinea. Weak demand has seen sawn timber output cutback, while high export duty rates are attributed with the recent cessation of log exports.

Around 90 per cent of the mill employee's are local, with some being 4th generation workers. There is only one expatriate worker. Total combined employment for the mill and logging operation is 115 at present. 105 staff were recently laid off most of whom returned to their (local) villages while some obtained work at a nearby palm oil plantation/mill. Pay rates start at 86t per hour for unskilled labour rising to K2.10 per hour for truck and dozer drivers.

The company has been relied upon to supply most of the timber for the construction of schools building and facilities and a 40 bed health facility in Ulamona township. The presence of a nearby active volcano has cut back the operation of these facilities, with temporary settlements established further away from the volcano. The company supplies water and electricity to the areas adjacent to the mill including the school and the health facility. The company also undertakes most road maintenance in and around Ulamona.

Some of the operator's permit area has been converted to palm oil, and small holder palm oil is providing increasingly important alternative employment opportunities. Palm oil can offer broadly comparable incomes to working in the mill. The next most important alternative activity is subsistence farming.

6.3 THE COSTS OF PROCESSING

The main cost of processing is the loss of government revenue from export duties as export grade logs are diverted from exporting to processing. With 80 to 85 per cent of the log input to the larger processing operations understood to be of export log quality, the loss in revenue is potentially large.

The loss of government revenue means that some government expenditure is forgone. This has what we call both an expenditure effect and a productivity effect. The expenditure effect flows from the reduction in employment and demand by government for materials, which in turn has a flow-on cost to businesses that would have supplied the government materials, those that would have supplied consumption items to government employees items, etc. The productivity effect captures the indirect benefits that would have generated by the government program that is forgone. For example, the benefit of improved education, better health care or improved roads.

For the purposes of analysis we assume the productivity effect can be measured by the potential benefits of maintaining roads. Road maintenance reduces the cost of travel by reducing wear and tear

on vehicles, reducing the use of fuel and reducing the time taken to travel. Road maintenance also offers other benefits by providing improved access to markets, to schools and health facilities. Estimates for selected coastal regions of Papua New Guinea suggest that every kina spent on road maintenance offers at least K3 in savings in vehicle operating costs alone (AusAID, 2000).

We use this estimate of the potential savings as a proxy for the productivity effect associated with foregone expenditure. This can be explained in the following terms.

Consider a simple case where the resource rent generated on an export log is K1. The Government could allow the operator to take this K1 as profit, which would be sent overseas.[15] Or the Government could collect K1 from the export of a log and retain the resource rent. This K1 collected from the export log could then be spent on road maintenance, which would generate multiplier effects as it is spent and, in addition, reduce the cost of travel by K3. Instead the Government actually decides to forego this K1 in order to promote timber processing and does not collect the K1 in export tax. In effect it is foregoing the boost to demand of K1 and the productivity effect of K3.

The underlying assumption of this cost benefit analysis is that road maintenance is the marginal expenditure foregone by the concession on export duties. The realism of this assumption can be seen by the recent history of budget allocations by the National Government to road maintenance. They have frequently been one of the first expenditure items cut as other initiatives have emerged or revenue has fallen short of expectations. This is despite road maintenance being frequently described by the Government as a high priority. An alternative assumption is that the funds would have been allocated to a less effective use that generated no benefits. We take this argument into account by conservatively assuming that of a K1 in expenditure foregone, a third would have been spent on activities that generate no productivity effect (eg K0.33 of every K1 is in effect wasted). This means the productivity effect foregone for every K1 of export duty foregone is assumed to be K2 (ie 3 x 0.66 = 2).

Most processing operations also do not pay landowners premiums on logs used in processing.[16] This means that landowners forgo income and hence consumption when logs are diverted from export to processing. This represents a loss in demand for those businesses that would have supplied goods and services to landowners, to their supplying businesses, etc.

Our analysis makes the assumption that all jobs for national employees in timber processing represent new jobs for the economy. This means that any individual employed in the industry was assumed to be previously unemployed or, if they were previously employed, the position they left has (ultimately) been filled by an unemployed person. This assumption is based on consultation at a number of processing operations that indicated most national employees were from the local area and would be unemployed in the absence of the processing operation.

While most national employees are unskilled and, given the economic remoteness of most timber processing operations, would be unlikely to have held formal employment previously, a small share are skilled. Given the shortage of skilled labour in Papua New Guinea, it is somewhat unrealistic to assume, as we have, that previously unemployed workers fill all skilled positions. The analysis does not factor in the loss from any informal activity previously undertaken by the employee (e.g. tending the family garden, fishing, caring for children). Clearly the opportunity cost is not zero as our analysis assumes. For these reasons our labour assumptions are seen to under-estimate the full costs of processing.

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[15] Note that most logging companies are foreign owned and (for reasons we do not totally understand) in practice the company tax payments for the forest sector have been close to zero for many years.

[16] We understand that the Wawoi Guavi operation of Western Province pays K1.75 per cubic metre in landowners premium (see Groome Poyry (1998)).

Ideally, the analysis should also have factored in the effect of tariffs on processed timber products on the cost of such products sold locally. The main concern is the high tariff on plywood that (combined with the presence of only one local supplier) may allow local plywood prices to be almost twice the international price (given the 85 per cent tariff, see Box 6.1). However, this issue was not explored because of a shortage of data.

6.4 WEIGHING UP THE BENEFITS AND COSTS OF PROCESSING EXPORT LOGS

The decision rule that we apply in our cost-benefit analysis is that processing must increase the consumption of Papua New Guineans. That is, for the benefits to outweigh the costs, the benefits from processing must add more to consumption that the consumption forgone because of the costs of processing. Consumption is focused on as a measurable and readily understood indicator of community well being.[17]

In preparing our analysis, we assume that the processing operation only exists because of the absence of export duties and landowner premiums. That is, the costs as described above need to be incurred to trigger the benefits from processing as described above. We discuss the impact of relaxing this assumption below.

The methodology used to estimate the impact on consumption is described in Annex C.[18] The results of the analysis are summarised in Table 6.1 and Figure 6.1.

The main finding is that all processing operations but the integrated saw mill the costs of processing are larger than the benefits of processing under the current policy regime and at current prices. That is, most timber processing makes Papua New Guinea worse off. This can be seen from the estimated negative net benefit for all stylised processing operations except for the integrated saw mill. The problem is most severe for the medium to large sawmill, with the integrated sawmill the relatively better performer.

[17] An underlying assumption is that all income generated by or lost because of processing is/would have been consumed. In other words, we assume that what goes into the community's 'wallet' equals what comes out.

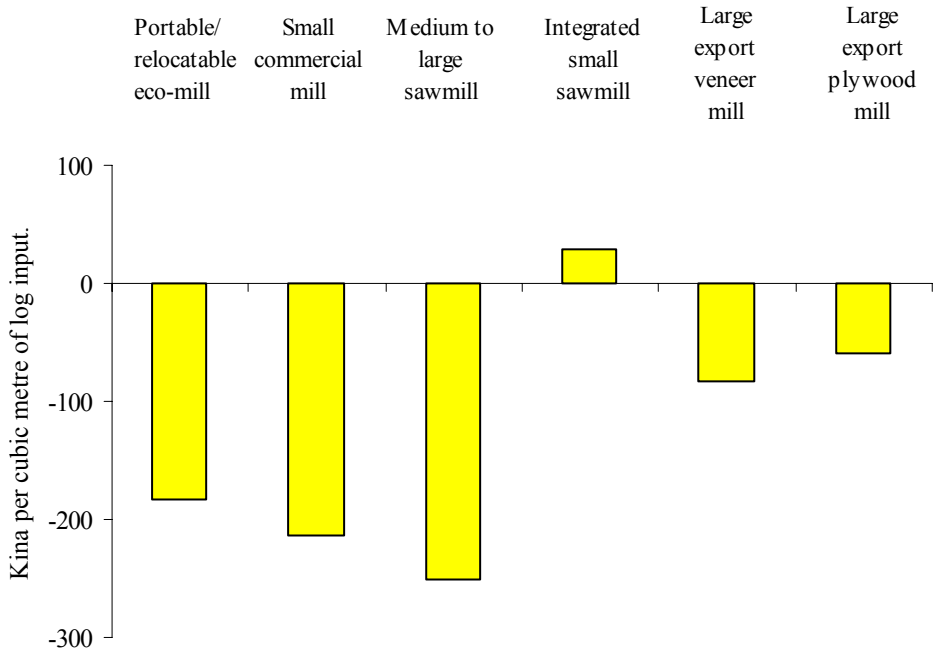
[18] It may be unclear how the productivity effect feeds into our consumption-based measure of costs and benefits. The saving in vehicle operating costs can be interpreted as providing an estimate of the indirect boost to consumption from road maintenance expenditure. The road maintenance means that households can undertake a given level of travel but at lower cost. The cost saving can be redirected to other consumption items (or potentially more travel) with the result that the households can consume more goods and services because of the road maintenance. For commercial road users, this saving in travel costs lowers business costs that can be assumed to add to profits and hence personal income. It is also reasonable to assume that these additional profits are ultimately consumed. The estimated additional consumption is the estimated value of the savings in travel costs.

TABLE 6.1 BENEFITS AND COSTS OF PROCESSING FOR A TYPICAL YEAR

	Kina per m3 of log input						
	Logging	**Re-locatable eco-mill**	**Small commercial mill**	**Medium to large sawmill**	**Integrated small sawmill**	**Large export veneer mill**	**Large export plywood mill**
Benefits of Processing from the —							
Consumption by national workers of their wages	13	77	35	27	88	23	29
Payment of landowners royalty	45	20	20	20	20	20	20
Increased demand for locally supplied inputs to production	39	3	31	14	51	14	29
Government expenditure funded by the tax on the wage and salary income of foreign workers	12	0	19	10	11	10	12
- boost to demand in the economy	4	0	6	3	4	3	4
- productivity effect	8	0	12	6	7	7	8
Consumption by foreign workers of part of their wages	1	0	5	3	3	4	4
Local infrastructure funded by the processing operation	8	3	3	3	3	3	3
- boost to demand in the economy	3	1	1	1	1	1	1
- productivity effect	5	2	2	2	2	2	2
Logging triggered by processing	0	24	24	24	24	24	24
Total Benefits	118	126	137	101	200	97	120
Costs of Processing Flowing from -							
Government expenditure foregone because of the export tax exemption	0	277	319	319	139	147	147
- lost demand in the economy	0	116	133	133	58	62	62
- productivity effect	0	161	186	186	81	86	86
Consumption foregone by the absence of a landowners' premium on most logs	0	32	32	32	32	32	32
Total Costs	0	309	351	351	171	179	179
Net Benefits	118	-183	-214	-250	30	-82	-59

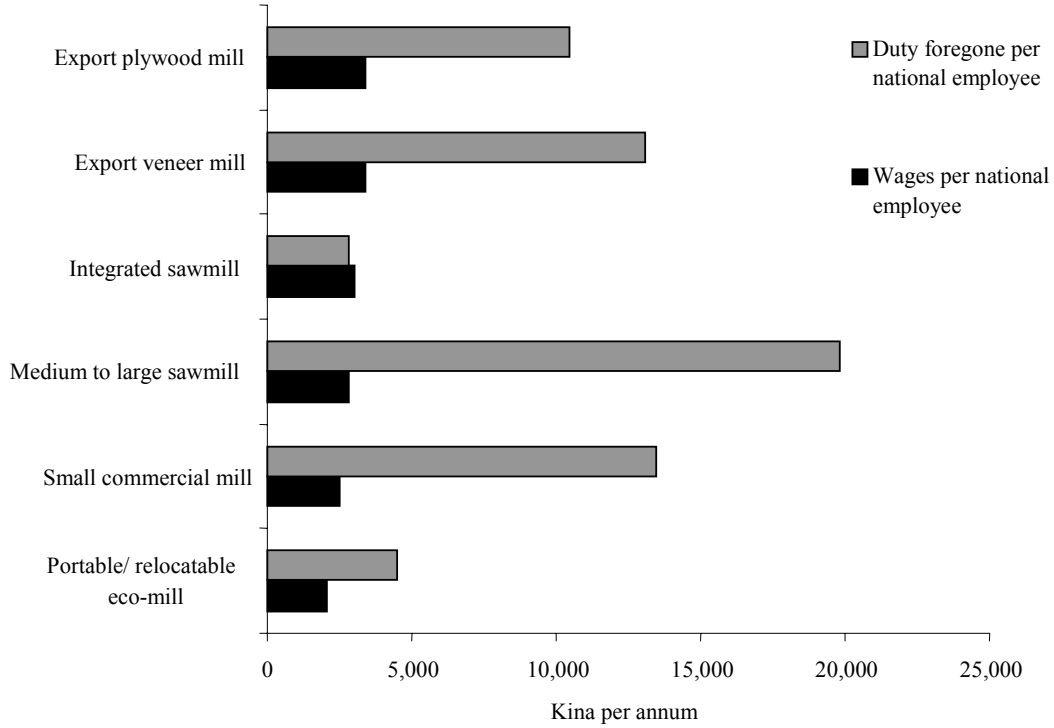
Source: Review Team estimates

FIGURE 6.1 NET BENEFITS OF PROCESSING FOR A TYPICAL YEAR



Source: Review Team estimates

FIGURE 6.2 EXPORT DUTY FOREGONE ON 'EXPORTABLE' LOGS PROCESSED



Source: Review Team estimates

The problem can be largely traced back to the high level of export duty foregone on timber processing. One of the most important benefits of timber processing is that it generates employment for nationals. But for most processing operations the tax foregone far outweighs the value of the extra wages generated. For example, for the medium to large sawmill the Government is foregoing around K20,000 to generate one national job paying K5,000 (see Figure 6.2). Expressed alternatively, the Government could collect the export duty and employ four unskilled labourers on a community project that has flow-on benefits. Under the current policy it is in effect instead choosing to employ one unskilled labourer on a project that has relatively weaker flow-on effects. The economy is worse off under such a policy.

The level of the costs is primarily determined by the level of export duty foregone. That is, the lower the export duty foregone the lower the costs imposed by processing. Table 6.2 presents estimates of how low the correct level of export duty would need to be before the calculated benefits of processing outweigh the costs. We describe the level of duty at which the processing operation passes the cost-benefit test as the 'breakeven' export duty. For example, it is calculated that if the correct level of export duty on log exports was US$4 per cubic metre, the export duty foregone would only be US$4 per cubic metre and the medium to large mill would pass the cost-benefit test.

The reduction required in the correct level of export duty to reach the 'breakeven' duty ranges from 41 to 79 per cent (excluding the integrated saw mill which could receive a small subsidy and still pass the cost-benefit test). The calculated 'breakeven' level of duty is substantially below the average, actual level seen over the 1990s. This 'breakeven' level is unrealistically low and it is very unlikely that the correct level of export duty would be so low as to see the larger processors pass a cost-benefit test.

TABLE 6.2 EXPORT DUTY UNDER DIFFERENT SCENARIOS

	Export duty in US$ per m3 of log input					
	Portable/ relocatable eco-mill	**Small commercial mill**	**Medium to large sawmill**	**Integrated small sawmill**	**Large export veneer mill**	**Large export plywood mill**
Currently foregone	31	35	35	15	16	16
'Breakeven' export duty	8	9	6	15	6	8
Average export duty paid across all log grades						
- from Jan 1996 to Sep 2001	24	24	24	24	24	24
- from Jan 1990 to Sep 2001	27	27	27	27	27	27

Source: Review Team estimates based on the data of Annex A.

It is also important to consider the effect of relaxing the assumption that the processing operation only exists because of the absence of export duties and landowner premiums. Doing so allows us to better understand whether it is good public policy to forego export duties and landowners premium on processed logs.

Assume that the processing operation would have operated even if taxes and charges were levied at the same rate that would have applied had the log being exported. In which case the absence of export duties and landowner premiums has no impact — the same operation exists regardless of the concessions. This means there are no benefits generated by the foregone export duties and landowner

premiums. But there would still be costs, flowing from the foregone revenue. The provision of concessions would clearly fail the cost-benefit test.

Now assume that instead the processing operation could pay some export duty. This means that only a portion of the benefits described in Table 6.1 could be attributed to the policy of foregoing export duties and landowners premium. How much would depend on the capacity to pay.

We know from Table 6.1 that the sawmills do have some capacity to pay export duty, even at current low prices. At the level of prices seen over recent years they could almost pay the same level of duty as would be payable on an export log. This means that the benefits of foregoing export duty are considerably lower than the benefits quantified in Table 6.1. The costs of foregoing export duty substantially outweigh the benefits.

The export veneer mill and large export plywood mill also has some capacity to pay export duty. A similar conclusion applies.

It is very difficult to envisage how reasonable variations to the analysis could lead to the conclusion that a blanket policy of providing duty concessions makes Papua New Guinea better off. The economic analysis suggests the policy makes the community, broadly defined, worse off.

It is also clearly helpful to consider the impact of the absence of export premiums on the economy in the immediate vicinity of a processing plant. The main benefit of processing to this nearby economy is via the payment of wages and salaries to national employees. Our fieldwork has concluded that typically most of these employees are from the surrounding villages, and will spend their earnings in the area. Even those employees from other regions spend most of their income in the area surrounding the processing plant. This expenditure provides an important boost to the nearby economy.

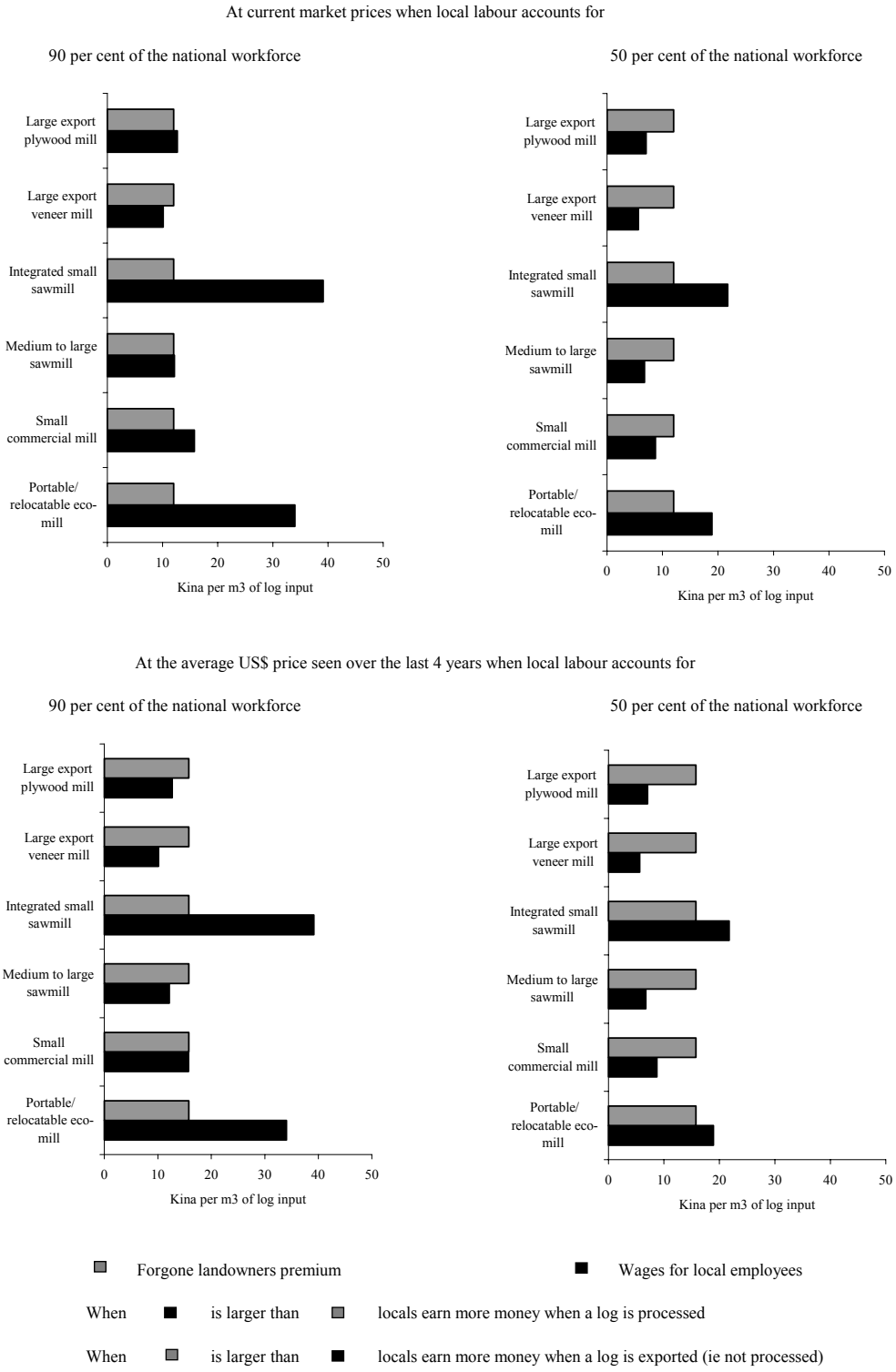
But most landowners forego premiums on logs that are processed. This means they have less money to spend in the absence of processing. This represents a loss to the nearby economy.

Which is larger – the benefit flowing from wages and salaries, or the cost flowing from premium foregone? Figure 6.3 presents estimates for the stylised processing plants based on different assumptions regarding log prices and the share of the national workforce account for by local people.

In most cases the costs outweigh the benefits. That is, more money is foregone than is earned. Only the integrated sawmill and relocatable eco-mill offer benefits greater than the costs.

For the veneer and plywood mills and the large sawmill under the most favourable scenario, the injection to the nearby economy from wages and salaries is approximately equal to the loss from foregone premiums. But the local economy has to work to earn what it would have been given had their been no processing (and the logs were exported). Clearly the local community is worse off under even the most favourable scenarios. For these operations, processing would fail a cost benefit test conducted at a local level.

FIGURE 6.3 LANDOWNER PREMIUM FOREGONE ON PROCESSED 'EXPORTABLE' LOGS



Note: Based on the assumption that the landowner premium applying to: the export plywood mill is an average of the premium paid at Panakawa and Vanimo; the export veneer mill equals the premium paid at Panakawa; and for all other operations is the weighted average across all areas reviewed excluding Panakawa. Rent or landowner premiums as drawn from Groome and Poyry (2000).

PART 7 THE DISTRIBUTION OF RESOURCE RENT

7.1 AN APPROPRIATE DISTRIBUTION

Simple economic models suggest that logging companies need not retain any of the resource rent earned on logging. The argument is that logging companies need only earn a normal rate of return in order to be attracted to the industry. This is essentially because the normal rate of return is the best that logging companies could expect in an alternative investment (being an investment in another sector of the economy). Anything above this is seen as an unnecessary bonus. Duncan (1995) for example argues that logging companies should not retain any of the resource rent (p. xvii). And the National Forestry Development Guidelines prepared in 1993 proposed a revenue system that would have seen landowners and the Government capture 85 to 90 per cent of the resource rent (Economic Insights, 1996).

But there are a number of practical and theoretical reasons why it is unwise for Government and landowners to try and capture all the resource rent. In particular —

- There is some uncertainty as to how exactly how high a normal, risk adjusted rate of return should be. If the normal rate of return is under-estimated, landowner and government taxes and charges will capture too much revenue and logging profits will be too low. The industry will tend to contract and this would reduce revenue collections. Attempts to collect all the resource rent run the risk of collecting too much revenue in the short term, deterring activity and reducing revenue collections over the long term.
- Maintaining the level of landowner or government charges at the maximum level will normally require reasonably sophisticated royalty and charging systems, and such systems are probably beyond the administrative capacity of landowners and the Government and provide too many opportunities for malfeasance.
- Loggers can probably expect to capture part of the resource rent from forestry in a number of Papua New Guinea's key competitors. Unless Papua New Guinea also offers a share of the rent, it may be difficult to attract efficient logging companies.
- The logging companies face little if any incentive to maximise efficiency when they do not receive any of the resource rent. If for example logging companies are only entitled to earn enough money to cover the cost of logging, and prices more than cover such costs, they have no incentive to maximise the quality of a log through appropriate felling and transport practices. This is because they receive the same payment for both a poor and high quality log. They would also tend to lack an incentive to get the marketing right as they do not share in the higher price provided by better marketing, and they may over-invest in capital (a so-called Averch-Johnson effect).
- If all the resource rent is collected on successful projects, the revenue system will only be economically efficient if the landowners and Government fund all losses on unprofitable (but efficient) operations, or alternatively allows all losses to be offset against the profits on successful projects. If not, the expected return across the industry will fall below a normal level and the industry will tend to contract (see Garnaut and Clunies Ross (1979) p.196). Because the revenue system used in practice will typically not be so generous as to allow all costs of loss-making activities to be recovered, in practice a revenue system that sought 100 per cent of the rent on successful projects would reduce the expected return below a normal level. This would defer industry development.

One way of trying to deal with uncertainty as to what is an appropriate share of resource rent to provide loggers is to auction the rights to timber resources. If logging companies do not require any

share of the resource rent, they will bid a price that transfers to the landowners and Government the full resource rent. Or alternately, they will bid that share of rent that the market is prepared to let the government and landowners capture. However our assessment is that there are too few operators in the industry to ensure a competitive bidding process and a system of bidding would probably be abused (see Box 7.1 for an analysis of this issue).

BOX 7.1 THE EXTENT OF COMPETITION IN THE FOREST INDUSTRY

A simple indicator of the extent of competition in a market can be provided by calculating measures of industry concentration. Such measures are used to indicate the extent to which a market can be controlled by any large industry participants. That is, whether a market is subject to vigorous competition

For example, the US Department of Justice and the Federal Trade Commission apply the Herfindahl-Hirschman Index, an index derived from the market shares of individual suppliers. The index ranges from 0 to 10,000, where a value greater than 1,000 seen in the US as a sign that a market lacks effective competitive pressure (Carlton and Perloff (2000), p.613). We estimate the relevant Herfindahl-Hirschman Index for the PNG forest industry as in the range of 1,500 to 2,500 (depending on assumed inter-relationships among operators). This is a high number and is a warning sign that the industry may lack effective competition.

These calculations are based on a market defined as the market for the rights to Papua New Guinea's forest resources. They also assume that the market shares in this market match each operator's share of log exports as identified in SGS data.

The calculated level of industry concentration is above what is normally seen as a critical level that minor refinements to the assumed market shares are unlikely to alter the basic conclusion that it lacks effective competition. However, a much broader geographic scope of the market could lead to much lower estimates of the extent of industry concentration. For example, if there was one world market for the rights to access tropical timber, the market shares would probably be quite different. However, we consider that the relevant market is limited to Papua New Guinea for the following reasons —

- The likely presence of some economies from a larger operation.
- Substantial sunk costs, particularly in processing.
- The superior knowledge of the resource held by existing operators and gained through first-hand experience.
- The familiarity of existing operators with the regulatory system and country-specific risks.

An implication of the above is that a standard tendering process for the access rights to timber is extremely unlikely to be competitive. It is possible that new entrants may be attracted to bid for any tender of access rights, and this could introduce an effective constraint on the existing participants. In this way new entrants, or at least the threat of their entry could ensure a competitive outcome. However it is a high risk strategy to assume that such competitive pressures would emerge.

Duncan (1995) recommended that a system of bidding for access rights be adopted. The above analysis suggests that such a bidding process would not be competitive and would lead to resource owners and the Government receiving too little for the forest resources.

In practice it is sensible for government and landowners to have in mind a target share of the resource rent that can be drawn upon in designing a revenue system.

A potential benchmark for the level of resource rent to be collected is provided by the mining and oil sector.[19] As well as paying an ad valorem royalty and company tax, the sector is subject to an additional profits tax (APT). This is an economically sophisticated royalty system based on the resource rent tax developed for Papua New Guinea in the mid 1970s (see Garnaut and Clunies Ross (1975, 1979) and Emerson and Lloyd (1983)). The APT was originally designed to collect 70-*n* per cent of the resource rent earned in the mining and oil sector, where *n* is the company tax rate (see Daniel *et al* (2000)). This means the APT was designed to collect 40 per cent of the resource rent,

[19] The potential to use the mining and oil sector as a benchmark was also noted in Shedden Agribusiness (1991).

with a further 30 per cent to be collected via company tax. This would leave 30 per cent of the resource rent for the operators. Current APT rates are somewhat below these original levels but the Government still targets a collection of at least half the resource rent. Within Australia, the resource rent tax applied to most offshore oil and gas is set at 40 per cent of the resource rent (with a company tax rate of 30 per cent also applying).[20]

There are no hard and fast rules on how much resource rent should be provided to operators, with the decision in part a subjective one requiring careful judgement. We conclude that a 70:30 split (ie. 70 per cent to Government and landowners and 30 per cent to operators) is an appropriate distribution of the resource rent from logging.

An important difference between the forest sector and the mining and oil sector is the ownership of the resource. Mineral and oil resources are owned by the State, and as the owner of the resource, the National Government is clearly entitled to collect a share of the resource rent. But the forest resources are owned by landowners (with the exception of a small area of plantations). Yet the National Government has captured considerably more of the resource rent from forestry than landowners have.

Certainly the National Government has a legitimate right to recover the costs it incurs in managing the forest sector (via the Papua New Guinea Forest Authority inclusive of SGS). This sets a minimum level of National Government charges. This would normally be seen as a user charge. At present the National Government spends around K21 million per annum managing the forest sector, which has typically been less than 20 per cent of its collections from export duty.[21]

The export duty has at various times been described as a means of correcting for transfer pricing or difficulties in administering the company tax regime.[22] Even if such a justifications for the export tax are valid, they do not address the question of an appropriate distribution. After all, the revenue could easily be returned to landowners if they were the rightful 'owners' of the rent (in the same way that the Forest Service currently collects royalty on behalf of landowners and returns it to them).

There are no indications that the export duty collected from the forest sector is returned to landowners in either cash or non-cash form. Instead the export duty feeds into general revenue that is re-distributed throughout Papua New Guinea via the budget process. One rationale for this re-distribution of the resource rent is provided by the aim expressed in the preface to the Constitution that forest resources be managed for all Papua New Guineans.

Whether it is appropriate for the National Government to capture a share of the resource rent from forestry and, if so, what share, is a value judgement best made through the political process. However, there are three points that appear reasonable to make —

- The substantial decline in the share of rent captured by landowners over recent years appears to be unintended and a consequence of the poor design of the revenue system. In particular, the specification of the royalty and some landowner premiums in kina per cubic metres has seen a decline in the US$ value of the payment and the Government earn far more from forestry than landowners.

[20] An important difference to Australia is that dividend imputation effectively removes company tax for domestic residents and substantially removes company tax for individuals. For domestic residents any resource rent distributed to shareholders would ultimately be taxed at the individual's personal income tax.

[21] It is reasonable to argue that these costs should have been added into the cost of logging and therefore be excluded from the resource rent. However for ease of exposition we have excluded these costs from logging costs.

[22] For example, the World Bank (1999) presents the argument that the export duty compensates for poor company tax administration.

- Landowners lose rent when timber is processed because landowner premium that would be paid on export logs is not payable on processed logs. As discussed in the cost benefit analysis, this practice makes landowners worse off.
- There appears to be widespread support amongst government officials and most logging and processing companies that the use of landowner payments be subject to tighter controls and directed to sustainable purposes. Some landowners consulted were also of this view. Many of the stakeholders we consulted were of the view that most of the payments to landowners had been wasted and those from logged areas were made worse off by logging.
- These considerations suggest that significant changes are warranted to both the distribution of resource rent between logging companies and landowners and the use of payments to landowners.

7.2 THOUGHTS ON IMPROVED MECHANISMS FOR DISTRIBUTING THE RESOURCE RENT

The design of revenue systems involves reaching a trade-off between competing objectives. As explained in Box 7.1, ideally revenue systems would be –

- economically efficient, in that they should allow all profitable logging to take place (subject to all non-financial costs being met).
- equitable, in particular by providing a fair distribution of the resource rent between logging companies, landowners and government.
- be simple to administer.
- provide a stable source of revenue.

Typically a revenue system can only satisfy some of these criteria. For example, a pure profit-based system that linked payments to the profits earned on each log would probably be economically efficient and equitable. But it would be too hard to administer in Papua New Guinea and lead to unstable revenue flows (because payments vary as prices, costs and volumes change and all must be regularly monitored).

A revenue system based on ad valorem rates (being a share of sales revenue), such as the current export duty, is simpler to administer and provides more stable revenue. But it would tend to be inefficient and inequitable in that the charge could exceed the level of resource rent on some logs. This is particularly the case for high cost operations or high cost logs. Consider a case where a log sold for K200 cost K150 to log in one area but K180 in another area. A fixed *ad valorem* rate of 20 per cent of the log value would see a charge of K40 levied on these logs. It would be profitable to harvest the lower cost log (because K200 > K150 + K40), but not the higher cost log (because K200 < K180 + K40). Thus, some otherwise commercially viable logging would be ruled out under such a revenue system and this is economically inefficient.

The simplest revenue system is based on specific charges, being a fixed Kina or US$ charge per unit of output. The existing landowners royalty is a specific charge set in Kina. Specific charges are simple to administer because they only require a measurement of log volume. And because the charge is independent of log price or logging costs (only varying with volumes), they provide relatively stable revenue. But they are more inefficient and inequitable than ad valorem royalties. For example, if the specific charge is K40 and the price is K200 and costs are K150, it is profitable to log. But as soon as prices fall below K190 it is unprofitable to log and over time logging would cease at these prices. Specific charges need to be regularly adjusted if the adverse efficiency and equity effects are to be avoided.

The current revenue system is a mixture of ad valorem charges (ie. the export duty, some landowners' premiums and miscellaneous levies) and specific charges (the landowner royalty and some landowner premiums). One of the weaknesses of the current system is that the export duty rates increase as the Kina price of logs increases (because the duty thresholds are set in Kina terms). This means that the share of rent captured by the government rises as the Kina depreciates. The problem with this is that the export logging industry is essentially a US$ industry, with revenue and most costs denominated in US$s. A fall in the Kina has very little effect on the level of resource rent when correctly measured in US$ terms. This means the government share of rent should not rise as the Kina falls. To be efficient and equitable, the government share of the resource rent should not vary as the Kina changes.

This weakness of the current export duty is shown in Figures B.1 to B.3 of Annex B. As the Kina rises, the ratio of the government payment to resource rent can rise above 100 per cent (see Figure B.1). This will deter logging and is inequitable. At low US$ prices, the ratio of the government payment to resource rent is also greater than 100 per cent (see Figure B.2).

The problem arises because the export duty is based on FOB revenue without any duty free threshold. In effect, this means that the duty is levied on costs and can be paid even when there is no resource rent (ie. it is payable even when price falls below the logging cost). The level of export duties is also too high for high cost logging operations even under favourable prices (see Figure B.3).

The weaknesses of the export duty system can be lessened if the duty thresholds are denominated in US$ terms (or alternatively in Kina terms with regular adjustments for changes in the Kina). Under such a system, government charges are less likely to exceed the level of resource rent. This is shown in Figures B.4 to B.6 of Annex B, which looks at the revenue system that sets the export duty thresholds at the US$ level that applied when the current system was first introduced (in late 1995).

The performance of an efficient and equitable revenue system is summarised in Figures B.7 to B.9 of Annex B. This system is based on an ad valorem export duty that provides a duty free threshold set at the estimated cost of logging. That is, export duty is only payable when the price exceeds the cost of logging. Under such a system the ratio of the Government payment to resource rent is largely invariant to change in US$ prices, the Kina or logging costs.

Under the current revenue system landowners are poorly placed to capture an appropriate distribution of the resource rent. A key contributor to this problem is the setting of the most landowner payments as a specific charge in Kina terms without a periodic adjustment for charges in US$ prices or the Kina.

The problem is illustrated in Figures B.1 to B.3 of Annex B. As the Kina falls, the landowners' share of resource rent falls because the US$ value of the payment falls. Under the current revenue system, the government benefits from a fall in the Kina but landowners lose (see Figure B.2). The problem would be lessened if the Kina value of landowner payments had been periodically adjusted for charges in the Kina such that the US$ value had remained at the original level (seen at the introduction of the revenue system). The landowners also fail to share in the benefits of a rising US$ price of logs (see Figure B.1).

The efficiency and equity of the current landowner payment system could be improved by providing a link between the landowner royalty and the price of export logs, or better still the profitability of operators. But a system that achieved this would be too complicated for landowners to negotiate or monitor effectively. An alternative solution is to retain specific royalties but provide better information to landowners so they can negotiate reasonable royalties and to also allow for periodic adjustments in the rate as the value of logs changes. Under this approach it would be desirable to set minimum royalty rates as a safeguard against the exploitation of landowners and as a reflection of the non-financial values of a forest.

BOX 7.2 CRITERIA USED TO ASSESS ROYALTY SYSTEMS

The performance of a royalty system is commonly assessed against four criteria of economic efficiency, equity, administrative simplicity and revenue. An economically efficient outcome is achieved when an economy's resources are used in such a way as to maximise community welfare or wellbeing (for a given distribution of resources). In a simple situation it is normally reasonable to see this as achieved when the income generated by an economy is maximised.

Royalties can affect efficiency by changing the incentives facing a logger. For example, consider the case of a log that could be sold for K200 per cubic metre and logging costs excluding royalty (but including a normal rate of return for the logger on capital invested) are K150 per cubic metre. This would leave a resource rent of K50 per cubic metre. If the royalty on a log was fixed at K100 per cubic metre, it would not be profitable to fell the tree and there would be no income for either the landowner or logger. The resource rent would be foregone and the revenue system would be described as inefficient. But if the royalty was K30 per cubic metre for the log, logging would take place, the resource rent would be realised and both the landowner and logger would earn income.

Efficiency also has a time aspect. The forest should be harvested in such a way as to maximise the resource rent over time. So under some conditions it may make sense to set royalties at a high enough level to defer logging to a time when greater resource rent is achieved.

It is important to note that environmental concerns are important when considering efficiency. A royalty system that leads to excessive exploitation of the environment (eg because of over-logging) is very unlikely to maximise community welfare and would normally be considered economically inefficient.

A second criterion used to assess royalty systems is equity. This mainly relates to the distribution of the resource rent, where a key concern is that resource owners receive a fair payment for their logs. Two forms of equity are commonly defined, horizontal equity and vertical equity. Horizontal equity can be thought of as being achieved when logs of similar value receive the same royalty, and achieving vertical equity requires a higher valued log paying a higher royalty than a lower valued log (as a share of rent). Ensuring inter-generational equity is also important.

The two other criteria are administrative simplicity and the capacity to generate predictable and/or stable income. Administrative simplicity covers the cost to logging companies of compliance and the cost to landowners and the government of administration and enforcement. If a royalty system is difficult to understand, it would rank poorly against the criterion.

These four criterion can be in conflict. For example, a royalty set as a fixed rate per log is simple to administer because calculating the total royalty only requires a log count. But it can deter logging if the rate is too high on high cost logs, and this leads to economic inefficiency. A royalty based on the value of the log is less likely to deter logging and more likely to provide an equitable outcome, but it is harder to administer because the log value must be known.

It is important that logging companies cover all costs incurred by the government in managing the forest. Logging companies impose these management costs on government through the need to oversee their operations, and as a general principle of public policy, those that impose costs should cover the cost. These management costs set a floor on the level of government charges. This minimum level is best seen as a user charge rather than a distribution of rent. Unlike a royalty, a user charge paid by logging companies need not be related to the value of the logs harvested. Instead it should be related to the costs incurred in managing the forest.

In setting a user charge to recover the cost of managing the forest sector, the distinction between fixed and variable costs is important. The PNG Forest Authority faces large fixed costs in establishing a monitoring system, such as in setting up an appropriate policy and regulatory environment, training staff, vehicle purchase and setting up regional offices. There is also a variable cost, largely attributable to the time spent preparing official measurements of logs, reviewing operating practices etc. An efficient revenue system would recover fixed costs via fixed charges and variable charges linked to the source of variability in costs.

7.3 OTHER ISSUES

There is a surprisingly low payment of company tax by the forest sector. As shown in Annex A, company tax payments for the sector as-a-whole are estimated to be less than 10 per cent of the operating profit after depreciation of the log export sector even though the company tax rate is 30 per cent. There are at least two potential explanations for the low company tax payments. It is understood that there are no checks or audits undertaken within Government of the company tax returns of logging and timber processing companies and the absence of these checks could explain the low payments. It is important that such checks or audits are undertaken so as to ensure the Government collects an appropriate payment and to curb any incorrect recording by the companies. This point was highlighted by the Bogan Review (see Bogan (2000)). A second explanation is that the profits on log exports are offset by the losses on processing. The extensive company tax concessions provided on processing has probably added to the expansion of processing and what is in effect a dissipation of the profits from log exports. This highlights the potential costs of the current company tax concessions provided to processing.

A case can be made to exempt from export duty any plantation logs developed by the private sector (including landowners) at their own initiative and cost provided that a fair price has been paid for the inputs (in particular land). As a general principle resource rent should be acquired by the owner or generator of that rent, in this case the private sector, and there is no basis for the Government seeking to acquire a share via the export duty. Instead the Government is only entitled to normal income taxes from company profits.

However, it is noted that not all plantation timber is grown on land owned or leased by the private operator, a case in point being plantations developed by Stettin Bay Timber Company on State land (being around two-thirds of the plantation area developed by the company). Further, if the plantation has been developed as an obligation of the timber access rights, it may be arguable that the landowner retains some rights in the plantation timber even though all costs have been paid directly by the logging company.

One of the problems faced in monitoring the forest sector is the variability across data sources on the level of activity. As shown in Table 7.1, the recent data from the Bank of Papua New Guinea (BoPNG) has underestimated the level of exports. This problem appears to arise from the BoPNG's reliance on export documentation obtained from the banking sector rather than the more reliable SGS data. The differences are worth investigating.

The PNG Forest Service records data on log exports from areas for which it manages royalty distribution. This is understood to be all areas other than LFA areas. But there are small differences between SGS data on export volumes from non-LFA areas and the Forest Service data (see Table 7.1). These differences may be worth investigating.

TABLE 7.1 COMPARISON OF ESTIMATED LOG EXPORTS

	Log exports in cubic metres						
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Total Exports by Source							
Internal Revenue Commission	3,050,340	1,998,187	2,625,861	3,006,157	1,612,566	1,983,853	1,992,526
BoPNG	2,943,900	2,512,500	2,607,400	2,375,900	1,066,900	1,312,300	1,398,500
Selected Data							
PNG Forest Service royalty collections	2,005,829	2,070,124	2,275,701	2,520,839	1,198,291	2,004,066	1,896,232
SGS (non LFA areas)	n.a.	n.a.	n.a.	2,202,368	1,211,799	1,641,140	1,760,551

Source: Internal Revenue Commission, SGS, Bank of Papua New Guinea Quarterly Economic Bulletins and Papua New Guinea Forest Service

Under the current export duty system logging companies are required to make their payments in kina. This requires the companies to convert their US$ revenue into kina on the local foreign exchange market. The volatility in the kina has encouraged exporters to time their local payments to take advantage of expected movements in the kina. For example, if exporters expect the kina to fall further they will tend to delay bringing US$ into the foreign exchange market to take advantage of the expected decline. This actually helps bring forward the expected fall in the kina and tends to add to the volatility in the kina. Such strategic behaviour can be of particular concern when the balance of payments position is very tight, such as most recently seen in mid 1999.

An alternative approach would be to require the logging companies to make their export duty payments in US$. This would provide the Bank of Papua New Guinea additional control over foreign exchange and assist the Bank's management of the foreign exchange market. A similar arrangement is understood to apply to the mining and oil sector.

PART 8 ESTIMATED ECONOMIC VALUE OF THE FOREST ESTATE

8.1 THE RATIONALE FOR AN ECONOMIC VALUATION OF FORESTS

The PNG Constitution (Fourth Goal) stipulates use of natural resources to derive maximum public welfare:

"… for Papua New Guinea's natural resources and environment to be conserved and used for the collective benefit of us all, and to be replenished for the benefit of future generations."

Source: National Forest Policy, Ministry of Forests, 1991

The current forest revenue regime consists of a tax system for commercial-scale logging activities. It is focussed on capturing a share of financial proceeds from the sale of commercially harvested logs. The primary underpinning of the tax schedule is the perceived ability of firms operating in PNG to pay export taxes and royalties, based on the volume of timber harvested.

In addition to the proceeds of commercial-scale harvesting, forests in PNG provide a multitude of values, in the form of tangible goods and services used directly by landowners, and indirect benefits including maintenance of basic production inputs such as soil and water. They also evoke intangible values relating to natural heritage and culture. Moreover, they may hold commercial and non-commercial assets that are as yet inaccessible, i.e. they have an option value.

It will be difficult for landowners and government to maximize and sustain forest-derived welfare without some understanding of these values and how they may be changing over time or affected by current uses. Most pertinent to this work is modifying the current tax system so that it recognizes a fuller range of forest values, promotes the efficient use and beneficial evolution of these values over time, and prevents them from leaking out of the country.

The flow of forest values is capable of being disrupted, diminished, or enhanced by commercial-scale harvesting activities. The scope, scale, and developmental pace of commercial activities is, in turn, affected by the type of tax structure imposed on the forest industry (among other variables). The flow of non-commercial benefits from forests, consequently, is affected by how commercial scale entities are taxed and managed.

Changing the basis of the forest revenue regime from the firm's ability to pay to national welfare requires acknowledging that forests have multiple values that vary spatially and can be diminished or enhanced by commercial-scale timber production activities. Realigning the basis of PNG's forest revenue regime in this way would seem to make an important aspect of forest policy significantly more compatible with the country's constitution.

In terms of human welfare maximization, there are additional reasons to address the full range of forest values. Many aspects of forest use result in positive or negative outcomes that do not affect the behaviour of primary forest users. Of concern is when the use by one party results in the loss of benefits by another forest user. For example, commercial timber cuts that do not adhere to established codes of practice may indirectly diminish the availability of high quality drinking water and the reproductive success of food fish in adjacent locations. The loss of these benefits (some time later) does not directly influence the behaviour of the logging firm; it does impose costs upon other forest users. If such costs could be recognized, a basis for avoiding or compensating for them can be established. Likewise, recognizing the indirect benefits forests provide (e.g., maintenance of drinking water supplies) is a first step toward capturing such values in ways that directly and positively affect

the efficiency of forest allocation. Valuation can provide the raw material for more efficient forest use decisions.

Yet even an intimate knowledge of the range of forest values does not guarantee that forests will be used in the best manner possible for the collective benefit of the nation. In large part, knowing values is of limited use unless actions that will result in full capture or internalisation of the values by the parties who dictate forest use can be successfully implemented. For example, there are individuals outside PNG who are willing to pay toward the protection and management of the biodiversity contained in some forests. There is currently no mechanism that would allow such individuals to act on these intentions by providing tangible benefits to landowners; consequently, such conservation values are unlikely to affect landowner decisions. Likewise, the decisions of a logging firm that is indirectly imposing costs on other forest users is unlikely to change unless such costs can be imposed directly on the firm.

The first step in mitigating the above situations is more fully accounting for values associated with current use of forests (i.e. moving from a financial to an economic underpinning), and recognizing where important values are being externalised from forest use decisions or escaping capture by the nation altogether. Invariably, some of these values will be attached to tangible direct benefits while others are linked to indirect services and intangible values people attach to forests (making some values simple and others nearly impossible to address quantitatively). Underpinning a forest revenue system with an economic derivation of the full range of forest values will involve addressing both of these types of values.

8.2 FOCUS: NATURAL FOREST LOGGING

This first effort is focused on obtaining a more realistic view of the value to PNG of natural forest logging, given that this review is tasked with reorienting the underpinning of the (industrial-scale) forest revenue regime. It is a departure from previous revenue reviews because it formally recognizes non-logging values of forests. It focuses on accounting for a greater spectrum of values associated with natural forest logging to obtain a partial picture of the value of logging from the societal welfare or economic perspective, rather than the perspective of maximizing rent capture from existing commercial stands.

PNG forests underpin incalculable goods and services for the country. Attempting to value all of them comprehensively without a notion of which decision problems need to be addressed first is unlikely to promote forest policies that result in enhanced and lasting benefits from forests. Natural forest logging is seen as the starting point for economic valuation because it occupies centre stage in the forest sector, from the industrial-scale perspective of government. For many years it has been relied upon to capture significant levels of foreign currency using a revenue regime. Forest plantations and processing industry have played relatively small roles in currency capture to date; hence, they are not analysed directly in this effort. There are additional reasons:

- Natural forest stands are, for practical purposes, not a fully renewable resource. Hence, as available stands become smaller, a national asset is diminished in value.
- Third-party effects stemming from the environmental ramifications of natural forest logging are more significant relative to other forest uses that are either currently or potentially relevant to the current revenue regime.
- Natural forest logging is probably in a state of decline, given current and probable future external market conditions and the size and nature of remaining natural stands in PNG. Consequently, there is a growing need to structure the tax system so that it facilitates a smooth transition away from a dependence on natural forest logging.

8.3 A FIRST STEP TOWARD ECONOMIC VALUATION

The goal of this work is to articulate a pragmatic incremental process for generating such an economic underpinning. It takes several broad steps:

Creates a partial picture of PNG's forest values by using the range of values derived throughout the world's humid tropical forests to suggest indicative values that are likely to have some transferability to PNG. While some quantitative estimates are employed, the effort is focused on illuminating the relative magnitude and significance of the full range of forest values, not providing an absolute derivation.
Recommends steps that can be used to gain increasingly more accurate pictures of PNG forest values, and, most importantly, link such studies to the most pressing forest policy problems.

Specifically, it takes several steps to derive an economic underpinning for the forest revenue regime:

The financial profitability of logging and rent capture by government and landowners is used a starting point.
Recognizing that logging incurs unaccounted costs that directly affect human welfare, it uses available information and simple assumptions to begin accounting for the most significant and quantifiable costs. Costs considered are related to environmental and social effects of logging, and the fact that the initial natural forest cut is worth substantially more than any subsequent cuts.
It also recognizes that logging creates assets (e.g. infrastructure) and secondary flow-on benefits that are not captured by financial analyses but which also affect human welfare. Attempts are also made to account for these factors.

It notes limitations and takes steps to circumvent them:

- It acknowledges that information necessary to quantitatively and comprehensively estimate forest values is either unavailable or incomplete at this time.
- It takes a subjective venture at estimating economic values in order to initiate a process.
- It concedes that some values will never be quantified and, therefore, must be represented and accounted for using other means, assuming they are important to pressing decisions.
- It recognizes that there is significant spatial and temporal variability with respect to these values. Therefore, this work derives lower-bound values that can be applied more broadly with greater confidence.
- It focuses on values that could be affected by commercial logging activities upon which export duties and landowner royalties are imposed.

8.4 THE ROLE OF FOREST TAXATION

Current tax policy captures and distributes forest rent resulting from the harvest and export of raw logs on a commercial scale. In turn, it influences the behaviour of firms that, in the process of generating financial benefits, are capable of imposing direct or indirect costs and benefits on forest users. There are several categories: environmental and social costs resulting from the biophysical and social ramifications of logging operations; displacement of other potential forest uses that could result in the capture of non-commercial benefits; follow-on or multiplier effects from employment and developed infrastructure.

Addressing the welfare effects from the complex mix of economic costs and benefits would almost certainly require a range of institutional, political, and social interventions. Tax policy may be able to contribute in several distinct ways:

- Accounting for benefits and costs that are external to the financial decisions made by logging operators, but that have welfare effects for landowners and the nation.
- Accounting for effects on the public goods that are necessary to maintaining a constant flow of forest values.
- Creation of an economic environment in which the decision to engage in commercial logging is made with a fuller view of the value of alternatives.
- Elimination of some opportunities for malfeasance that result in the leakage of forest values out of PNG.

Specifically, limited forest valuation can provide the basis for informing effective tax policy intervention if certain conditions are met:

- Values are directly relevant to a decision problem relating to forest use, enhancement, or protection (i.e. values reflect the real incentives facing forest resource users and owners).
- Pertinent values can be ascertained precisely enough so that decisions that rest upon them result in enhanced economic welfare most of the time (in a fashion that is believable and relatively simple to explain).
- Tax imposition holds promise for interfacing previously displaced or unrecognised forest values with on-the-ground forest allocation and management decisions, and overall forest allocation policy for the nation.

Several specific decision problems could be addressed with an amended tax policy that is underpinned by knowledge of the full range of economic values.

8.4.1 Forest Asset Depletion

Forests have a finite potential to provide a return to forest users through the myriad of possible uses (what is being realized may be another matter). Any activity that results in the reduction of such potential is imposing a cost on future users. Commercial harvest of natural forest involves the liquidation of a resource (i.e. initial cuts of natural forest) that is non-renewable. Subsequent cuts will command significantly lower financial returns, assuming they are viable. Taxing natural forest cuts potentially solves this intergenerational equity problem if tax proceeds are successfully used to create alternative assets (e.g. education, infrastructure) that fairly compensate future users for the loss of potential returns from the initial cut.

8.4.2 Landowner Costs

Environmental and social disruption (even under the best circumstances) imposes costs on landowners. The real value of logging to landowners, consequently, is equal to the payments made to them minus such costs[23]. Unanticipated costs borne by landowners have reduced the real returns of logging to landowners. The effect is acute where multiplier benefits from logging are weak and appropriate and well-maintained infrastructure falls short of expectations. The effect is probably most acutely felt in areas that upon project inception had no previous experience with the implications of logging. The problem is almost certainly exacerbated if landowners were not aware of alternative economic options or the commercial value of trees on their land when agreements to log were made. Forest taxation may be able to partially rectify the problem by identifying some payments as compensation for these costs. Efficiency is enhanced when the behaviour of loggers and the sites selected for logging are tied directly to a more complete accounting of relevant costs and benefits.

[23] The focus is on costs because at least some of the secondary benefits from logging have been accounted for through a formal audit process. Audits identify the cost of developed infrastructure and award credits toward industry payments to government and landowners (See Groome Poyry report).

8.4.3 Sub-optimal Selection of Logging Over Alternatives

Meaningful consideration of the full value of forests means that commercial logging is one of numerous options that, in welfare maximization terms, should "compete" against others to provide the greatest welfare to owners. The current tax system, because of its orientation around logging, potentially biases land use in favour of logging: It instigates a powerful political force by creating financial flows that are augmented by the one-off payment from natural forest cuts. Moreover, logging is supported and promoted by a government agency (PNGFA), a favourable condition that does not apply to many alternatives. A tax system that contributes to these ends can do landowners and the government a disservice by encouraging them to select logging without giving unbiased consideration to alternatives.

In addition to the focus on commercial logging there are other factors that inhibit the capture of all forest values: some forest goods and services are tied to national or global markets that remain inaccessible to landowners that decide forest use. For example, there is a national demand for the maintenance of ecological functions (to conserve soil and protect water quality) required to ensure that forests assets can continue to provide a steady return to human endeavours. If they are not maintained, then the supply of valuable factors of production (such as fertile cropping land) declines and benefits are lost. It is a rational response of landowners – and loggers – to ignore the potential effects on ecological functions if there is no benefit or cost to their action (logging operations are, after all, profit maximizing firms beholden to shareholders). The same situation arises in relation to global markets for biodiversity services and carbon offsets.

There are potential solutions available in the form of mechanisms that may bridge the gap between local costs (the economic environment faced by landowners and loggers) and global benefits. The premise is that forest-derived welfare would increase if local-level forest users could tap into national and international markets for forest goods. In other words, some potential markets are being overlooked, most notably the national market for ecological functions that form a cornerstone of many land-based economic options, and biodiversity services, an emerging market on which PNG may be in a premier position to capitalize.

8.4.4 Flow-on or Multiplier Effects

In addition to direct payments made to government and landowners, natural forest logging results in other indirect benefits not normally accounted for in financial analyses:

- Employment is created at logging sites (private) or by government (public) that has both direct benefits (wages) and flow-on effects (boost to consumption). Employees pay taxes that augment the direct benefits to government and flow-on effects resulting from government budget expenditure (e.g. boost to consumption).
- Infrastructure is created either by logging companies or through government-sponsored programs. It creates direct benefits and can promote flow-on indirect benefits that are linked to better access to markets, improved education, and better health care.

The direct values are relatively simple to treat quantitatively. These generally involve the sum total of wages to PNG National and cost of developed infrastructure. Accounting for the indirect flow-on effects is a much more difficult and information-intensive exercise. Flow-on effects only occur in the presence of a sufficiently developed and diversified domestic economic architecture that can facilitate the spread and augmentation of wealth effects and other benefits.

For example, when a wage earner spends income in a remote area in which mostly imported goods are available, few flow-on benefits are created (currency is leaked out of the country and few if any jobs are created for nationals in the process of supporting such transactions). Roads created for logging

purposes may only marginally enhance access to markets (spawning new businesses) if they are not part of a planning process that recognizes non-logging needs, and if other aspects of successful business development (such as human skills or knowledge of untapped markets) are absent[24]. Sealed roads may reduce the maintenance costs of vehicles, but this may produce few flow-on benefits if vehicles are imported, and primarily owned and maintained by expatriates or outsiders. Schools produce few benefits if skilled teachers are not consistently available to teach in them.

In short, flow-on or multiplied benefits are likely to be scant where economic structure is undeveloped or incomplete, markets are immature, or distorted by monopolistic elements, and necessary supporting elements (such as government services) are absent. The degree to which such conditions prevent flow-on benefits in PNG is highly variable across the country: some areas will benefit significantly while others almost not at all.

8.5 ESTIMATING THE FULL RANGE OF FOREST VALUES

Economists commonly conceptualise forest values by using the total economic value (TEV) of an environmental asset method (See Pearce and Turner, 1990)[25]. TEV divides all values into use and non-use values that are, in turn, subdivided again into various other categories. Many of the subcategories relate to intangible values such as option and existence values of forests. While intangible values are likely to be important in PNG, they are not valued in this work for several reasons: there is a paucity of data and information relating to them, and resource owners and government cannot easily capture them (and thus they have a very small bearing on how forests are actually used and managed).

Still, a significant step is taken toward replacing the financial underpinning of today's revenue regime with an economic one. A spreadsheet model is specified that accounts for previously overlooked forest values that broadly affect human welfare in PNG in the short and long-term. It estimates both the financial return and the economic (welfare) value of natural forest logging from the perspective of the nation. Every national is assumed to receive logging benefits either directly as a landowner, indirectly through government, or both. Hence, the total value is equal to the sum of net benefits enjoyed by landowners and government.

The focus of this effort is accounting for several types of use values:

- The value of the depreciation of natural forests as an asset due to the commercial value of the first natural forest cut[26],
- The costs that landowners bear when commercial-scale logging operations impact local-level environments, and
- The flow-on or multiplier effects from logging (simple equations for both financial and economic value of natural forest logging are found in Table 8.1 below). These first two values are selected because they meet several criteria:
  - they directly relate to tangible goods derived from forests that are commonly used to satisfy landowner needs for stable foods, shelter, and livelihood security (thus spatial variability is likely to be relatively small).
  - they represent forest benefits that are commonly enjoyed by the vast majority of the population in PNG and can be reasonably valued in a believable fashion using existing

[24] This is especially true if they are maintained exclusively for the purpose of logging and left in a state of disrepair after logging in the area has terminated.

[25] A full explanation of TEV is beyond the scope of this report.

[26] The forest is treated as an asset that can be employed to either deliver streams of benefits over time in its current form, or be partially transformed to other types of assets capable of delivering equal or greater benefit streams.

information and a few simple assumptions (thus they represent values that are easily perceived and widely cared about in the short-term).

- accounting for them is consistent with PNG's constitution.

The effort is preliminary because it uses lower-bound values for tangible goods and indirect benefits only (derived from transfer values)[27], and does not account for all forest values. In order to take a first step that can be broadly accepted, estimates of landowner costs and forest asset depletion are conservative, and estimates of flow-on effects give the benefit of the doubt to logging enterprises, despite the fact that significant flow-on effects seem unproven given the incomplete and distorted nature of many economic systems observed during field visits to logging sites. While this effort should be used to adjust the system to reflect some previously disregarded costs and benefits, it should be followed up with more complete economic estimates of forest values that are, at least in part, based on empirical data collected in PNG. Also, thought should be given to creating an alternative to method (that does not rely on multipliers) for estimating flow-on effects, especially for areas characterized by incomplete and distorted economic systems that are highly isolated from major market channels.

The primary output of the model is estimates of the both the financial and economic value to landowners and government of a typical natural forest logging operation. On balance, the economic value of logging is different from the financial value from the national perspective because the economic analysis introduces additional costs and benefits (see Table 8.1).

Commercial-scale logging concessions generate monetary flows that are tied to the value of natural forest cuts. The vast majority of cuts are from stands that have accumulated over 100 years or longer and can deliver a premium one-off value that can't be duplicated. Subsequent cuts will generate a substantially lower return to all parties involved (40% lower is assumed for this work). This leaves future landowners with an asset that is able to deliver only about 60% of what current owners enjoy (in terms of commercial logging and almost certainly other goods and services).

The model accounts for the loss of the one-off value by estimating the cost of creating an alternative asset that is equal in monetary value (in present value terms) to 40% of the first cut. Specifically, it estimates the cost of enrichment planting and forest management that would be required to ensure that a second cut is viable (and likely to be worth about 60% of the first cut). It also simulates the creation of an alternative asset by estimating the monetary flow required to generate an annuity[28] that would be worth 40% of the initial cut after 40 years (the end of the first cutting cycle). Investment in plantations and processing operations also create assets that are worth the value of sustainable employment, infrastructure, and lasting follow-on effects that would be available to multiple generations of Papua New Guineans.

Landowner environmental costs valued are tied to subsistence activities, small-scale cash cropping, collection of non-timber forest products (NTFPs), and ecological functions that maintain soil stability, water supply quality, and other hydrologic and geomorphologic conditions that underlie rural economies across PNG. It is assumed that environmental disturbance will result in costs to landowners, even under ideal conditions in which logging codes of practice are followed. Environmental costs can take on numerous forms: for example, sago palms and other food-bearing trees may be accidentally disturbed, sediment flow regimes negatively altered, and labour requirements to collect stable goods such as firewood or building materials increased. Moreover, for

[27] Given the high spatial variability across PNG of conditions that influence such values and the general paucity of good empirical information, a conservative approach is taken to target lower bound values that can be applied more broadly with greater confidence (employing a "base case" scenario). Long-term recommendations address the need to undertake empirically based work that encompasses a greater scope of values that can be captured. There is also a need to identify how values change according to varying site characteristics.

[28] Use of an annuity fund is strictly for the purpose of simulating a lost benefit and does not imply that this mechanism should be recommended for implementation.

all the trees cut and exported, there will be potentially valuable stems destroyed for which landowners collect no compensation.

To an uncertain degree, logging natural forests is incompatible with other forest uses. The model estimates the value of displaced goods and services (only) by assuming that logging displaces about one-third of the total value of these benefits (to derive landowner environmental costs). All values are based on lower-bound estimates of local-level goods and services that represent the minimum core benefits which typical rural communities derive from natural forests. Given that there is little empirical data on subsistence values, NTFPs, and ecological function value, a range of values is employed that are transferred from numerous studies of resource use by rural communities in tropical forests in other counties. A proxy or placeholder value is derived using the lower end of the range of values reported in an array of studies (primary source of summarised values: Linddal and Lubowski, 1999).

Normally, the value of the next best alternative (opportunity cost) is also accounted for in economic valuations. Opportunity costs are assumed to be zero in the model, due to the large perceived variability of such alternatives, and the likelihood in many areas that another economic option (especially one that viably generates cash) is unavailable in the near term.

The flow-on effects from logging are accounted for using simple multipliers (that magnify the value of direct benefits to simulate a flow-on value). They multiply the value of direct payment made to government, wages paid to PNG Nationals, and estimates of the value of developed infrastructure. Flow-on effects are equal to about one-third of the total direct value (e.g. export taxes and salaries paid); this means that for every three Kina collected through the forest revenue regime, another 1 Kina in value is created through secondary economic activity. The assumed multiplier should be viewed at this time as "placeholder" that recognize that flow-on values exist, but is very preliminary and has virtually no known empirical basis. Obviously, more work is needed in this area.

TABLE 8.1 MODEL DEFINITIONS – RENT, FINANCIAL AND ECONOMIC RETURNS

Forest Rent =	**Financial Return =**	**Economic Return =**
fob International Price ($US per cubic metre)	Sum of rent captured by government (1)	Sum of rent captured by government (1)
–	–	–
Cost of logging (private fixed and variable cost to industry, including 'normal' profits)	Cost of administering the logging industry (forest authority and SGS)	Cost of administering the logging industry (forest authority and SGS)
	+	+
	Sum of rent captured by landowners (2)	Sum of rent captured by landowners (2)
		–
		Landowner costs: environmental and social costs of logging
		–
		Forest asset depletion
		+
		Flow-on/multiplier effects (from employment, infrastructure, expenditure effects)
		–
		Opportunity cost of next best alternative to logging

1. Proceeds from export taxes, reforestation and agricultural levies.
2. Proceeds from royalties, Project Development Benefits (received as infrastructure and cash), negotiated premiums, and employment salaries.

To estimate financial and economic returns to landowners and government, the model simulates a base case natural forest logging enterprise in PNG (Table 8.2).

TABLE 8.2 BASE CASE MODEL – NATURAL FOREST LOGGING IN PNG, ASSUMPTIONS AND SOURCES

Parameters	Assumptions	Sources
Timber yield (in operable area):	30 m^3 per hectare	Review team assumption
Gross concession area:	150,000 hectares	Review team assumption
Net operable area (65% of gross):	97,500 hectares	Review team assumption
Project time horizon:	40 years	Review team assumption
Area harvested annually:	2,437.5 hectares	= Operable area /time horizon
Annual export volume:	73,125 m^3	= Area harvested annually X Timber yield
Average FOB log price:	58 $US per cubic metre	-
Assumed export tax rate (%FOB):	36%	Current tax schedule applied to FOB price
$US/Kina exchange rate:	0.28	-
Volume exported annually by PNG:	1,750,000 m^3	SGS reports
Annual Government budget (Forest Authority and SGS):	21 million Kina	Ministry of Finance (most recent figures)

To estimate an economic return to landowners and government, the model makes additional calculations and assumptions (Table 8.3).

Key findings, conclusions and recommendations on the economic value of the forest are presented in Part 10 along with those pertaining to the earlier parts of this Review. First, however, it is necessary to consider one of the terms of reference that does not fit easily into to general pattern of this Review.

TABLE 8.3 BASE CASE MODEL – ECONOMIC DERIVATIONS, ASSUMPTIONS AND SOURCES

Parameters	Assumptions	Sources/Remarks
Landowner environmental costs	Accounts for modest (33%) displacement of direct/tangible goods: Cropping (own consumption) Cash cropping Bush meat/fish Collectable foods such as nuts/fruits Building materials Medicinals Indirect use: Soil retention Water quality effects	Sources: 1. Linddal and Lubowski, 1999. 2. Lampietti and Dixon, 1995. Remark: Transfer data derived from summaries of empirical findings from studies of resource direct/indirect use in tropical forests (NTFPs, ecological functions only) Remark: Cash cropping and cropping for own consumption assumed to equal about 28% of average per capita income recorded for PNG
Landowner social costs	No treatment in model	Remark: paucity of data and difficulty of translating highly variable social outcomes into economic costs/benefits
Forest asset depletion	Simulates cost of alternative asset creation to compensate for loss of financial value associated with initial cut; uses an annuity that matures after 40 year time horizon	Source: Consultant assumption Remark: Assumes real rate of return of 2% per annum Remark: Cost per m^3 set to generate a fund that equals 40% of the net present value (@ 7%) of initial cut at year 40
Flow-on/Multiplier effects	Assumes that benefits are created when logging company employees spend wages and infrastructure creates better access to markets, jobs, etc. Also assumes flow-on benefits are created through government expenditures and employment.	Source: Various multipliers reported for PNG Remark: Results of field visits suggests that multiplier effects are very small or even negligible, especially in areas where logging operations represent the single significant source of cash income and employment
Landowner opportunity costs	Assumed to be zero	Remark: Assumed to be too uncertain and variable for treatment in a base case model

PART 9 AN INDUSTRY PERFORMANCE BOND

9.1 DESCRIPTION

Section 87 of the *Forestry Act 1991* requires the performance bond to be fixed for each Timber Authority issued, and Section 98 gives details of how this provision is to be implemented, not only in respect of TAs but also of Timber Permits and licences.

The bonds are generally intended to secure payment of royalties and other levies, and may be drawn on by the PNGFA in the case of default by the holder. In certain case, the PNGFA may require the lodgement of an additional accumulating bond, comprising a percentage of the fob value of each export shipment, as security for the performance of subsequent obligations.

For the holder the bonds represent an additional cost, being the opportunity cost of the return on these funds, had they remained part of working capital, less the interest earned through the bank where the deposit has been made, which still belongs to the holder. This cost might indeed be negative.

The magnitude of the bond is calculated on estimates of two-month royalty-equivalents, and in the case of domestic processing Timber Authorities it is based on one-sixth of the annual allowable cut. When additional landowner premium levies are payable those are factored in to the calculation as well. Amounts are specified in Schedule 4 of the Act.

The performance bonds are a *sine qua non* for the operator, as until the bond is lodged the Timber Authority is of no effect. The bond is only released on the Managing Director of the PNGFA's written authority and this is only forthcoming once the completion report has been submitted to the Resource Development Division, and there has been an opportunity to inspect the Project Area.

In the case of a breach of the Agreement, conditions, or requirements, the PNGFA may drawn upon the bond only after following the correct procedures and only to the extent determined by the nature of the breach. The holder must reinstate the amount drawn within 30 days of being notified of the withdrawal.

The holder and his bank must provide evidence of lodgement of the bond to the PNGFA.

9.2 RATIONALE

The rationale for the bond is to protect the issuer of a valuable permit, authority or licence (the Government) against default by the holder in any respect. It is logically appropriate that the existence and magnitude of the bond should be proportional to the actuarial risk of default and the probable levels of damage suffered by the issuer in that event. Thus, to take the extreme case, for a wholly trustworthy holder operating in an environment free of adverse business events, the bond size would be zero, but in a situation with poor legal enforcement of contracts and highly risky trading conditions, the bond size might be so large that the holder would be unwilling to proceed with the application.

In between such hypothetical extremes, there must exist actuarial data on the extent and magnitude of default. Such data, if it exists, has not been available for the Review Team to consult, so the proper analytical approach is difficult to apply. However, the issue is one of the Terms of Reference and must be addressed.

The classic use of performance bonds is in the area of large engineering contracts for public authorities, in which case the deposited sum normally exceeds the total value of the contract. In effect,

this is a form of guarantee, with the bank agreeing to release the bond to the contractor's client in the event of default on services to be rendered. The contractor can also indemnify himself against loss of the bond in circumstances beyond his control by taking out an insurance policy or arranging another form of indemnity. So, for some price, there is always an economic agent willing to shoulder the risk.

PART 10 KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

10.1 STRUCTURE

In this final part of the Review, we address under each heading (key findings, conclusions, and recommendations), the four important core issues, namely the economic value of the forest estate, the forest industry, transfer pricing, and resource rent.

The key findings begin with the study of the economic value of the forest, primarily as it is more fundamental than the financial analysis findings, but also because this Review is the first study commissioned by the Government to examine the worth of the national forest patrimony. For both reasons, it needs to be set in the context of the other terms of reference and this will be easier for the reader to do if it precedes them.

The next step is to consider the findings on the industry, which will essentially be summaries of the results obtained in Part 3. The resource rent study, Parts 5, 6 & 7, is the core of the analysis, but in order to consider it transfer pricing (Part 4) must first be considered because its existence and magnitude would alter the results of all other calculations.

The components of conclusions and recommendations are treated in the same sequence.

10.2 KEY FINDINGS ON THE ECONOMIC VALUE OF THE FOREST ESTATE

After adjusting for previously unaccounted costs, the net economic return to natural forest logging, as predicted by the model, is significantly positive (about 100 kina per cubic metre exported log). While the model outlined in Part 8 produces some insightful findings, it should be carefully interpreted. First, these values correspond to what has been captured; current and probable future market conditions do not augur well for continued flows on these terms (this subject is addressed in several other sections, especially in Part 2). Secondly, the value to the nation in societal welfare terms is almost certainly less than predicted values:

- Given the general paucity of good empirical information, the model assumes conditions that are in most cases overly idealistic. For example, it assumes that forests are managed for a second cut and areas of obviously high conservation value are not logged, etc. The model predicts values based on conditions that should apply, not the conditions that are probable in PNG. With additional information, the model could be updated to simulate more realistically actual conditions.
- Many important values that are likely to be diminished or displaced by logging are not addressed by this preliminary effort. For example, the social ramifications of logging are not addressed.
- Transfer values from other studies are used to estimate environmental values relating to non-timber products, subsistence-based activities, and the maintenance of soils and water quality (so-called ecological functions). Only values from formal empirical studies of forests in the humid tropics were considered. However, because it is not known how relevant these values are to PNG forests, estimates are purposefully conservative.
- It is anticipated that further study would reveal that landowner costs especially are greater in most instances, although spatial variability is certainly very significant.
- Environmental costs estimated by the model are likely to represent areas that do not have outstanding considerations related to fragile forests, high endemism, extreme terrain, or other biophysical features that typically coincide with high conservation value. Model predictions

would not hold under such conditions, and logging may be altogether unfavourable, from a welfare perspective, if such features are present.

Flow-on benefits from logging are highly uncertain and variable, being dependent on a number of previously discussed conditions. In economically disadvantaged areas, it is possible that flow-on values are relatively small or even negligible, while they could be higher than values predicted by the model where conditions allow. Simple multipliers used in the model are designed to represent a scenario in which at least minimal economic structure exists to allow the spread and magnification of expenditures brought about through logging enterprises. In fact they may not fairly represent the logging sites observed by the Review Team during brief field visits to logging operations and surrounding communities in September and October of 2001.

In summary, model conclusions best represent areas that exhibit several base conditions:

- Low or perhaps modest conservation values.
- Sufficient economic and institutional architecture to facilitate flow-on effects.
- Low or negligible propensity for social conflict.
- Absence of transfer pricing or other forms of malfeasance.

Areas that do not meet these conditions are likely to have significantly higher environmental costs, the possibility of social unrest, and much lower flow-on benefits. Consequently, in areas that do not exhibit these features, logging would almost certainly compare unfavourable to alternatives – from the societal welfare perspective of PNG nationals and their descendents.

10.2.1 Model Findings

Derived values suggest that landowners appear to be much worse off when environmental costs are considered. Accounting for such costs, even when offset by previously unaccounted flow-on/multiplier effects, suggests that the return to them is about 70% lower than financial estimates would indicate. Net benefit drops from about K29 per cubic metre to about K9 per cubic metre (see Figure 10.1).

The model estimates that almost $US 7 per cubic metre would be required to compensate for the overall net cost or "burden" borne by landowners during logging operations[29] (see Table 10.1 for a breakdown of this estimate). The finding implies that this amount paid to landowners makes them as well off with logging as without. Any benefit from logging to landowner welfare would require compensation in addition to $US 7 per cubic metre. Figure 10.1 indicates that after landowner costs are accounted for, about 9 kina per cubic metre remains. By definition this is the economic return to landowners at present.

Conversely, the economic values of natural forest logging derived through government appear significantly greater than the financial values because flow-on effects are accounted for (and environmental costs are borne by the landowners, not government). Values on the government end are estimated at about K91 per cubic metre, an increase of about 39% over the strictly financial return to government.

Overall, the differences between financial and economic values appear negligible and uncertain after this initial effort. On balance estimated flow-on benefits slightly exceed previously unaccounted costs. See Table 10.1 for a breakdown of the costs and benefits that differentiate financial from economic derivations.

[29] Recall that this figure represents a lower bound of only the factors that the model is able to represent. Many more forest values exist that remain unaccounted.

The estimated total net economic value (to landowners and government) of one cubic metre of log is about K100 or $US 28, providing the four conditions above are met.

FIGURE 10.1 ANNUAL NET RETURNS TO NATURAL FOREST LOGGING IN PAPUA NEW GUINEA (2001)

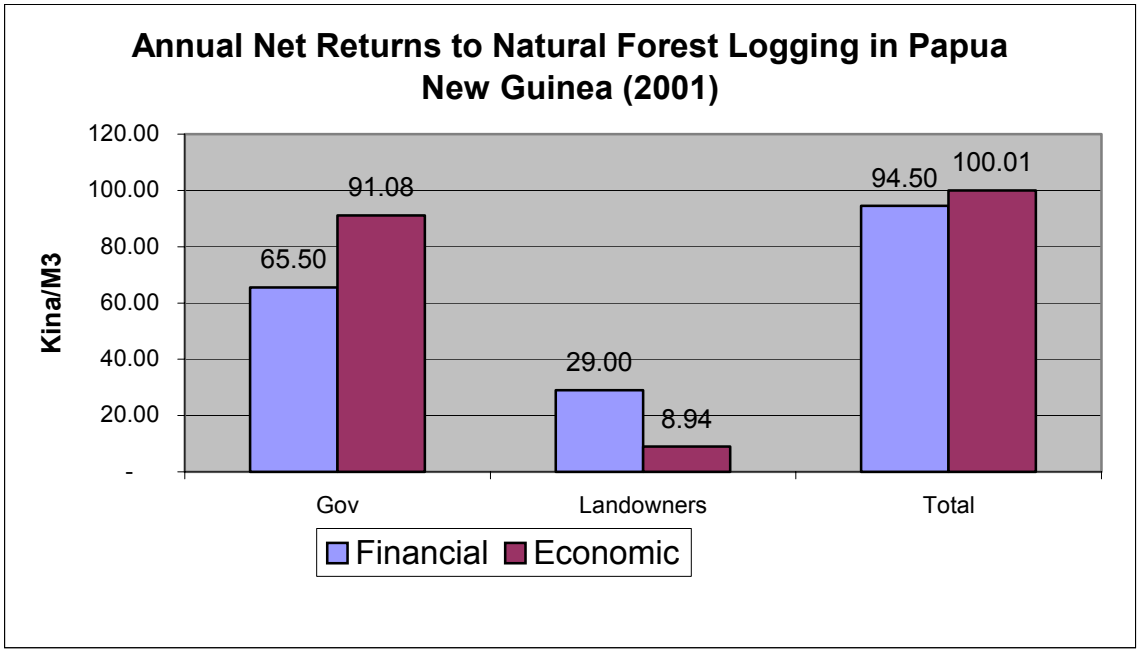


TABLE 10.1 BREAKDOWN OF LANDOWNER COSTS AND FOLLOW-ON BENEFITS

Cost/Benefit Component	$US per cubic metre	Kina per cubic metre
Economic Costs of Logging:		
Limited enrichment planting and land management	1.54	5.50
Creation of alternative asset to compensate for one-off value of initial cut	2.10	7.50
Environmental disturbance (cropping, NTFP, ecological effects, etc.)	3.25	11.62
Social disruption and related effects (1.)	-	-
Opportunity cost (1.)		
Total	6.89	24.62
Follow-on/Multiplier Benefits of Logging		
From Government expenditure/employment/infrastructure	7.16	25.6
From logging employment	0.55	2.0
From infrastructure provided by logging companies	0.72	2.6
Total	8.44	30.13

These values are likely to be positive in many cases; however, they were not estimated quantitatively due to a paucity of information and resources.

10.3 KEY FINDINGS ON FOREST INDUSTRY

10.3.1 Export Logs

The analysis indicates that when average costs are applied, log exports are currently unprofitable for all price levels of logs, and losses are greater for lower value logs. The logging industry continues wherever companies can meet "cash ongoing costs". Integrated companies are better placed than stand-alone companies as they can re-allocate head office overheads to other more profitable activities.

10.3.2 Processing

The small, integrated sawmill/added value processing operation is the most profitable under all tests; saw milling is more profitable than the three board product options, which either have negative financial internal rates of return (plywood and medium density fibreboard) or are very marginal (veneer).

The small, integrated sawmill/added value processing operation also demonstrates the least loss of Government revenue per national job created from foregone log export taxes, followed by the re-locatable eco-mill (whose products are not exported). All other processing options show relatively high rates of loss of Government revenue per national job created.

10.3.3 Market Outlook

Plywood and sawn timber demand (the main uses for PNG's logs) face the lowest projected growth rates of all wood products in the Asia Pacific region over the next 10 years. Wood substitutes are a larger threat to tropical timber market penetration into markets than competition from alternative suppliers of wood products. On the supply side, plantation log production (predictable with greater precision than natural forest harvests) is expanding rapidly. There is a shift to softwood logs (particularly as core veneer), and competition from non-plywood wood panel substitutes that can be produced from small diameter logs and wood or agricultural residues.

Factors with uncertain effects include the Russian Far East forest reserve, Asian pulpwood forests being grown on to sawlog dimensions, China's per capita income growth and the exhaustion of her domestic sawlog supply, carbon credits, and green consumerism associated with certification, demanding changes in social as well as environmental management.

10.3.4 International Competitiveness

Compared to her South East Asian competitors, Papua New Guinea has been hampered by high labour cost (recently decreasing) and low labour productivity, reliance upon expensive expatriate technical staff, high internal and external freight costs, high energy costs, and high overhead costs affected by remoteness, security, secondary support services and managing landowner liaison.

Against the same yardstick, the forest resource is more diverse, rights of use are more insecure, and landowner disruption more common. A new aggravating factor is the implicit input subsidies to Indonesian mills from illegal logging in that country.

Processing is afflicted by relatively ineffectual management, which is reflected particularly in the low conversion rates. The domestic market is small and unable to utilise many non-exportable lower grade and residue outputs. Owners are reluctant to invest in new technology, because of the perceived low returns and high risks. New mills announced will not necessarily be equipped with new machinery. Such mills cannot operate profitably in current conditions, but may serve other purposes in corporate

strategy, such as political leverage for future resource allocations of neighbouring forest areas to the incumbent concessionaire, or the whole enterprise, resource rights plus processing facilities, may be "packaged" and later sold *in toto* when market conditions improve.

10.4 KEY FINDINGS ON TRANSFER PRICING

Papua New Guinea has a well-established system to monitor and control exports (section 3.1). It covers volumes, species, grades and prices. At the field level, volumes, species and grades are physically checked. The field data is compared with information provided in the export documents. The only weak point of the monitoring process is the price information, where the work is limited to comparison with approved prices, and these are simply projections of recent locally observed data.

10.4.1 Japan

The result of the assessment made on log exports to Japan highlights an unexplained difference between fob log prices reported in PNG documents and cif prices reported in Japan. Two reasons were identified by this study that might explain the discrepancy found:

- Cif prices needs to be adjusted to "cif landed". However even when adjustments of around 10% are made, the total difference detected (of around US$38.00 per cubic metre), could not be fully explained.
- Cif average prices have been inflated. This would be basically a reflection of the so-called "regular grade" logs imported from the Solomon Islands. The possible impact of this factor is also estimated to be in the range of 10 percent.

However, the two reasons would have to occur simultaneously to explain the discrepancy. This is extremely unlikely. Perhaps only a 15 percent adjustment to cif figures could be considered. This fails to explain fully the difference identified for Japan.

Demonstrating a price difference exists does not prove that it is a result of transfer pricing practices. In the trade chain analysed the only possible practice that could be adopted would be a re-issue of exporting documents (or double invoicing). This study did not cover such analysis, and in exporting to Japan this practice is not expected to happen, although it is possible. The analysis has also not covered the possibility of transfer pricing by import agents based in Japan, whose tax avoidance incentives would be the converse of that of a Papua New Guinea exporter i.e. to record the highest possible purchase price, since inputs to a process are tax-deductible allowances. Long distribution chains are typical of the Japanese economy, and various commissions and agent profits in this chain would be accepted as normal business practice.

10.4.2 China and Hong Kong

China and Hong Kong statistics are neither detailed nor reliable. This makes an in-depth analysis impossible. In any case volume discrepancies have been detected in Chinese imports. There is some indication of the possible use of Hong Kong as a port of transference, where export documents are re-issued. This could be an indication of transfer pricing. Also Hong Kong cif prices for tropical logs are lower than those in other markets. This corroborates with the evidence that Hong Kong has been used as a transit port. Difference in prices covers, of course, costs and profit. Most of the difference is probably profit, indicating that Hong Kong operations are used for transfer pricing practices. In any case this is at the moment not very relevant to PNG as exports to Hong Kong have been relatively small, around 3% of the total volume in 2000 and 5% in 2001.

10.4.3 Common Evidence

The overall finding is that discrepancies in price and volumes do exist that could be evidence of transfer pricing. Adjustments made to cif prices for Japan were not sufficient to explain the discrepancies. The Hong Kong/China markets also show discrepancies in terms of volume and value that could not be explained. However, it is important to note that this finding does not prove that the difference in price and discrepancies in volumes are associated with transfer pricing practices. To reach a final conclusion further investigation, beyond the terms of reference for the present work, will be necessary.

Finally, it is important to stress that this study only investigated part of the possibilities related to transfer pricing practices. It is a matter for tax authorities in importing countries to assess the possible existence of such practices on the importing side (including over-pricing of imported goods and services, transfer of overhead costs and other forms).

10.5 KEY FINDINGS ON RESOURCE RENT

There has been substantial resource rent earned on log exports over the 1990s. However, the decline in world prices has brought the current average export price (of less than US$60 per cubic metre on average) close to the full cost of logging. This means that on average there is little or no resource rent being earned on log exports at present.

Logging companies were major beneficiaries of the jump in world prices in 1993. The Government's adjustment to the export duty system corrected for this and over the 1990s the Government has collected a reasonable share of the resource rent. Log export duties are now too high and unless reduced there is a high risk that the export duties will see the industry contract further. The industry needs to re-equip over the next two to three years and early action is required to ensure the right conditions are in place.

The current situation has mainly come about because the devaluation of the kina has substantially increased effective export duty rates.[30] The industry is essentially a US$ industry and efficiency and equity considerations lead to the conclusion that duty rates should be neutral with respect to the kina. A re-design of the export duty system is justified along with a substantial reduction in effective duty rates.

It is unlikely that much if any resource rent has been earned on processed timber sold locally. This is mainly because demand and supply conditions will tend to keep prices close to the cost of supply over time. The Review Team is uncertain as to whether export processed timber that is exported earned resource rent. However the low profitability of processing operations and an associated low capacity to pay for the timber indicates that resource rent is being dissipated through processing and that for some logs, processing is an inefficient use of the timber resource.

It was found that the exemption from export duties and landowner premiums of log that are processed but could have been exported imposes costs that are substantially higher than the benefits generated by processing. There is a clear case to levy export duties and landowner premiums on such logs, being from all species except those banned from export in log form (the conifers and rosewood).

[30] Note that effective duty rates should be calculated as the tax payment relative to the tax base. In this case, the tax base is the resource rent. The calculation of effective duty rates as a share of FOB values is incorrect and creates a misleading picture.

TABLE 10.2 EXPORT DUTY UNDER DIFFERENT SCENARIOS

	Export duty in US$ per m^3 of log input					
	Relocatable eco-mill	**Small commercial mill**	**Medium to large sawmill**	**Integrated small sawmill**	**Large export veneer mill**	**Large export plywood mill**
'Breakeven' export duty	4	7	4	10	3	5
Export duty payable under the preferred system at average FOB prices						
- as currently applying	0	0	0	0	0	0
- as seen from Jan 1996-Sep 2001	20	20	20	13	3	3
- from Jan 1990 to Sep 2001	34	34	34	25	13	13

Source: Review Team Estimates

The outcome shown in Table 10.2 is not surprising given the design of the revenue system. The provision of concessions does not take into account processing operations' need for assistance, and it is inevitable that concessions will be provided to operations that do not require support, and that too much will be provided to some operators while other operations will not be provided with enough assistance.

In effect the current system provides timber processors the first call on Government resources. Under the current system the provision of subsidies to the processing of logs that could be exported is given a higher priority that expenditure on basic health, education and physical infrastructure. These expenditure items are considerably more important from a development perspective and it would be better for the Government to collect more revenue from processing and allocate these funds to basic health, education and physical infrastructure.

The exemption from landowner premiums of those logs that could have been exported but were processed onshore instead has a very peculiar effect. In some cases the concession will see landowners work for the same level of income that would have been earned via the premium had the timber being exported as a log. This means that in effect some landowners are working in processing operations for nothing or very low rates of pay.

An appropriate mechanism for levying charges on logs that could be sold as export logs are but are actually processed is somewhat unclear at this stage and requires further investigation. While there is a case for increasing taxes and charges on exported product, there is probably no case for levying charges on timber products that are sold locally.

Substantial changes are required to the revenue system to lessen distortions in the economy, to provide for a more equitable distribution of the resource rent and ensure a sustainable logging and processing industry. Further work is required to design and improved system. The broad parameters of a desirable system can be specified relatively easily, but there are important administrative and implementation issues that need to be considered before a sensible revised system can be put in place.

10.6 CONCLUSIONS

10.6.1 Conclusions on the Economic Valuation of the Forest

The benefits to the nation of natural forest logging appear significant if there is adequate spatial area in PNG that meets the base conditions stated at the beginning of this section (an uncertain condition). However there are several large caveats that, depending on how they are interpreted, suggest that natural forest logging is not resulting in the benefits it could be delivering (that this model estimates), and should be promoted by government and allowed by landowners only with great caution. Even with respect to areas that meet the base conditions, estimates should be interpreted with caution as they presume:

- A well-managed logging industry that takes a long-term investment view (undertakes good management and makes investments required to make a second cut viable).
- Successful creation and equitable sharing of alternative assets to offset the one-off nature of initial cuts.
- Good spatial planning that prohibits logging of areas that are thought to have high conservation value or unusually valuable alternative development pathways.
- Government that is well situated and properly motivated to maximize the welfare benefits that can be derived from tax receipts.
- The economic and institutional architecture necessary to ensure sustainable flow-on benefits and long-term investment in public goods ranging from appropriate infrastructure to better healthcare and education.

Model findings simulate natural forest logging under these idealized conditions that are unlikely to ever exist in their entirely in PNG (or anywhere else). Results need to be adjusted (downward) to conform to actual conditions in PNG. Specifically, several other conclusions and related information gaps need to be addressed:

1. The overall value to the nation of natural forest logging, the primary foreign-income earner in the forest sector at present, is highly sensitive to flow-on benefits. This topic is complex and relates to several disparate factors including the economic and social conditions at proposed logging sites and the way in which government spends or invests export tax receipts.
2. The economic return to landowners is highly sensitive to conditions that influence landowner costs (e.g., natural features, code of practice adherence), and the opportunity cost of alternative development pathways that may change significantly during a 20-40 year cutting cycle. Landowners are operating on a very small margin (about K9 per cubic metre); in cases where landowner costs are 50% greater than model estimates, landowner returns are essentially negative.

Additionally, the value of logging to the nation is affected by external conditions, notably fluctuating fob prices, and other factors analysed as part of this review. These issues and the need for additional study and action are addressed in the section on long-term recommendations below.

10.6.2 Conclusions on the Forest Industry

In discussing the probable effect of the introduction of the new revenue system in February 1996, the PNGFA reviewed the average prices of log exports from their inception in 1951 until 1993. Despite the existence of a three-decade average of about US$20-30 per cubic metre, the dramatic rise over the eighties and the price peak at the time of writing emboldened the authors to state “owing to the current and continuing world shortage it is highly improbable that prices will fall below this line (90

kina = US$90 per cubic metre)". The average price is currently below $60/m ^{3} but in the light of this sharp change within half a decade the Review Team would be rash to state that owing to the continuing world glut it is highly unlikely prices would ever rise *above* US$90 per cubic metre.

Nevertheless it is our view that the market outlook and the level of competitiveness of the national forestry sector caution conservative projections of both real prices and volumes with continuing low prices in the short term and a long-term outlook for tight profit margins. The processing industry would not be competitive if it paid the opportunity cost of the logs it used plus the export tax they normally bear.

10.6.3 Conclusions on Transfer Pricing

The case is unproven. However, sufficient evidence exists of price and volume discrepancies that cannot be explained. The investigation did make some progress by ruling out explanations previously adduced, such as scaling differences for the Japanese market (non-existent), the supposed premium paid for higher quality logs by Japan (non-existent), and under-estimated freight rates (probably over-estimated). The continued existence of an inexplicable price gap (fob PNG – cif E. Asia) warrants further investigation.

10.6.4 Conclusions on Resource Rent

The broad parameters flowing from the Review Team's work are summarised in Table 10.3. We have in mind an export duty based on fob log value but providing a duty exemption up to the estimated total cost of logging. This total cost has been calculated on a forward-looking basis. In particular, it provides for a recovery of depreciation and a normal profit based on the cost of all new equipment (in contrast our estimates of the past level of resource rent have been based on actual, written down values). This reflects the need for the industry to re-equip.

This model system would see a substantial reduction in government charges. Comparisons between the current and preferred systems are provided in Figure 10.3. Estimates of the distribution of resource rent that would have applied over the 1990s had our preferred system been in place are provided in Annex A, and summarised in Figure 10.2.

Our analysis of resource rent issues has been based on the assumption that there is no transfer pricing. The conclusions could be substantially different if transfer pricing was instead assumed to be significant. The potential effect of transfer pricing on our key estimates are shown in Figures 10.4 and 10.5, which are based on the assumption there has been transfer pricing worth US$30 per cubic metre on every saw log exported. The alternative, hypothetical estimates, if correct, would lead to the conclusion that logging companies had collected too much of the resource rent over the 1990s and significantly higher export rates would have been justified.

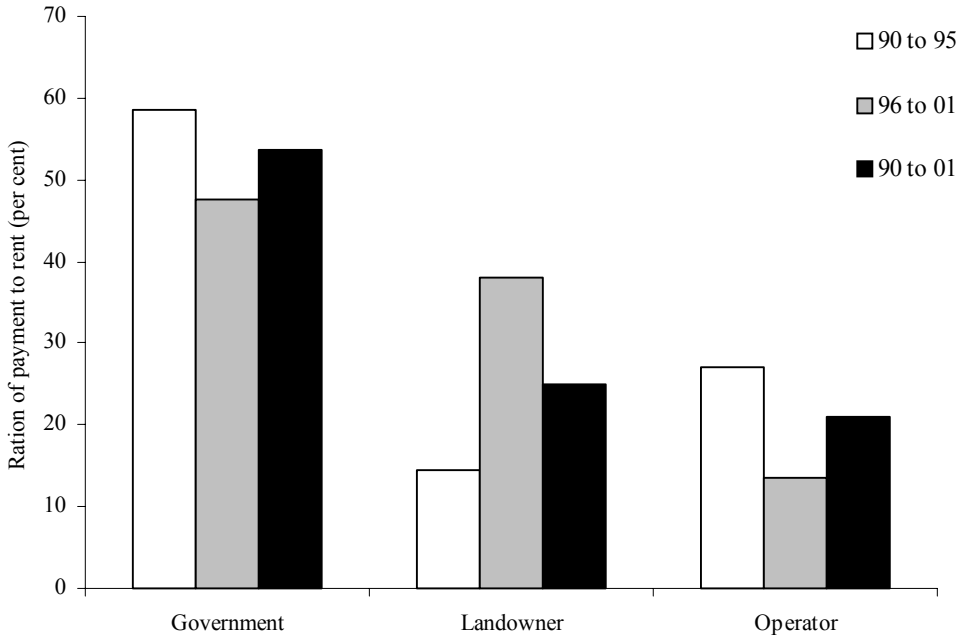
TABLE 10.3 THE PREFERRED DISTRIBUTION OF EXPORT LOG REVENUE

	US$ per cubic metre[a]	To be distributed to
Production Cost	39	Loggers
Depreciation	12	Loggers
Government Cost[b]	4	PNG Forest Service
Landowner cost	6	
- Environmental cost	2.5	Landowners
- Depletion cost	2.5	Landowners
- Reforestation and management	1.1	Landowners
Loggers profit	9	Loggers
Total cost of logging	70	
Other National Government, Provincial Government and landowner duties and charges	70 per cent of the fob price less the total cost of logging	National and provincial governments and landowners
Logger's excess profit	30 per cent of the fob price less the total cost of logging	Loggers
Average price 1985 - 2001	90	

a Calculations are based on industry average costs.

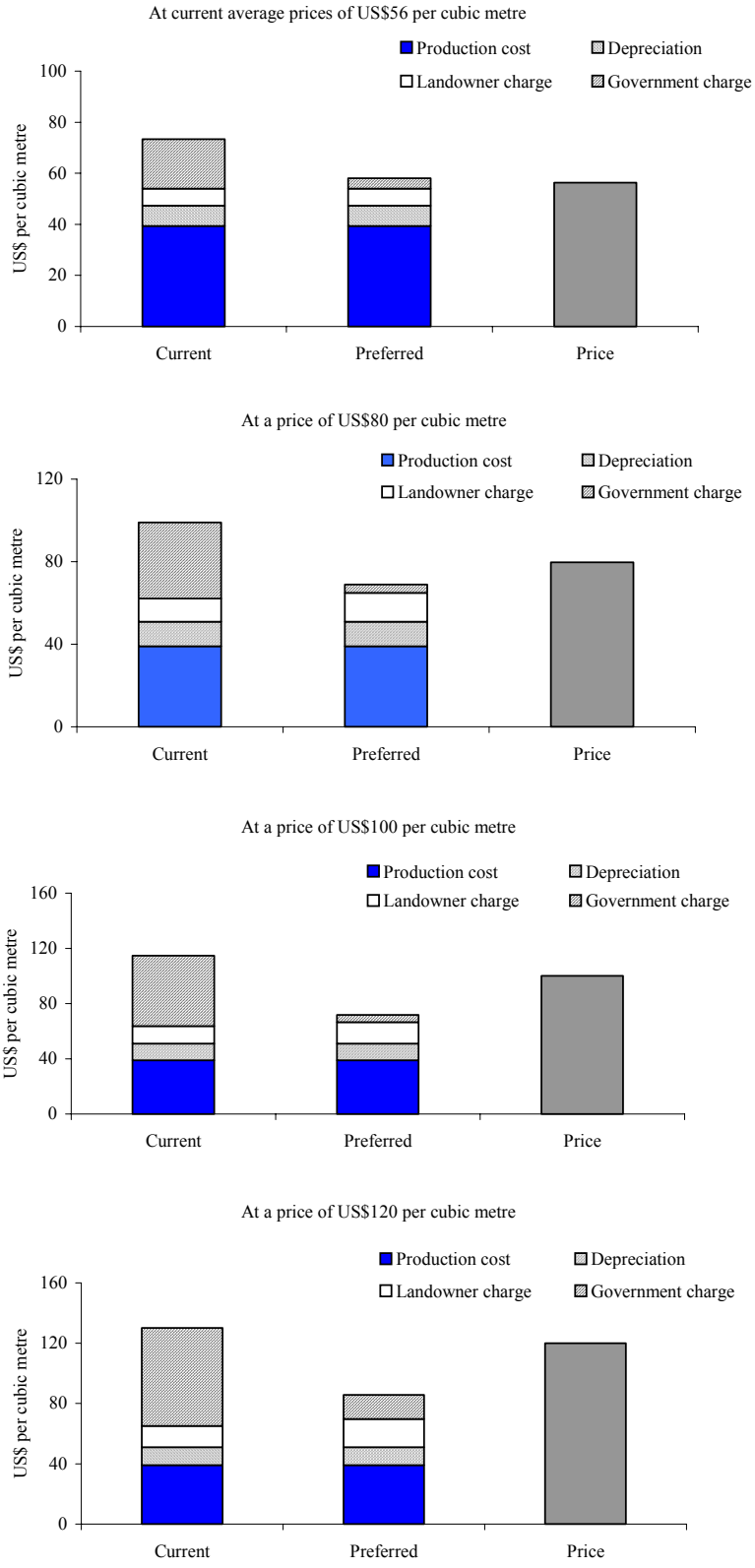
b This is a kina cost expressed in US$ at current prices. It covers the cost of operating the Papua New Guinea Forest Service (which includes SGS PNG Ltd.).

FIGURE 10.2 THE PAST DISTRIBUTION OF RENT HAD THE PREFERRED SYSTEM APPLIED



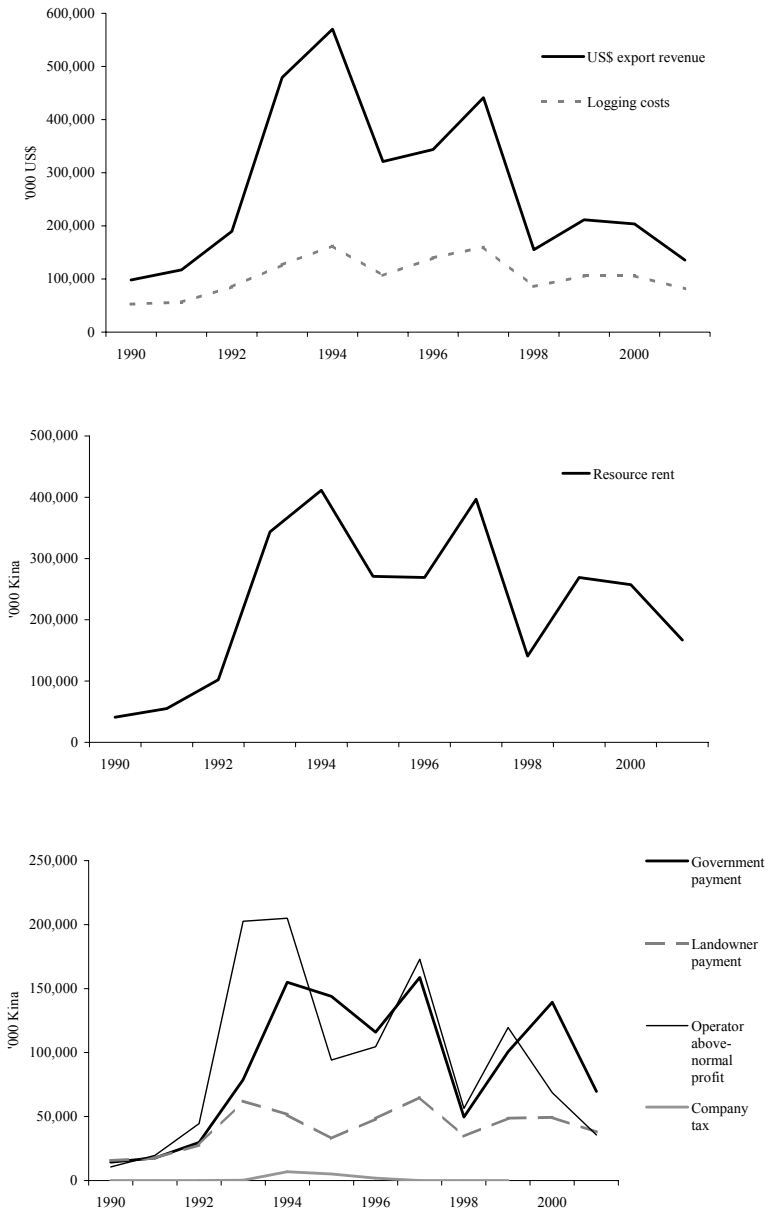
Source: Review Team estimates

FIGURE 10.3 THE ACTUAL AND PROPOSED LEVEL OF CHARGES UNDER DIFFERENT PRICES



Source: Review Team estimates

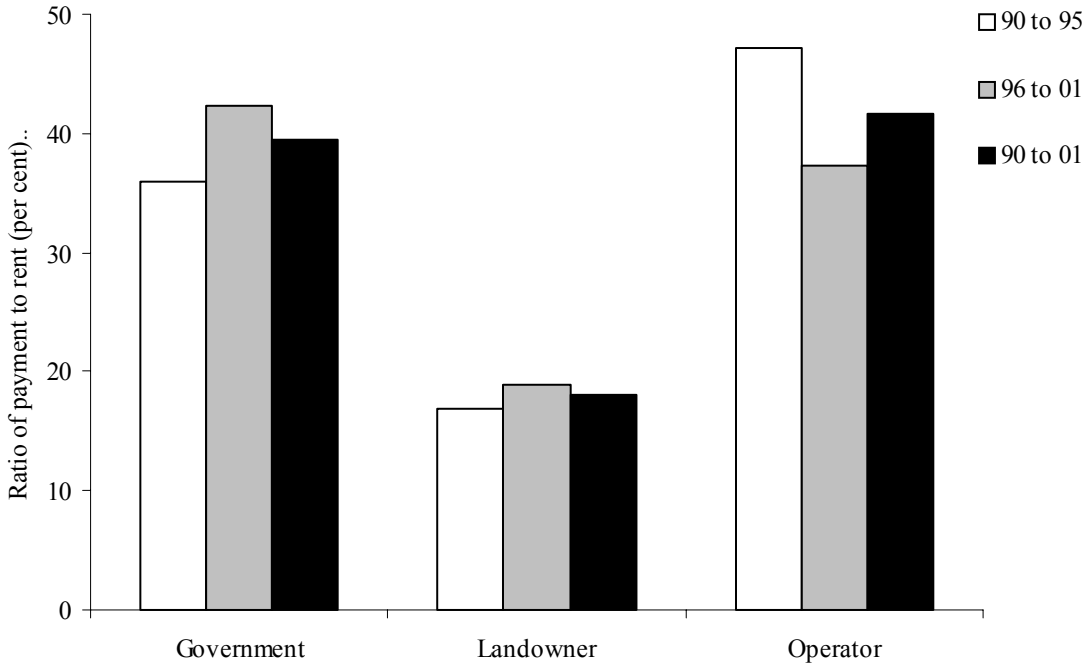
FIGURE 10.4 THE HYPOTHETICAL LEVEL OF RESOURCE RENT FROM LOG EXPORTS (ASSUMING TRANSFER PRICING)



Notes: Export volumes for 2001 are an estimate based on data for the first 9 months of the year. The estimates assume transfer pricing of US$30 per cubic metre.

Source: Review Team estimates based on the data in Annex A

FIGURE 10.5 THE HYPOTHETICAL PAST DISTRIBUTION OF RESOURCE RENT (ASSUMING TRANSFER PRICING)



Note: The payment to the operator presented in the figure is the estimated above-normal profit, being the operator's portion of resource rent. The negative above-normal profit seen from 1996 to 2001 (Sep) shows that operators were unable even to earn a normal profit over the period. The estimates assume transfer pricing of US$30 per cubic metre.

Source: Review Team estimates based on the data in Annex A

10.7 RECOMMENDATIONS AND DISCUSSION

10.7.1 Recommendations for further study of the economic value of forests from the perspectives of landowners and the nation

a. Conduct targeted empirical study on the economic value of forests, to refine and expand the current work.

Discussion: The issue of landowner costs ensuing from environmental and social disturbance needs greater attention. There is a dearth of information on the role and significance of subsistence-based activities in PNG rural society, including insights into how such activities are likely to change and grow or decline in importance over time. Local-level economies, often isolated from national and international market channels, form the base fabric of critical livelihood strategies that are intimately linked to the welfare of the vast majority of the country's citizens. More information is needed on how forests contribute to the economy, social stability, and risk management at this level, including an applied understanding of how forests contribute to food and economic security and coping mechanisms.

Focus study on values that can be captured at the local or national level (using existing or emerging markets only), analysed in a believable and understandable fashion, and of expressed importance to landowners. Rather than attempting a total economic valuation, focus on acquiring information

required to answer the most pressing decision problems that gain traction with landowners and government. Since the result is of great importance to Papua New Guinea, such studies should be conducted irrespective of whether the FCP proceeds or not.

b. Develop an array of diverse case histories that illuminate the economic and social effects of logging and industrial scale processing. Make such information accessible to communities.

Discussion: Logging of natural forests is an unprecedented development with potentially huge implications for landowners. Because landowners, in most cases, have not directly experienced logging in their area, the value of clear, unbiased, and timely information on the ramifications is extremely high. An array of brief case studies, informed by the work done for recommendation "b" above could provide the ingredients for better participation, representation, and decisions by landowners.

c. Identify the natural, economic, and social conditions that make natural forest logging particularly attractive or unattractive to landowners and the nation. Of particular importance is gaining an understanding of how export tax receipts and other direct benefits are creating flow-on benefits. If capacity allows, use findings from "a" and "b" to construct a mechanism for adjusting landowner costs according to anticipated conditions at sites where new concessions are being considered.

Discussion: Landowner costs and benefits vary broadly according to site selection, spatial planning, and management of operations. A variety of factors are worthy of consideration: terrain, forest type and condition, undeveloped options that could be precluded by logging, fragility of some highly diverse forests, availability of cash income, the ability of the local economy to facilitate follow-on or multiplier effects, the expressed needs and economic aspirations of landowners, potential for conflict, etc. Field observations by several team members indicate that logging activities can cause local populations to move settlements and replace some subsistence activities with cash-derived benefits (a normal phase of moving to an increasingly cash-based economy). Several possible outcomes and their effects should be weighed: a lower capture of "traditional" forest system values may be traded for an increase in labour jobs that could facilitate access to improved health care, education, and other previously scarce benefits. However, this dynamic can also lead to increased exposure to the effects of international commodity price risk, and loss of local knowledge/skills being effectively passed on to young members of the community. Displacement of traditional skills/knowledge may negatively impact food security, accessible forms of social welfare, and the capacity of families to take economic risks that could lead to attainment of long-term economic aspirations. Especially when cash earning alternatives are few, this process may lead to an increasingly smaller influence over logging company activities that affect a relatively large area, and policies that impinge upon landowner economic security and overall welfare (especially if the logging industry is monopolized). The later effects may be most acutely felt when unprecedented cash incomes do not result in lasting and stable benefits, and/or do not create multiplier effects that benefit wider segments of local populations. Exacerbation of these outcomes may result when newly enriched consumers have limited choices for spending cash; a case in point occurs when logging companies own or control a majority of mercantile outlets in areas that are economically and spatially isolated, and in which the capacity of government to act on behalf of landowners is severely limited.

10.7.2 Recommendations for the study and piloting of financial and operational mechanisms for enhancing the efficiency of forest allocation and preventing malfeasance

a. Consider a variety of options for ensuring that reductions in the value of the forest asset only occur if new assets of equal or greater value are created for landowners and their descendants. Implement the PDB system and predicate it on the government's responsibility to invest in public goods. Recreate the Development Options Study to ensure that it is performed prior to the decision to commit to logging and fairly considers non-logging economic options.

b. Search for modifications to the current form of the taxation regime that can prevent some forms of malfeasance and enhance the transactional position of landowners and government.

Discussion: Landowner and government returns to logging are tied to volume of timber cut and not to land area granted to logging operations. This practice can create several disadvantages for landowners and government. It encourages loggers to apply for areas that may be much larger than they intend to use, except under the most ideal market conditions. Loggers can ramp their level of production up or down according to existing market forces, without concern that pressure will be felt to reallocate some forest areas to other uses during prolonged periods of poor market conditions, a significant factor if concession periods are longer than 20 years. While the later is arguably a necessary condition for logging company investment, it can result in losses to landowners and government:

- It facilitates barriers to entry for other logging firms and helps to cement monopolization of the industry, a condition currently arising in PNG.
- It exposes landowners and government more directly to the effects of fluctuating FOB log prices.
- It imposes financial losses on landowners when concessions are oversized and the opportunity cost of land is greater than zero.

The practice of taxing volume creates opportunities for malfeasance, requires relatively higher administration costs, and necessitates administrative capacity that may be lacking in some areas. Volume taxes, however, have the advantage of taxing logging companies according to production levels. Imposing some portion of taxes in the form of a land area tax has several advantages that may outweigh any negatives:

1. It is virtually impossible to evade.
2. It reduces administration costs.
3. It encourages logging operations to bid for control only over areas they are almost certain to utilize.
4. It promotes competition among firms.
5. It forces poorly performing firms to relinquish their rights to either more efficient firms or an alternative land use practice that may emerge to compare favourably during the course of a planned cutting cycle. If a land area tax were to be used to capture all or most of forest taxes, it could be imposed under a competitive bid process with a set minimum cost per hectare that would vary according to anticipated landowner costs, opportunity costs, etc. Imposing such a system, while simplifying in some regards, does not negate the need for some minimum level of under standing of forest values.

10.7.3 Recommendations for forest revenue policies that promote beneficial changes in the forest sector in response to changing market forces, emerging markets, the condition of PNG's forests, and uncertainties

a. Create an institutional environment that places alternatives on a level playing field with natural forest logging. Ensure that non-logging interests be given equal and fair access to bidding on timber/land concessions or similar opportunities. Create any necessary institutional architecture that would be required to allow PNG to access potentially emerging global markets for conservation services, carbon offsets, or any other foreign income-capturing market or investment that may compete with natural forest logging.

Discussion: Initial cuts of natural forest are a finite resource and competing uses for such stands are emerging. As these stands become scarcer and increasingly more expensive to log, the comparable value of alternatives will become greater. Some of these areas may evolve into viable plantation/processing areas or agricultural estates after being logged over.

Current market conditions and prospects for improvement, in conjunction with the findings of this work, punctuate the need for adaptive forest policy. Average FOB prices (about $US 58) are below the estimated minimum "budget" (about $US 70) needed to cover the private cost of logging, the administrative costs to government, and landowner costs. Prospects for significant price increases in the short-run seem small, considering the likelihood that illegal logging will continue on a massive scale in Indonesia, thus continuing to flood the market and drive prices down. The general state of the world economy may also act to keep prices flat. Long-term outlook for price increases is uncertain and seems to depend on two factors that contravene each other:

1. The increasing scarcity of raw logs from natural forest cuts (scarcity drives prices up); and
2. The increasing availability of close substitutes for the products produced from these logs that could drive the log market demand, and prices, down.

New alternatives for use of forests to capture foreign currency may be emerging: a market for conservation services (compensation for the right to conserve biodiversity) has reached about $US500 million and is likely to continue expanding[31] (pers. comm. J. Hardner). Information on recent proposals suggests that this market may be significantly larger (see Gullison *et* al, 2000). Conceivably, deals currently under negotiation are likely to result in payments of up to $US4/hectare per annum for several decades if not longer (Rice, 2001). As natural forests in PNG become increasingly expensive to log, the opportunity cost of conserving remaining natural stands will become lower, perhaps lower than offers made to preserve them. Recognizing and anticipating how such changes may create opportunities for PNG will help the country position itself to take advantage of mechanisms that may in the future allow government and landowners to access emerging markets and transition smoothly from natural forest logging to other forest uses.

b. Consider developing mechanisms that directly link any decision to award or defer proposed logging concessions to the following conditions:

- Prolonged FOB prices that are lower than the estimated minimum required "budget" for logging (about $US 70 per cubic metre given current estimates, which need to be progressively refined).
- Transfer pricing and other forms of malfeasance remain suspect (leakage of forest values is potentially significant).
- The forest asset is being diminished in value but alternative assets of equal or greater value are not being created in the wake (i.e. there exists little or no capacity to invest in public goods or assets such as plantations and wood processing).

10.8 RECOMMENDATIONS FOR INDUSTRY

These emerge from the recommendations on resource rent below.

10.8.1 Recommendations on Transfer Pricing

Two recommendations are made in relation to the present monitoring and control system:

The system needs to be audited periodically by an independent third party. The auditor should focus on the quality of work and coverage, as well as identifying ways of streamlining the work to improve the work efficiency. This will ensure a continuous improvement of the system and also help to reduce costs.

A market intelligence service should be created by the PNGFA. This service would help to monitor prices, as well as to identify market opportunities for the PNG forest industry as a whole. The State

[31] This is intended as one example of several emerging options. Further study would be needed to determine whether and under what conditions such options will be viable in PNG.

Purchase Option has not functioned well in this role. Having a broader market intelligence service, beyond the focus on regulatory issues, has already been recommended by previous studies.

In case PNG decides to go into a more detailed investigation it will be necessary to work at the shipment level, and to establish links between documents issued in PNG and the corresponding documents at the final destination in the importing port. This basically means to take random sample shipments and audit them along the chain of custody. The alternative is to move back to a system of setting benchmark prices for assessing export tax liability.

A firm recommendation is for Government to take a decision on dealing with the issue, based on the results of this investigation, which are that unexplained discrepancies exist but no transfer pricing practice has been proven. The options are:

- Move to a system of endorsed prices based on cif values less assessed freight and insurance costs.
- Examine by random samples shipments where an audit trail can be determined and observed, with the cooperation of importing country tax authorities.
- Accept the *status quo*. This implies eschewing the use of unproven transfer pricing practices when making fiscal policy and calculating its effects on taxpayers.

10.8.2 Recommendations on the Industry Performance Bond

At present there is insufficient actuarial data on the nature and extent of contractual default and the present system should remain in place until this evidence has been gathered and can be analysed.

10.8.3 Recommendations for Short Term Action on Resource Rent Issues

- Take no action to adjust the revenue system until a decision is made and implemented as detailed above on the existence and extent of transfer pricing. If transfer pricing is a substantial problem, replace *ad valorem* duties and charges with specific duties and charges automatically updated for changes in an endorsed price derived from cif values.
- Reduce the level of log export duties. This is important to reduce the risk of a substantial contraction in the rate of logging and hence in total payments to the Government and landowners.

Give consideration to the following interim changes to the export duty —

- Re-instatement of the thresholds at the US$ value that applied on 22 November 1995. This would reduce the average export duty at current prices from approximately K57 per cubic metre to approximately K30 per cubic metre (but is more likely to sustain logging than the current export duty rates); or
- Exempt exports from duty up to a specified, minimum level (eg US$39 per cubic metre, being the estimated cash cost of logging excluding duties and charges) with existing marginal duty rates to apply. This would reduce the average export duty at current prices from approximately K57 per cubic metre to approximately K33 per cubic metre (but is more likely to sustain logging than the current export duty rates).
- Remove export duties on logs harvested from plantations that have been developed by the private sector (including landowners) at their own initiative and cost provided that a fair price has been paid for the inputs (in particular land).
- Increase payments to landowners provided mechanisms are in place to ensure the sustainable use of the extra funds provided.

- Give consideration to, as an interim measure, compensating landowners for the reduction in the US$ value of the royalty since 22 November 1995, provided a management system is in place similar to that to be established under the Project Development Benefit. This would involve an increase in landowner benefits of approximately K17 per cubic metre.

10.8.4 A Model System for the Longer Term

Re-design the revenue system to —

- allow operators to re-cover the full costs of efficient operations over time.
- as a minimum, provide the National Government at least enough revenue to fund the Papua New Guinea Forest Authority to adequately implement the National Forest Policy.
- ensure that landowner payments at least match the income offered by alternative uses of the forest and the reduced environmental value resulting from forest activities.
- provide landowners and the government 70 per cent or more of the resource rent generated by logging (being the difference between revenue and the total cost for an efficient operation).
- subject both export logs and logs that could be exported but are processed to a similar level of government and landowner charges.
- build the future revenue system upon the parameters shown in Table 10.3

10.8.5 Tax Rates and Thresholds

- Establish the payment to landowners in the first instance, and subsequently set export duty rates and thresholds for export logs so as to ensure that the share of resource rent captured by government and landowners is at least 70 per cent over time. This could be implemented, for example, by calculating the export duty for logs as 70 per cent of the difference between the actual fob price and the industry's average, total cost of logging (as shown in Table 10.3) less actual payments to landowners.
- Give consideration to establishing the export duty on export logs as a *de facto* company tax on the logging sector. Extending the example of the previous paragraph, this could be implemented by deducting from the total cost of logging the industry's average profit (as shown in Table 10.3) with an appropriate marginal duty rate to apply (i.e. of 30 per cent).
- Set thresholds for the export duty applying to export logs either in US$ or automatically adjust them for changes in the Kina/US$ rate. This would ensure the duty is largely neutral with respect to changes in the kina.
- Give consideration to ensuring the Project Development Benefit is neutral with respect to the kina. This would mean the effective rate of levy would be invariant to changes in the kina. Thresholds and any specific charge (i.e. a charge defined as a set amount per cubic metre) could be specified in kina provided thresholds and specific charges are automatically adjusted to compensate for movements in the kina.
- Set the minimum payment to landowners for commercial forestry at the estimated landowner cost of US$6 per cubic metre. Landowners would also receive a share of the resource rent (being the difference between revenue and the total cost of logging).
- Base the landowner payments for operations other than commercial forestry (e.g. conservation areas or non-wood forest products such as eaglewood) on the same principles as the forest revenue system.

10.8.6 The Revenue Base

- Undertake investigations of the feasibility of levying export duties and landowner charges on logs that could be exported but are processed (at a level to that applying to export logs of similar value).
- Subject all logging activities to a charge that recovers average government and landowner costs.
- The National Government should exempt plantation timber from export duties, provided the plantation has been developed by a logging company or landowner group at their own initiative and cost and provided a fair price has been paid for the inputs (in particular land).

10.8.7 Administration

- Progressively introduce the Project Development Benefit to consolidate and standardise the various landowner charges, to minimise the potential for non-payment and to help ensure that payments to landowners are allocated for sustainable uses.
- Install improved mechanisms to ensure the accountability of payments to landowners.
- Improve information sharing arrangements between the IRC, the Forest Authority (including SGS PNG) and BoPNG to ensure consistency and the cross-checking of data.
- Consider the possibility of requiring companies to make their export duty payments in US$.

10.8.8 Implementation

- Develop an industry action plan between government, landowners and operators to provide for a phased and predictable introduction of the revised revenue system.
- Give further consideration to ensuring methods are in place to, over the long run, ensure a reduction in the value of the forest asset only occurs if new assets of equal value are created for landowners.

ANNEX A DATA ON THE FOREST SECTOR

A number of qualifications apply to the data and methodology used to prepare the estimates of resource rent and actual and potential revenue collections as summarised in Tables A.1 to A.3 —

- Ideally resource rent calculations should be based on the marginal cost of logging, where price received on each log should be compares with this marginal cost of harvesting that log. However this study has not been able to estimate the marginal cost of logging, and instead the resource rent calculations are based on the average cost of logging.
- The methodology employed can be expected to under-estimate the level of resource rent that could be generated by the forest sector. The royalties and export duty set a minimum charge per cubic metre. If the resource rent on a log is less than this minimum charge, it will not be logged because the revenue from the sale of the log will be less than the total costs faced by the logging company (ie the harvesting cost inclusive of a normal return on capital invested and the landowner and government charge). This means that there are trees remaining that do offer resource rent that remain un-harvested. This resource rent is not estimated.[32]
- It is assumed there is no transfer pricing and that the volume and value of all logs are correctly recorded.
- The estimates of the landowner payments are approximates only based on assumptions regarding the charge systems in place. Data on actual payments were not available. Estimates are based on Groome Poyry (1998) as summarised in Table A.4.
- The calculations assume that the average cost of logging has been constant since 1985 in US$ terms. This is a simplifying assumption made due to data limitations. In practice it is likely the cost of logging was lower in earlier years. This effect would tend to under-estimate the level of resource rent seen in earlier years.
- The normal level of profit and depreciation is based on our estimate of the typical, actual written down value of logging capital. This is seen as 67 per cent of the cost of new equipment.

The full dataset is contained in spreadsheets used to estimate resource rent, its distribution and to prepare the cost-benefit assessment of processing which have been provided to the PNGFS.

[32] Vincent (1990) presents a methodology for estimating this additional component of resource rent based on estimates of the marginal cost curve. However, we do not have information on key parameters required to apply the methodology meaningfully.

TABLE A.1 BACKGROUND DATA AND ASSUMPTIONS

	Units	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 (Sep)	Total/Simple Average
Export volumes	m3	990,200	1,061,800	1,601,000	2,374,900	3,050,340	1,998,187	2,625,861	3,006,157	1,612,566	1,983,853	1,992,526	1,145,252	23,442,642
Kina FOB price	K per m3	66	76	87	169	158	167	133	166	136	193	189	181	144
US$ FOB price	US$ per m3	69	80	89	172	157	131	101	117	66	77	72	59	99
Kina export revenue	'000 K	65,200	81,200	140,000	400,200	483,585	329,544	349,471	496,138	217,544	385,569	379,825	206,820	3,535,095
US$ export revenue	'000 US$	68,532	85,244	141,778	407,804	478,757	260,977	264,831	351,114	106,646	151,918	143,713	67,350	2,528,662
Logging costs	'000 US$	52,728	56,541	85,253	126,463	162,431	106,403	139,827	160,078	85,869	105,640	106,102	60,985	1,248,321
Resource rent	'000 K	12,472	24,659	54,747	273,737	318,592	195,187	164,860	268,752	41,466	118,249	99,551	19,355	1,591,627
- Kina per m3	K per m3	13	23	34	115	108	99	63	88	23	61	50	14	58
- US$ per m3	US$ per m3	13	24	35	117	107	77	48	63	11	24	19	5	45
Operator normal profit														
- Kina	'000 K	13,048	14,008	21,896	32,279	42,914	34,946	48,016	59,142	45,797	69,528	72,897	48,758	503,228
- US$	'000 US$	13,714	14,706	22,174	32,892	42,247	27,675	36,368	41,635	22,334	27,476	27,596	15,862	324,681
Depreciation														
- Kina	'000 K	7,442	7,990	12,489	18,412	24,478	19,933	27,388	33,734	26,122	39,659	41,580	27,812	287,040
- US$	'000 US$	7,823	8,388	12,648	18,762	24,098	15,786	20,744	23,749	12,739	15,672	15,741	9,047	185,197
Production cost														
- Kina	'000 K	37,117	39,850	62,288	91,826	122,079	99,412	136,595	168,244	130,281	197,792	207,376	138,706	1,431,567
- US$	'000 US$	39,014	41,835	63,079	93,571	120,183	78,729	103,459	118,443	63,535	78,164	78,506	45,123	923,640
Parameters														
Total operator cost (incl of normal profit)	US$ per m3	53	53	53	53	53	53	53	53	53	53	53	53	53
Operator normal profit (incl of depreciation)	US$ per m3	14	14	14	14	14	14	14	14	14	14	14	14	14
Depreciation	US$ per m3	8	8	8	8	8	8	8	8	8	8	8	8	8
Operator normal profit minus depreciation	US$ per m3	6	6	6	6	6	6	6	6	6	6	6	6	6
Production cost	US$ per m3	39	39	39	39	39	39	39	39	39	39	39	39	39
US$/Kina		1.05	1.05	1.01	1.02	0.99	0.78	0.76	0.70	0.49	0.40	0.38	0.32	0.75

TABLE A.2 ESTIMATED REVENUE COLLECTIONS UNDER THE ACTUAL REVENUE SYSTEM

	Units	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 (Sep)	Total/Simple Average
Payment to National Government	'000 K	12,865	16,049	27,289	75,375	150,018	140,088	114,167	156,706	48,628	99,367	138,069	68,885	1,047,506
Export duty	'000 K	11,140	14,200	24,500	71,600	147,418	138,237	111,658	153,588	47,027	97,134	135,875	67,595	1,019,972
- unit rate in kina	K per m3	11	13	15	30	48	69	43	51	29	49	68	59	41
- unit rate in US$	US$ per m3	12	14	15	31	49	56	33	36	14	19	26	19	27
Withholding tax on royalty	'000 K	1,124	1,205	1,817	2,333	748	638	915	1,293	622	1,029	984	595	13,302
- unit rate	K per m3	0	0	0	1	0	0	0	1	1	1	1	0	0
Payment to Forest Authority	'000 K	601	645	972	1,442	1,852	1,213	1,594	1,825	979	1,204	1,210	695	14,232
Payment to provincial governments	'000 K	1,555	1,668	2,514	3,440	5,013	3,877	1,740	1,993	1,069	1,315	1,321	759	26,264
Royalty to provincial governments	'000 K	899	964	1,453	1,866	2,991	2,553	0	0	0	0	0	0	10,726
- unit rate	K per m3	0	0	0	1	1	1	0	0	0	0	0	0	0
Levies to provincial governments	'000 K	656	704	1,061	1,574	2,022	1,324	1,740	1,993	1,069	1,315	1,321	759	15,538
Landowner payment	'000 K	13,841	15,584	24,655	57,550	48,519	30,268	44,949	60,953	31,282	43,730	44,207	25,031	440,569
- unit rate	K per m3	14	15	15	24	16	15	17	20	19	22	22	22	19
Landowner royalty	'000 K	6,920	7,792	12,327	32,276	17,058	9,240	20,065	29,305	15,905	19,350	19,655	11,297	201,192
Land owner premium	'000 K	5,250	6,001	9,626	21,267	26,313	17,657	20,453	26,576	12,657	21,032	21,190	11,801	199,822
Other payments to landowners	'000 K	1,671	1,792	2,701	4,007	5,147	3,372	4,431	5,072	2,721	3,347	3,362	1,932	39,555
Operator above-normal profit														
- Kina	'000 K	-15,789	-8,642	289	137,372	115,042	20,953	4,003	49,100	-39,513	-26,163	-84,045	-75,319	77,288
- US$	'000 US$	-16,596	-9,073	293	139,982	113,001	17,252	3,007	35,319	-19,186	-9,500	-31,690	-24,479	198,328
- US$ per cubic metre	US$ per m3	-17	-9	0	59	38	7	1	15	-18	-7	-23	-87	-3
Operator profit before depreciation	'000 K	-2,741	5,366	22,185	169,651	156,009	56,010	51,879	107,993	6,069	43,376	-11,198	-26,561	578,036
Operator profit after depreciation	'000 K	-10,184	-2,624	9,696	151,239	131,531	36,077	24,490	74,259	-20,054	3,717	-52,778	-54,373	290,996
Company tax	'000 K	0	0	11	226	6,890	5,107	1,910	0	56	0	0	0	14,201
Distribution of rent														
Government	ratio to rent (%)	116	72	54	29	49	74	70	59	120	85	140	360	102
Landowner	ratio to rent (%)	111	63	45	21	15	16	27	23	75	37	44	129	51
Operator	ratio to rent (%)	-127	-35	1	50	36	11	2	18	-95	-22	-84	-389	-53

TABLE A.2 ESTIMATED REVENUE COLLECTIONS UNDER THE ACTUAL REVENUE SYSTEM (CONT)

	Units	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 (Sep)	Total/Simple Average
Parameters of actual system														
Landowners royalty	kina per cubic metre	3	3	3	3	6	5	8	10	10	10	10	10	7
Share of landowners premium specified on		0	0	0	0	0	0	0	0	0	0	0	0	0
- per cubic metre basis	per cent	57	57	57	57	57	57	57	57	57	57	57	57	57
- share of FOB value	per cent	43	43	43	43	43	43	43	43	43	43	43	43	43
Landowners premium														
- per cubic metre basis	kina per cubic metre	6	6	6	6	6	6	6	6	6	6	6	6	6
- share of FOB value	per cent	8	8	8	8	8	8	8	8	8	8	8	8	8
Infrastructure benefits to landowners	kina per cubic metre	1	1	1	1	1	1	1	1	1	1	1	1	1
Other payments to landowners	kina per cubic metre	1	1	1	1	4	4	4	4	4	4	4	4	3
Payments to provincial governments	kina per cubic metre	1	1	1	1	4	4	4	4	4	4	4	4	3
Payments to Forest Authority	kina per cubic metre	1	1	1	1	4	4	4	4	4	4	4	4	3
Rent based duty rate	per cent	35	35	35	35	35	35	35	35	35	35	35	35	35

TABLE A.3 HYPOTHETICAL ESTIMATED REVENUE CALCULATIONS AS IF THE PREFERRED REVENUE SYSTEM HAD APPLIED

	Units	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 (Sep)	Total/Simple Average
Landowner cost	'000 K	5,652	6,069	9,486	13,984	18,591	15,139	20,801	25,621	19,840	30,121	31,580	21,123	218,005
Other payments	'000 K	4,710	5,057	7,905	11,653	15,492	12,616	17,334	21,351	16,533	25,100	26,317	17,602	181,671
Government cost	'000 K	3,768	4,046	6,324	9,322	12,394	10,093	13,867	17,081	13,226	20,080	21,053	14,082	145,337
Actual normal profit minus depreciation	'000 K	5,605	6,018	9,406	13,867	18,436	15,013	20,628	25,407	19,674	29,870	31,317	20,035	215,277
- unit rate in kina	kina per m3	6	6	6	6	6	8	8	9	12	15	16	17	9
- unit rate in US$s	US$ per m3	6	6	6	6	6	6	6	6	6	6	6	6	6
De-facto company tax	'000 K	1,682	1,805	2,822	4,160	5,531	4,504	6,188	7,622	5,902	8,961	9,395	6,011	64,583
- tax rate	per cent	30	30	30	30	30	30	30	30	30	30	30	30	30
Additional profits tax	'000 K	0	2,090	14,609	156,656	176,538	98,784	63,399	124,074	1,501	8,897	1,057	0	647,605
- tax rate	per cent	70	70	70	70	70	70	70	70	70	70	70	70	70
Government payment	'000 K	5,450	7,941	23,755	170,139	194,462	113,380	83,455	148,777	20,630	37,939	31,505	20,092	857,525
Operator profit before depreciation	'000 K	12,270	22,283	36,567	112,598	132,960	88,998	91,286	132,145	30,260	94,618	83,047	9,296	846,327
Operator profit after depreciation														
- in kina	'000 K	4,828	14,293	24,078	94,186	108,483	69,065	63,897	98,411	4,138	54,959	41,466	-18,515	559,287
- in US$	000 US$	5,075	15,004	24,383	95,976	107,603	54,695	48,438	69,831	2,454	21,481	15,637	-5,959	454,618
- US$ per m3	US$ per m3	5	14	15	40	36	27	18	23	0	11	8	-6	16
Operator above-normal profit	'000 K	-3,341	5,592	13,602	77,961	90,047	54,052	43,270	73,004	-15,537	25,089	10,149	-39,462	334,426
- share of rent	per cent	-27	23	25	28	28	28	26	27	-96	20	9	-324	-19
Parameters														
Landowner cost	US$ per m3	6	6	6	6	6	6	6	6	6	6	6	6	6
Other landowner payments	US$ per m3	5	5	5	5	5	5	5	5	5	5	5	5	5
Government cost	US$ per m3	4	4	4	4	4	4	4	4	4	4	4	4	4
Distribution of rent														
Government	ratio to rent (%)	44	32	43	62	61	58	51	55	50	32	32	104	52
Landowner	ratio to rent (%)	83	45	32	9	11	14	23	17	88	47	58	200	52
Operator	ratio to rent (%)	-27	23	25	28	28	28	26	27	-37	21	10	-204	-4

TABLE A.4 LANDOWNER PREMIUMS AND THE OTHER LEVIES BY LOGGING AREA

Logging area	Exports from Jul '96 - Nov '97 Km FOB	Estimated landowners premium in K per cubic metre at current prices	Other levies in K per cubic metre		
			Landowners	Prov Govt	PNGFA
LFA-10-1	25	79.2	2.0	1.0	0.0
LFA-10-2	14	6.5	2.0	1.0	1.0
LFA-11-1	1	n.c.	1.0	0.5	1.0
LFA-11-2	n.a.	5.0	1.0	1.0	1.0
LFA-14-10	21	10.0	2.0	2.5	1.0
LFA-14-11	13	5.0	1.0	1.5	1.0
LFA-14-13	12	20.0	2.0	1.0	1.0
LFA-14-2	9	16.0	3.0	0.0	0.0
LFA-14-3	10	16.0	3.0	0.0	0.0
LFA-14-4	19	12.5	3.0	0.5	1.0
LFA-14-7	12	5.5	1.0	1.5	1.0
LFA-14-8	15	20.0	2.0	1.0	1.0
LFA-14-9	14	5.5	1.0	1.5	1.0
LFA-18-1	7	12.0	2.0	1.0	0.0
LFA-18-2	3	18.0	2.0	2.0	1.0
LFA-3-2	1	4.0	3.0	0.5	1.0
LFA-5-1	9	12.0	6.0	0.0	1.0
TP-10-8	55	15.0	1.0	2.0	1.0
TP-12-18	6	8.0	1.0	1.5	1.0
TP-12-20	9	10.0	0.0	0.5	1.0
TP-12-22	6	12.0	0.0	0.0	0.0
TP-13-27	8	20.0	2.0	5.0	1.0
TP-13-35	4	n.c.	0.0	0.0	0.0
TP-14-41	6	n.c.	0.0	0.0	0.0
TP-14-50	15	6.0	0.0	0.0	0.0
TP-14-52	21	4.0	0.0	0.0	0.0
TP-14-53	18	35.0	1.5	0.0	1.0
TP-14-54	16	35.0	3.0	0.0	1.0
TP-14-55	22	35.0	2.0	0.0	2.0
TP-14-58	1	n.c.	0.0	0.0	0.0
TP-15-49	2	n.c.	0.0	0.0	0.0
TP-15-52	12	4.0	1.0	0.0	1.0
TP-15-53	12	n.c.	0.0	0.0	0.0
TP-15-56	12	20.0	3.0	1.0	1.0
TP-16-43	7	7.1	3.0	0.0	1.3
TP-16-48	5	4.0	1.0	1.0	0.0
TP-1-7	74	1.8	0.0	0.0	0.5
TP-18-2	8	13.0	0.0	0.0	0.0
TP-2-12	38	10.0	0.0	0.0	0.0

Logging area	Exports from Jul '96 - Nov '97 Km FOB	Estimated landowners premium in K per cubic metre at current prices	Other levies in K per cubic metre		
			Landowners	Prov Govt	PNGFA
TP-2-12a	21	14.0	0.0	0.0	0.0
TP-2-14	2	n.c.	0.0	0.0	0.0
TP-2-15	13	3.0	1.0	1.0	0.0
TP-2-16	0	13.0	1.5	1.0	0.0
TP-3-27	7	10.0	2.0	0.0	0.0
TP-3-28	1	19.5	0.0	0.0	0.0
TP-3-29	2	12.0	2.0	1.0	0.0
TP-3-35	4	7.0	1.0	1.0	0.0
TP-4-3	16	10.0	0.0	0.0	0.5
TP-4-6	2	11.0	2.5	1.0	0.0
Weighted average/total	605	12.0	1.2	0.7	0.6

na not available

nc not calculated

Source: Review Team estimates based on Groome and Poyry (1998)

ANNEX B THE PERFORMANCE OF ALTERNATIVE LOG EXPORT REVENUE SYSTEMS

TABLE B.1 ASSUMED PARAMETERS OF THE CURRENT REVENUE SYSTEM

Export duty schedule - actual		
Threshold	**Base duty**	**Marginal duty rate**
90	0	15
110	13.5	30
130	19.5	50
150	29.5	55
200	40.5	60
	70.5	70

Logging cost	US$ per cubic metre	53
Landowners royalty	kina per cubic metre	10
Share of landowners premium specified on		
- per cubic metre basis	per cent	57
- share of FOB value	per cent	43
Landowners premium		
- per cubic metre basis	kina per cubic metre	6
- share of FOB value	per cent	8
Share of misc government levies specified on		
- per cubic metre basis	per cent	100
- share of FOB value	per cent	0
Misc government levies		
- per cubic metre basis	kina per cubic metre	2
- share of FOB value	per cent	0

TABLE B.2 ASSUMED PARAMETERS OF A US$ BASED REVENUE SYSTEM

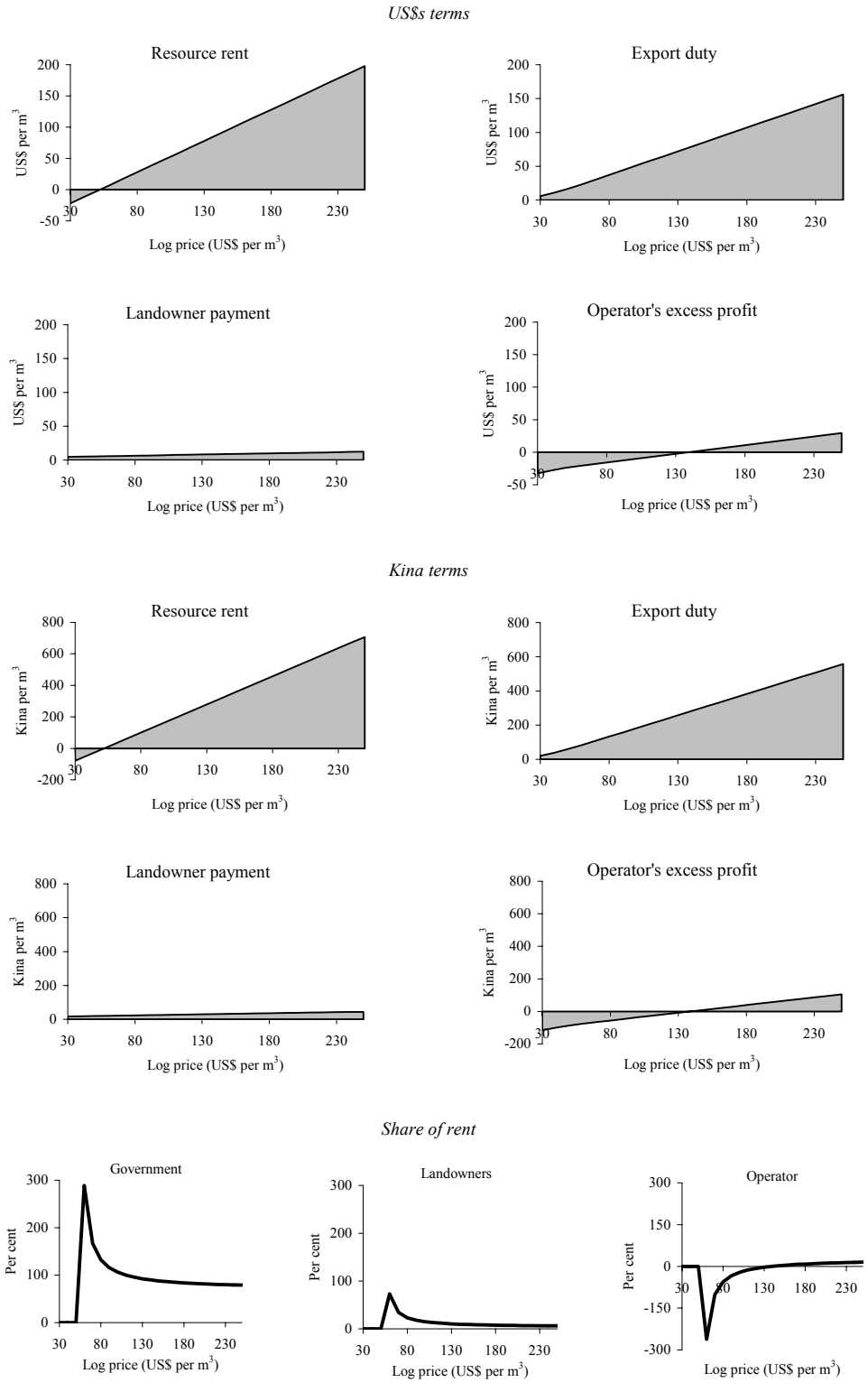
Export duty schedule		
Threshold	**Base duty**	**Marginal duty rate**
68	0	15
83	10	30
98	15	50
113	22	55
150	30	60
	53	70

Logging cost	US$ per cubic metre	53
Landowners royalty	kina per cubic metre	10
Share of landowners premium specified on		
- per cubic metre basis	per cent	57
- share of FOB value	per cent	43
Landowners premium		
- per cubic metre basis	kina per cubic metre	6
- share of FOB value	per cent	8
Share of misc government levies specified on		
- per cubic metre basis	per cent	100
- share of FOB value	per cent	0
Misc government levies		
- per cubic metre basis	kina per cubic metre	2
- share of FOB value	per cent	0

TABLE B.3 ASSUMED PARAMETERS OF AN EFFICIENT AND EQUITABLE REVENUE SYSTEM

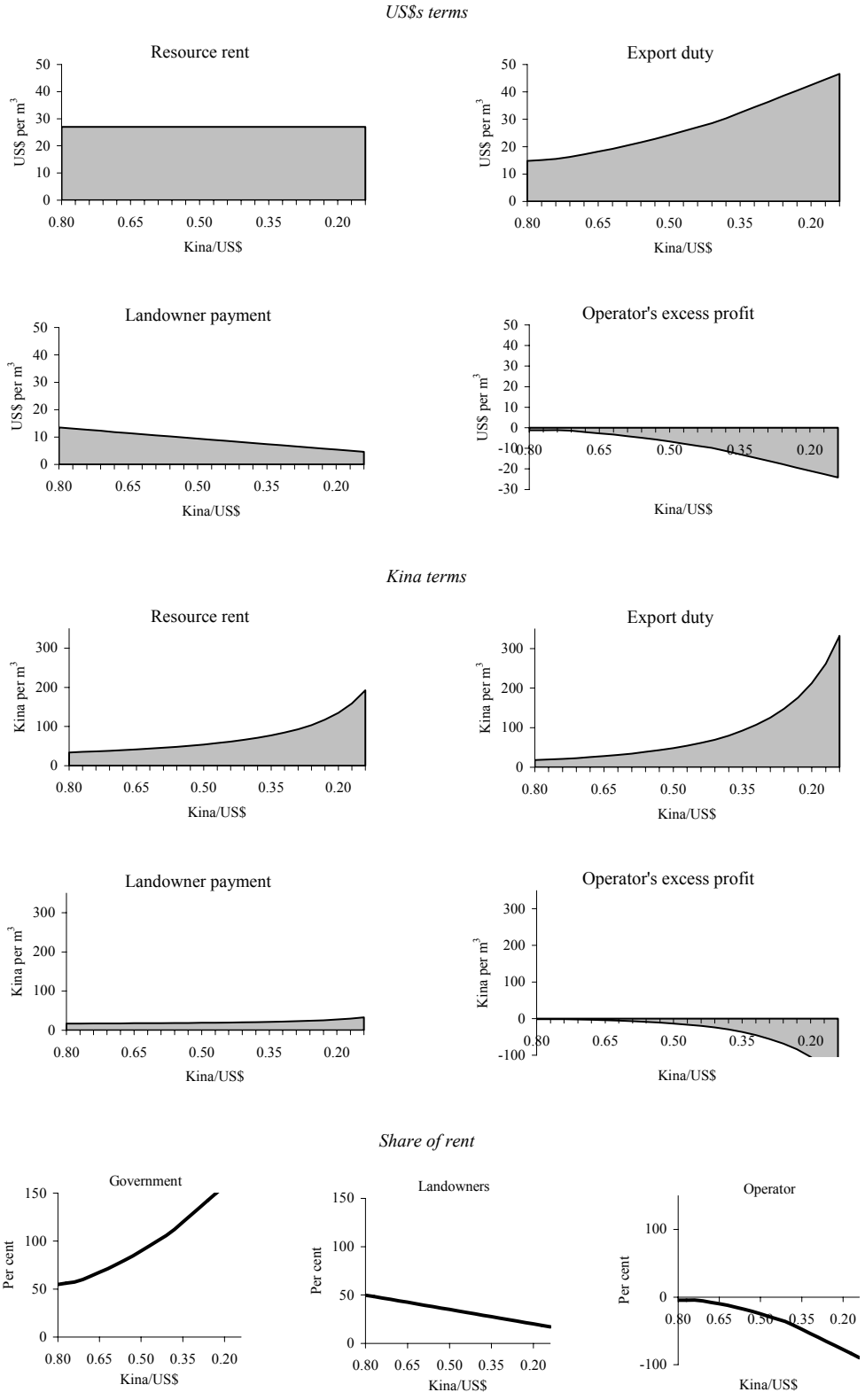
Marginal export duty rate	**per cent**	**45**
Logging cost	US$ per cubic metre	53
Landowners royalty	US$ per cubic metre	10
Share of landowners premium specified on		
- per cubic metre basis	per cent	57
- share of FOB value	per cent	43
Landowners premium		
- per cubic metre basis	kina per cubic metre	6
- share of FOB value	per cent	8
Share of misc government levies specified on		
- per cubic metre basis	per cent	100
- share of FOB value	per cent	0
Misc government levies		
- per cubic metre basis	kina per cubic metre	2
- share of FOB value	per cent	0

FIGURE B.1 RESOURCE RENT UNDER THE CURRENT REVENUE SYSTEM AND VARIABLE US$ PRICES



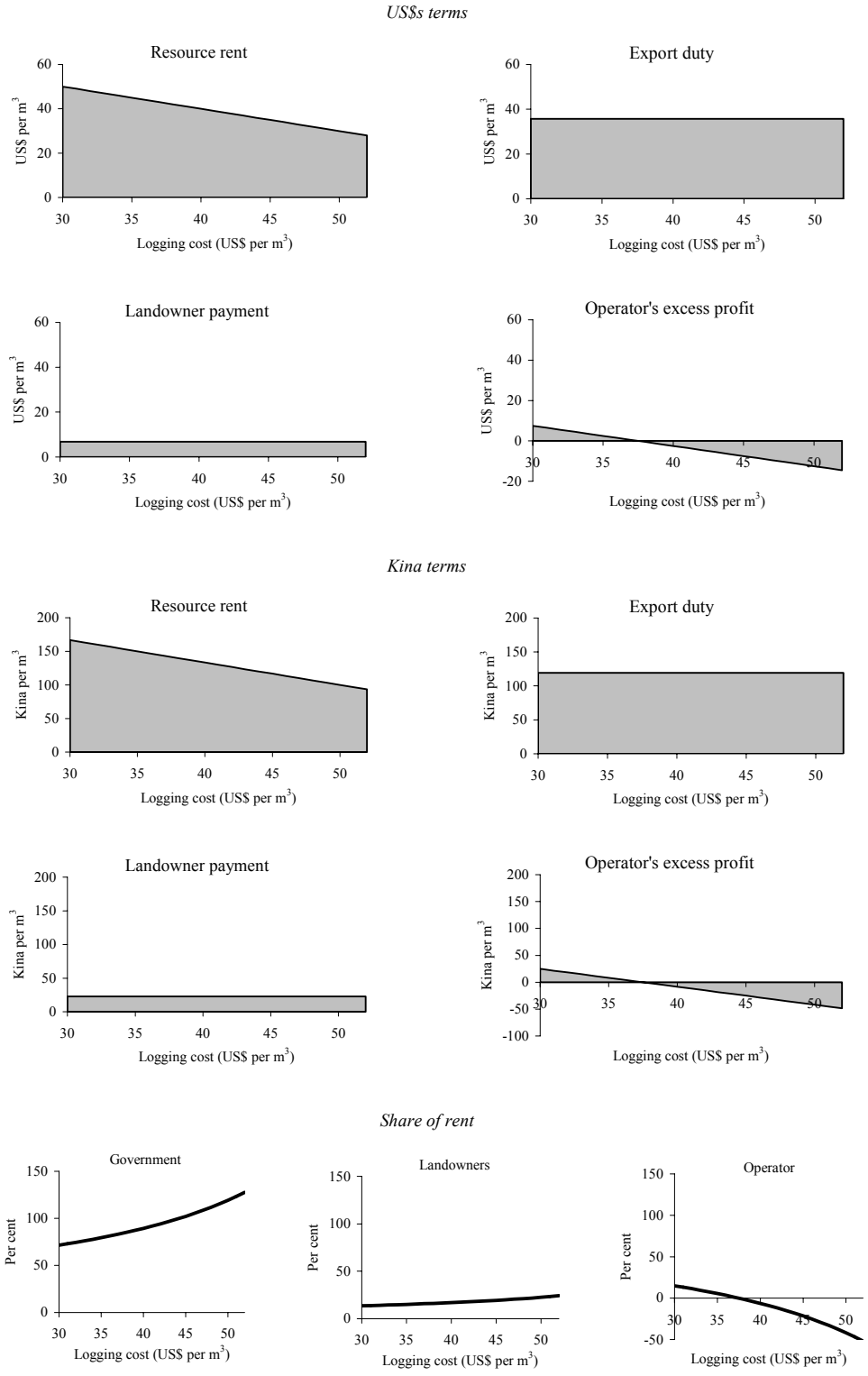
Source: Review Team estimates

FIGURE B.2 RESOURCE RENT UNDER THE CURRENT REVENUE SYSTEM AND A VARIABLE KINA



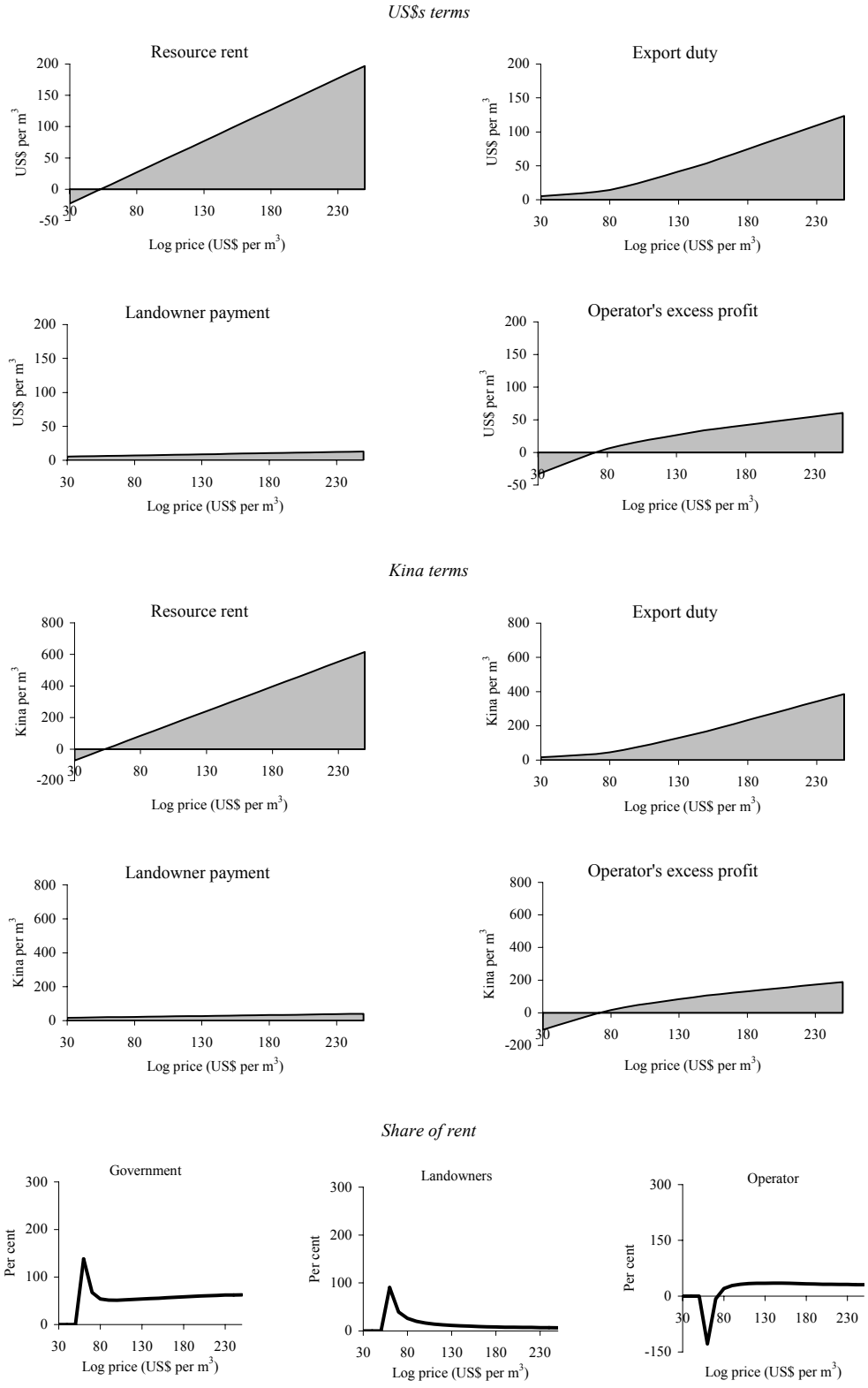
Source: Review Team estimates

FIGURE B.3 RESOURCE RENT UNDER THE CURRENT REVENUE SYSTEM AND VARIABLE LOGGING COSTS



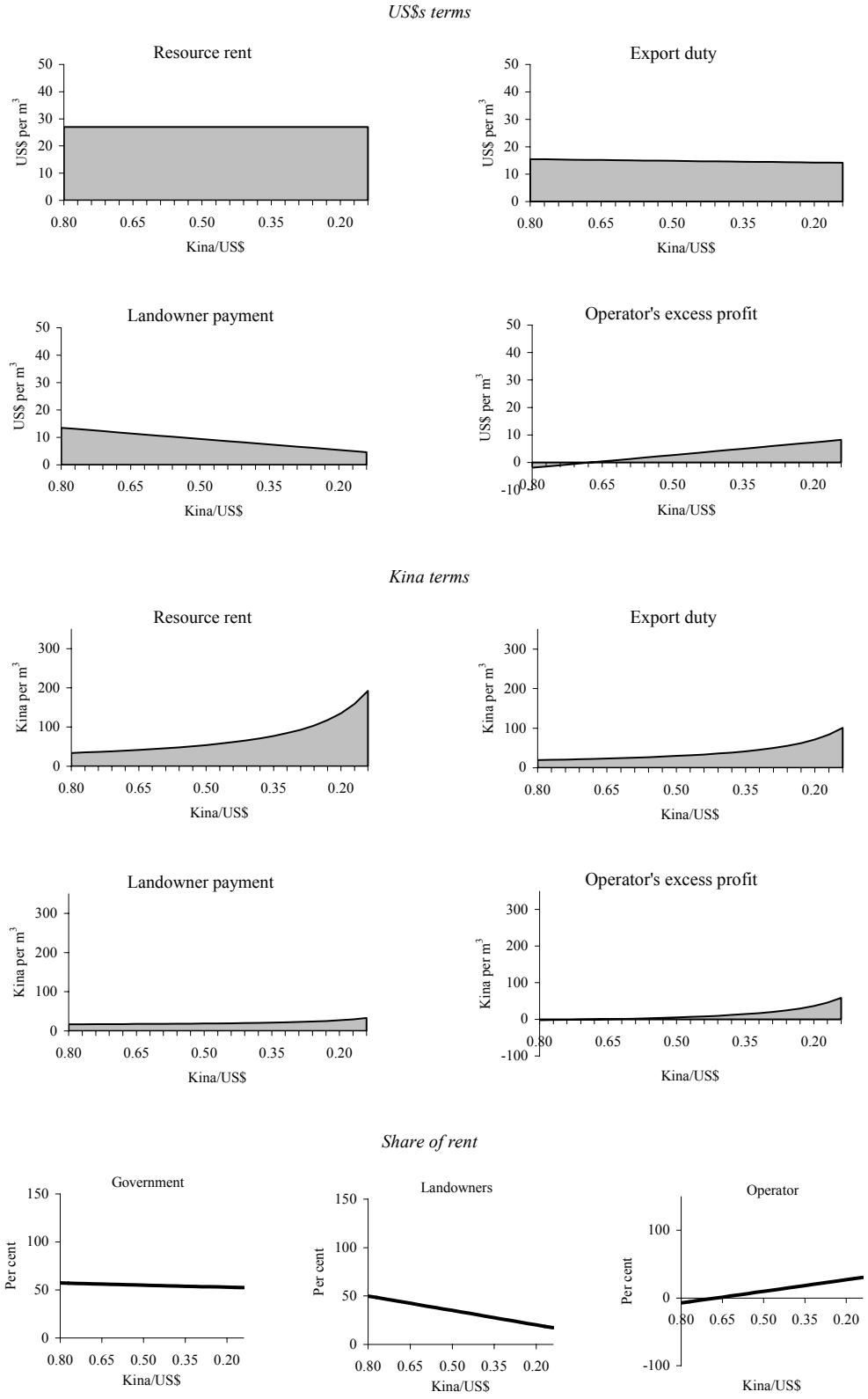
Source: Review Team estimates

FIGURE B.4 RESOURCE RENT UNDER A US$-BASED REVENUE SYSTEM AND VARIABLE US$ PRICES



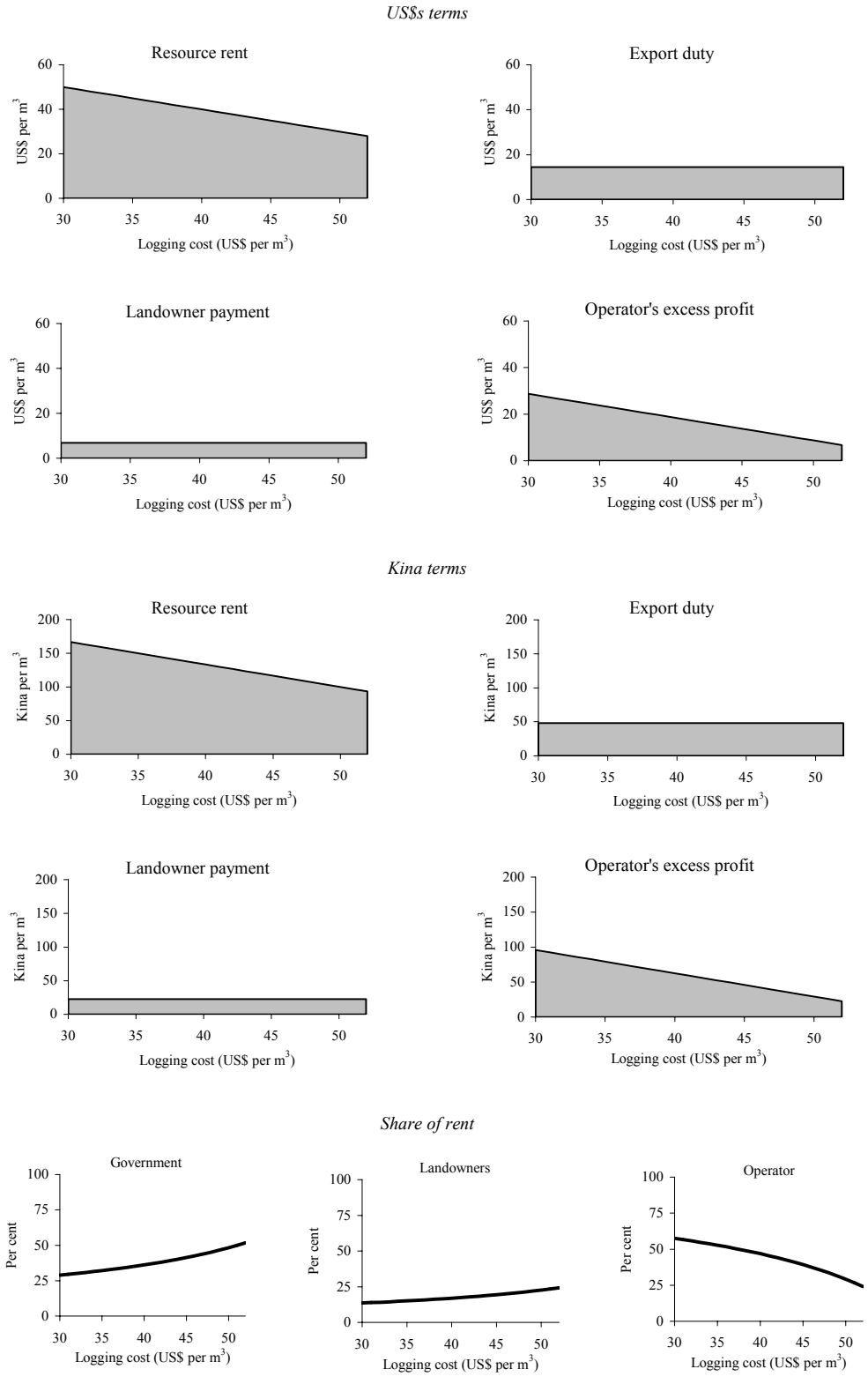
Source: Review Team estimates

FIGURE B.5 RESOURCE RENT UNDER A US$-BASED REVENUE SYSTEM AND A VARIABLE KINA



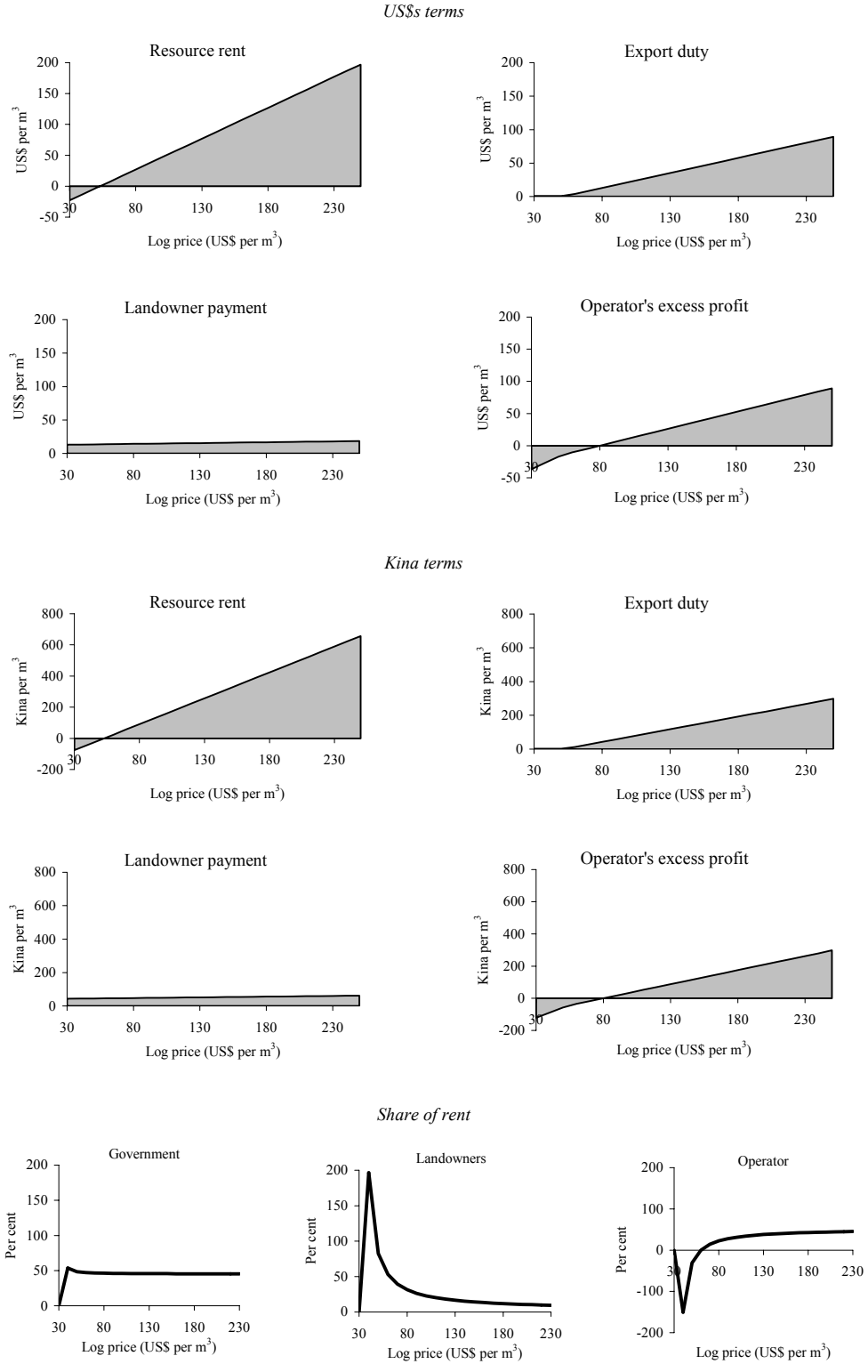
Source: Review Team estimates

FIGURE B.6 RESOURCE RENT UNDER A US$-BASED REVENUE SYSTEM AND VARIABLE LOGGING COSTS



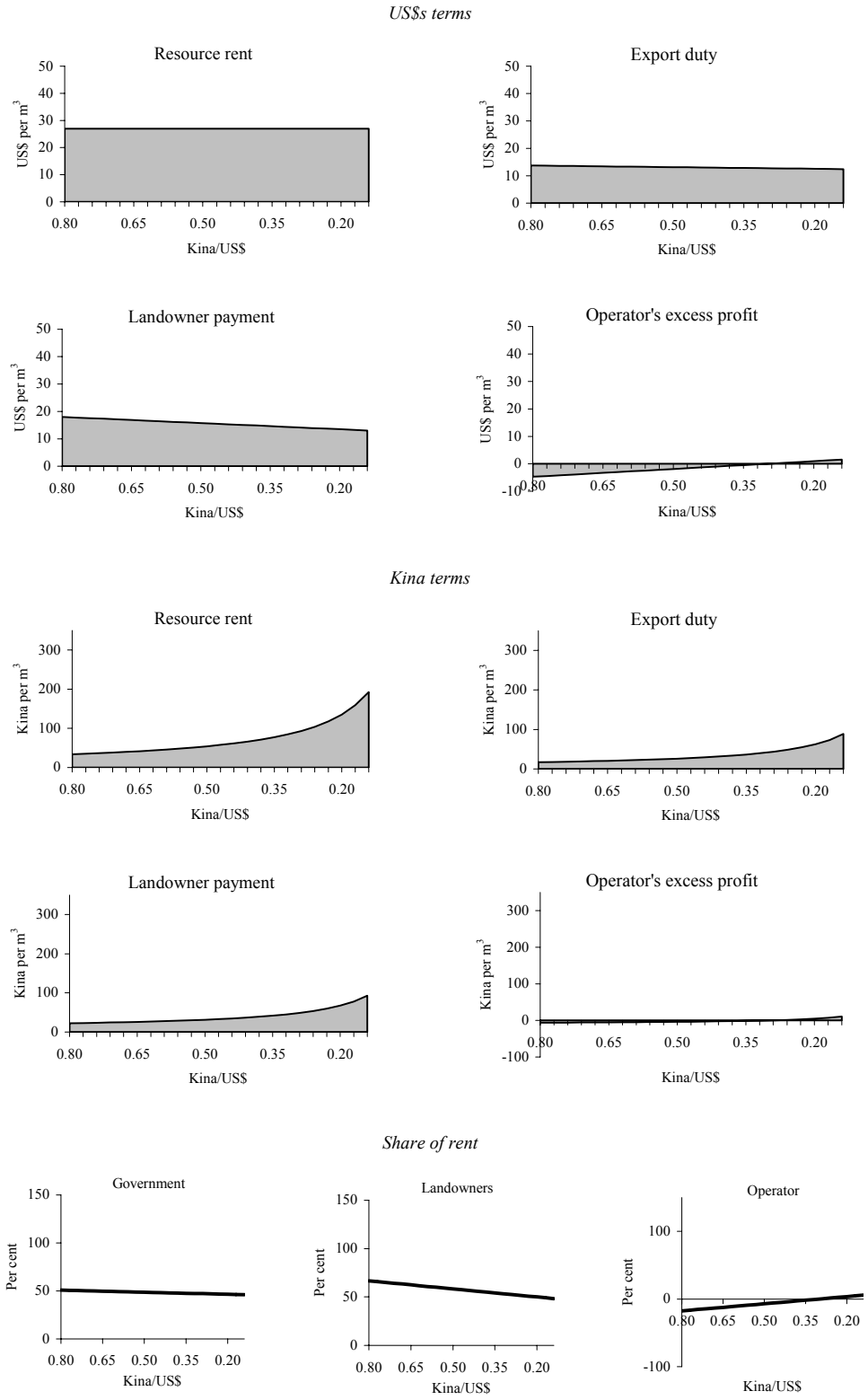
Source: Review Team estimates

FIGURE B.7 RESOURCE RENT UNDER A MORE EFFICIENT AND EQUITABLE REVENUE SYSTEM AND VARIABLE US$ PRICES



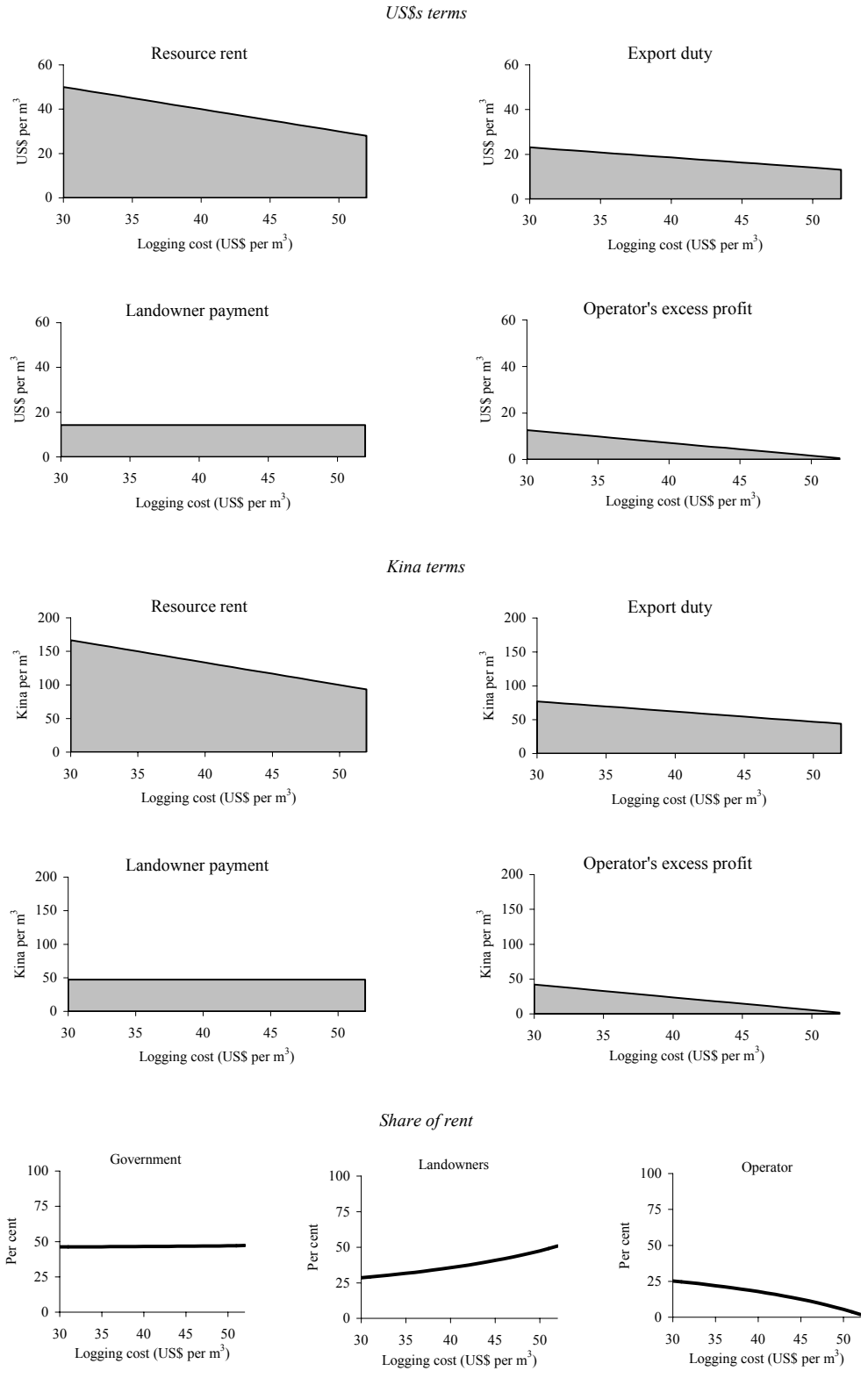
Source: Review Team estimates

FIGURE B.8 RESOURCE RENT UNDER A MORE EFFICIENT AND EQUITABLE REVENUE SYSTEM AND A VARIABLE KINA



Source: Review Team estimates

FIGURE B.9 RESOURCE RENT UNDER A MORE EFFICIENT AND EQUITABLE REVENUE SYSTEM AND VARIABLE LOGGING COSTS



ANNEX C COST BENEFIT METHODOLOGY

C.1 OVERVIEW OF THE METHODOLOGY

The Review Team's cost-benefit analysis of timber processing focuses on the impact of processing on the level of consumption by Papua New Guineans. The test rule applied is as follows - if higher consumption levels are possible because of the timber processing operation, Papua New Guinea is better off and timber processing passes the cost-benefit assessment. If instead the costs are so high such that the processing operation actually reduces potential consumption levels, Papua New Guinea is interpreted as worse off and timber processing fails the cost-benefit assessment.

Timber processing has both direct and indirect effects on the consumption levels of Papua New Guineas. There are both direct and indirect benefits, and direct and indirect costs.

The direct benefits are relatively straightforward to quantify. They arise as national workers earn salaries and wages and as landowners are paid royalty. It is assumed that all this income and royalty payments are spent such that the direct effect on consumption equals the level of the payment.[33]

Indirect benefits are harder to quantify. Ideally a representative survey would be conducted of the timber processing industry and associated activities and such that typical indirect effects could be calculated. However this is impractical (as is usually the case in economic impact analysis). Some simplifying assumptions are instead made in order to quantify the indirect effects.

Some indirect benefits arise as the expenditure from processing operations on the inputs to production feed through the economy. For example, as the demand for local inputs creates opportunities for income to be earned in supporting industries. This extra income boosts consumption (on the assumption that all income is consumed) and this is a benefit offered by the processing operation. The total effect of these purchases of production inputs on economy-wide income can be estimated using what are termed value-added, input-output multipliers (value-added is the addition of wages and salaries, profits and rents and equals income). These multipliers capture the total effect on value-added (ie on income) arising from the extra production from an industry as demand for its output increases (ie in effect the multiplier adds up the value-added created in the supplying industry, the value-added created in its supplying industries etc and the extra value-added subsequently created as the initial increase in value-added is used to fund household consumption etc, where the leakage from the economy via imports is taken into account at each stage).

The extra consumption flowing directly from payments of wages and salaries to national employees and of royalty to landowners also create indirect benefits as it flows through the economy. These arise as suppliers of consumption goods and services employ labour, demand inputs to production etc. These indirect benefits flowing from consumption can also be estimated

[33] It would be possible to assume that some of these payments are saved. If the savings are invested efficiently (and the rate of return on investment equals the social opportunity cost), the net present value of the consumption ultimately funded by these savings equals the initial level of savings. In which case the initial level of savings can be interpreted as equal to the level of consumption and the assumption that some payments are saved would not affect the estimates of the impact on consumption.

using value-added, input-output multipliers to show the total effect on value-added (ie income) made possible by the direct boost to sales of those industries supplying consumption goods and services (again assuming that all income is consumed). Indirect benefits also arise from the extra demand generated by the consumption of foreign workers, and these benefits can be estimated in a similar fashion.

Taxes collected from the timber processing operation and its workers fund government expenditure and this also generates value-added as it feeds through the economy. Again value-added, input-output multipliers can be used to calculate the total effect on value-added of this increase in expenditure (where the additional value-added is assumed to be fully consumed for the purposes of the cost-benefit test).

As explained in the body of the report, government expenditure and infrastructure funded by the timber processors are assumed to have important, additional flow-on effects because they help develop the economy. The method for quantifying these so-called productivity effects and their effect on consumption is discussed in the body of the report. Data on the value of infrastructure benefits paid by processors are unavailable, and are assumed to equal the estimate by Groome Poyry (1998) of the average value of the infrastructure levy paid by logging companies to Provincial Governments.

The direct costs of the timber processing operation are, like the direct benefits, relatively easy to quantify. It is assumed that consumption is forgone equal to the level of landowner premiums forgone.

The cost of timber processing arises from the export duty forgone. This means government expenditure is forgone. This would have generated value-added in the economy had it been spent, and offered productivity benefits. The method for quantifying the direct and indirect effects is as employed to estimate the benefits flowing from government expenditure (except the estimated flows are interpreted as costs because they are forgone under timber processing).

C.2 INPUT-OUTPUT MULTIPLIERS

This section explains the basis of the input-output multipliers used in the cost-benefit assessment.

Input-output models provide a disaggregated description of an economy that identifies the inter-relationships between industries in a region. An industry's inputs into production are separated into intermediate materials and services, which are purchased from other industries, and the factor inputs of land, labour and capital. An industry's output is sold to either other industries or the 'final demand' categories that normally comprise consumption, investment, government and exports. An input-output table also shows the level of imports in an economy and the level of indirect commodity taxes paid.

Multipliers can be derived from an input-output model to measure the impact of a change in sales by an industry or the value added of an industry on key economic aggregates. These aggregates are typically total sales, value added (i.e. wages, salaries and supplements, gross operating surplus and indirect taxes paid by industry), labour income (i.e. wages, salaries and supplements) and the number of persons employed. For example, an income multiplier for farming of 0.5 would imply that for every $1 increase in farm sales, total income in the economy would increase by $0.5. The

multipliers capture both the direct effect of an industry's expansion/contraction and the flow-on effect as expenditure changes feed through the economy.

Three types of multipliers are normally derived, being —

- an initial multiplier. This looks at the direct effect of a change in industry output, such as a change in income paid to those working in the industry and the number of people employed in the industry.
- a Type I multiplier. This captures both the direct and indirect, production-induced effect. The latter refers to the industry's purchase of inputs from other businesses in the economy and the further purchase of inputs by those other businesses.
- a Type II multiplier that also captures an indirect consumption effect that flows from the spending of household income.

We have used Type II value-added multipliers in our analysis. The underlying assumption is that all value added, including profit, flowing from the expenditure triggered by processing flows to residents and ultimately is spent within Papua New Guinea (and vice versa for forgone value-added).

Ideally, the input-output multipliers would be drawn from an input-output table for Papua New Guinea that separately identified the five stylised processing projects we consider. However, no such table exists (and cannot exist as some of the projects are hypothetical and do not operate at present).

An alternative approach to the application of multipliers is adopted that rests on –

- estimating the local inputs to the production process. Multipliers for the relevant industry (ie the supplying industry) are applied to the estimated levels of sales by that industry to the stylised processing operation. So, for example, we estimate that every cubic metre of log input required K5 worth of oil and fuel during processing. If the value-added multiplier for the oil and fuel industry is 2, we calculate the total direct and indirect effect of the purchase of oil and fuel by processing as K10 (i.e. K5 x 2).
- estimating the income earned by national labour, the payment of royalty to landowners and the local consumption of foreign works (as K100 per week per employee) and applying a weighted average multiplier calculated for consumption of goods to these flows.
- separately estimating the government expenditure funded by taxes on foreign labour income or foregone via the export duty concessions and applying an average multiplier calculated for government expenditure to these flows.

The multipliers used in this analysis are drawn from an input-output table prepared for the Fiji Islands for 1997 by the Fiji National Statistics Office of Fiji Islands (see Table C.1). These multipliers are consistent with those estimated by the Queensland Government Statistician for native forest logging areas of Queensland, giving some confidence in their reliability (see Table C.2).

TABLE C.1 MULTIPLIERS FOR SELECTED INDUSTRIES FOR THE FIJI ISLANDS

Industry	Value added multipliers[a]	
	Type I	Type II
Fiji Islands (1997)		
Forestry	0.83	1.15
Other manufacturers	0.60	0.83
Electricity & water	0.87	1.01
Construction	0.68	1.07
Transport	0.64	0.96
Business services	0.76	1.12
Other Priv services	0.79	1.18
Health	0.82	1.27
Education	0.94	1.61
Other gov services	0.92	1.36
'Consumption basket'	0.74	1.02

a The Type I multipliers show the $ increase in regional value-added (ie the income generated in a region) for a $1 increase in sales taking into account the increased demand for the output of other industries only. The Type II multipliers also factor in the $ increase in regional value-added resulting from the expansion in other industries as household expenditure increases

Source: Consultants estimates based on the input-output tables for the Fiji Islands for 1997 as prepared by the National Statistics Office of the Fiji Islands (and reproduced in Levantis (1997)).

TABLE C.2 MULTIPLIERS FOR SELECTED INDUSTRIES FOR NATIVE FOREST LOGGING REGIONS OF QUEENSLAND

Industry	Value added multipliers[a]	
	Type I	Type II
Northern Region (1989-90)		
Forestry	0.90	1.23
Wood and paper	0.78	1.18
Chemicals, petroleum and coal products	0.68	0.94
Other manufacturing	0.66	0.97
Electricity	0.75	0.94
Other building and construction	0.79	1.16
Non-rail transport	0.84	1.13
Finance, property and business services	0.82	1.20
Public administration	0.87	1.41
'Consumption basket'	0.84	1.12
Fitzroy Region (1989-90)		
Forestry	0.81	1.03
Wood and paper	0.72	1.03
Chemicals, petroleum and coal products	0.60	0.76
Other manufacturing	0.63	0.90
Electricity	0.79	0.95
Other building and construction	0.70	0.96
Non-rail transport	0.77	0.98
Finance, property and business services	0.75	1.03
Public administration	0.85	1.28
'Consumption basket'	0.78	1.00
Darling Downs Region (1989-90)		
Forestry	0.82	1.10
Wood and paper	0.76	1.16
Chemicals, petroleum and coal products	0.74	0.98
Other manufacturing	0.58	0.81
Electricity	0.82	1.00
Other building and construction	0.75	1.10
Non-rail transport	0.82	1.08
Finance, property and business services	0.80	1.15
Public administration	0.86	1.37
'Consumption basket'	0.83	1.07

a The Type I multipliers show the $ increase in regional value-added (ie the income generated in a region) for a $1 increase in sales taking into account the increased demand for the output of other industries only. The Type II multipliers also factor in the $ increase in regional value-added resulting from the expansion in other industries as household expenditure increases

Source: Regional input-output tables for 1989-90 prepared by the Queensland Government Statistician's Office

C.3 DATA

The data drawn upon for the analysis are summarised at Table C.3.

TABLE C.3 CHARACTERISTICS OF THE STYLISED OPERATIONS

	Stylised Operation						
	Logging	*Portable/ relocatable eco-mill*	*Small commercial mill*	*Medium to large sawmill*	*Integrated small sawmill*	*Large export veneer mill*	*Large export plywood mill*
Log input ('000 m3/yr)	250,000	330	2,000	63,000	10,000	150,000	150,000
IRR (per cent)	0	18	22	24	28	8	-3
Log price paid (US$/m3)							
Base Case	0	16	60	50	45	36	36
For a 15 per cent IRR at current prices	0	19	63	57	73	26	9
For a 15 per cent IRR if prices were 50 per cent higher	0	19	88	79	78	45	32
Affordable export duty (US$/m3)							
For a 15 per cent IRR at current prices	0	3	3	7	28	-11	-27
For a 15 per cent IRR if prices were 50 per cent higher	0	3	28	29	33	9	-5
Foreign employees							
Number	30	0	1	20	3	50	60
Wages ('000 K)	2,098	0	30	500	90	1,250	1,500
Wages per employee (K)	69,940	0	30,000	25,000	30,000	25,000	25,000
Income tax per employee (K)	22,879	0	8,900	7,150	8,900	7,150	7,150
Total income tax from foreign employees (K/year)	686,375	0	8,900	143,000	26,700	357,500	429,000
Total local expenditure of foreign employees (K/year)	156,000	0	5,200	104,000	15,600	260,000	312,000
National employees							
Number	400	6	14	300	145	500	625
Wages ('000 K)	1,652	12	35	851	435	1,690	2,113
Wages per employee (K)	4,129	2,079	2,500	2,835	3,000	3,380	3,380
Inputs to production ('000 kina)							
Operating supplies	0	0	4	284	150	1,350	8,250
Repairs and maintenance	7,054	3	8	851	150	3,000	4,000
Fuel and oil	6,964	6	2	354	0	1,500	2,625
Electricity	0	0	4	0	350	0	0
Transport	5,357	0	80	992	0	1,350	1,500
Other overheads	3,125	0	20	340	75	1,013	1,350
Other general and admin	8,929	0	40	340	100	500	550
Total	31,429	9	158	3,161	825	8,713	18,275
Local inputs ('000 kina)							
Operating supplies	0	0	1	85	45	405	2,475
Repairs and maintenance	705	0	1	85	15	300	400
Fuel and oil	696	1	0	35	0	150	263
Electricity	0	0	4	0	350	0	0
Transport	1,607	0	24	298	0	405	450
Other overheads	1,563	0	10	170	38	506	675
Other general and admin	4,464	0	20	170	50	250	275
Total	9,036	1	60	843	498	2,016	4,538
Infrastructure							
Benefit in Kina per m3 of log input	2	1	1	1	1	1	1
Royalty in kina per m3 of log input	10	10	10	10	10	10	10
Best estimate of export duty forgone							
Kina per national employee per annum	0	4,507	13,486	19,824	2,826	13,060	10,448
Per m3 of log input	0	82	94	94	41	44	44
Best estimate of premium forgone							
At current prices per m3 of log input	0	12	12	12	12	12	12

ANNEX D MISCELLANEOUS DATA

TABLE D1 ESTIMATES OF THE CURRENT REFORESTATION LEVY TRUST FUND

	Kina	Levy Collected	Capital 5.00%	Plus 10.00%	Interest 15.00%
Balance in 1994	4,484,412				
Balance in 1995	6,931,607	6,931,607	6,931,607	6,931,607	6,931,607
Deposits Net of Drawings during 1995	2,447,195				
Export Volume 1995 (m3)	2,400,000				
Reforestation Levy K per cubic metre	1.019664583				
Export Volume 1996	2,600,000	2,651,128	9,929,315	10,275,896	10,622,476
Export Volume 1997	3,006,157	3,065,272	13,491,053	14,368,757	15,281,119
Export Volume 1998	1,612,567	1,644,277	15,809,883	17,449,910	19,217,565
Export Volume 1999	1,983,852	2,022,864	18,623,241	21,217,765	24,123,063
Export Volume 2000	1,992,527	2,031,709	21,586,112	25,371,250	29,773,231
Export Volume 2001 Estimated	1,564,190	1,594,949	24,260,367	29,503,325	35,834,165
Total Estimated Reforestation Levy at 31.12.'01 before drawings 1996-2001 and ignoring interest earned		19,941,806			
Total Estimated Reforestation Levy at 31.12.'01 before drawings 1996-2001			24,260,367	29,503,325	35,834,165

Notes: 1994 & 1995 actual from PNGFA 1995 Annual Report

Estimates for 1996-2001 use average rate derived from 1994-95 and actual volumes, except 2001 estimated volume

Assumption: No drawings between 1995 and 2001

TABLE D2 LIST OF GROUP 1 SPECIES & CURRENT VALUES, VOLUMES & AVERAGE PROPENSITY TO DOWNGRADE

Commercial Name	Scientific Name	Mean Fob P US$ per cubic metre in 2001	Price Index 1= US$75.39	Mean Fob P US$ per m3 in Sept 2001	Average Sales Volume m3/month in 2001	Average Propensity to Downgrade (0-1)
Kwila	Intsia spp.	$99.04	1.314	N/a	133	0.79
PNG Mersawa	Anisoptera thurifera	$90.20	1.196	$78.19	10425	0.23
Pencil Cedar	Palaquium warburgianum	$86.71	1.150	$73.17	5799	0.12
Taun	Pometia pinnata	$84.98	1.127	$69.13	12680	0.21
Calophyllum	Calophyllum spp.	$84.73	1.124	$71.52	15804	0.12
Red Planchonella	Planchonella torricellensis	$70.55	0.936	$54.54	173	0.14
Red Canarium	Canarium indicum	$68.17	0.904	$58.65	4040	0.20
Hekakoro	Gluta papuana	$67.52	0.896	N/a	41	0.00
Burckella	Burckella obovata/B. sorei	$67.26	0.892	$57.57	4336	0.10
Grey Canarium	Canarium oleosum	$67.24	0.892	$56.69	2045	0.10
Terminalia	Terminalia spp.	$66.65	0.884	$56.87	5951	0.16
White Planchonella	Planchonella kaembachiana	$65.74	0.872	$55.91	1096	0.07
Dillenia	Dillenia papuana	$64.51	0.856	$53.32	4685	0.16
Lophopetalum/Perupok	Lophopetalum torricellense	$64.34	0.853	$58.89	1013	0.10
Erima	Octomeles sumatrana	$63.64	0.844	$55.19	5019	0.14
Malas	Homalium foetidum	$63.28	0.839	$54.80	15279	0.06
PNG Walnut	Dracontomelon dao	$60.21	0.799	$50.55	2750	0.15
Group 1	All Species	$75.39	1.000	$67.29	91269	0.15
Group 2	All Species	$59.31	0.787	$48.89	11950	0.12
Group 3	All Species	$55.26	0.733	$45.34	33387	0.07
Group 4	All Species	$50.80	0.674	$42.62	28070	0.08
Group 2	Plantation Regular	$57.00	0.756	N/a	2757	0.00
All Groups	Saw/Veneer	$65.95	0.875	$59.25	164676	N/a
All Groups	All Logs	$62.55	0.830	$56.28	188972	0.12
All Groups	Low Grade	$39.14	0.519	$35.86	22652	N/a

Source: SGS Log Export Monitoring Report for September 2001

ANNEX E TERMS OF REFERENCE

REVIEW OF THE FOREST REVENUE SYSTEM

1 Introduction

As part of the Government's announced initiative to encourage sustainable forest management, it has commissioned the Review team to undertake a Review of the Forestry Revenue System and Taxation Regime. The Review will be transparent and involve consultation and dialogue with stakeholders.

In 2000, the Review completed a partial review of various aspects of forestry taxation and the resulting recommendations were included in the 2001 Budget. As a continuation of this process a more comprehensive examination of the forestry revenue and tax system is proposed that will not only build on this previous work but will also include a number of other previous forest revenue studies within PNG and overseas. It is envisaged that implementation of more medium-term reform options/recommendations of the forestry revenue system and taxation regime will be facilitated through the proposed Forestry and Conservation Project.

The Government's objectives for the development of the forestry revenue system are:

- To improve the forestry revenue and taxation system to encourage tax efficiency and buoyancy, sustainable forestry management, adequate economic rent capture and good governance, taking into account the importance of sustaining robust revenues to the State and reducing distortions to resource allocation decisions (allocative efficiency);
- To enhance equity in the forestry revenue and taxation system to ensure a fair distribution of benefit between resource owners, the community and the State, while minimizing distortions to commercial investment and operational decisions and returns;
- To reduce impediments to the development of economically viable and sustainable forestry-based opportunities, including domestic processing, plantations and natural forest regeneration improvement, and evaluating options for charges and/or incentives while minimizing the impact on allocative economic efficiency; and
- To improve the administration of the system through measures designed to enhance compliance and good management practice, increase transparency and accountability, limit the official management of trust funds and reduce discretion by officials, thereby reducing the scope for malfeasance.

In this Review, the primary focus will be to assist the Government lay the foundations for an efficient, robust and equitable tax and revenue regime that will underpin the long-term sustainable development of forestry in Papua New Guinea. It is imperative that this review be conducted from a long-term national economic perspective, rather than the more narrow financial perspective of the firm's ability to pay, as has been the case in all previous forest revenue studies.

2 Background

This Review is part of a broader reform of the forestry sector which has included: amendments to the Forestry Act to improve governance and accountability; an Independent Review of FMAs and other timber harvesting applications; and a proposed Forestry and Conservation Project (supported by the World Bank).

Current forest tax and revenue arrangements are set out in the table below:

National Government	Provincial Governments	Resource Owners
Company income tax including concession arrangements	VAT (now zero rated)	Royalties
Withholding tax	Infrastructure development levies	Project Development Benefit (formerly Levies)
Log Export tax		Premiums and development levies (some projects);
VAT (now zero rated)		Reforestation levy administered by PNGFA
Reforestation levy administered by PNGFA		
Personal income tax		

It is recognised that the current revenue system is not consistently applied to all projects (partly on the basis of prior project agreements, etc.), and is relatively limited in its objectives and coverage.

3 Issues for Review

The proposed revenue system should be developed on the basis of the current forest tax and revenue system elements (taxes, royalties, levies, incentives and fees) against generally accepted tax principles (efficiency, buoyancy, administrative simplicity, user pays attributes etc.) and accounting for the interdependencies of tax and revenue components within a whole forestry revenue system. In addition, charges and levies should be evaluated against their objectives and against the overall forest policy of the PNG Government. In this respect, the review should generally take forest policy as set by Government as a given, unless changes can demonstrably and significantly improve the efficiency and administration of the forest revenue system. The review should also attempt to establish/maintain a level playing field framework both within the forest and related forest industries and with other industries in PNG.

The proposed revenue system should ultimately relate to the entire forestry sector, notably:

- natural forest utilisation (including industrial logging, community forestry and eco-forestry);
- plantation forestry;
- non-timber forest products (including rattan, eaglewood, etc); and
- timber processing.

Resource Owner Benefits

Until 1996, royalty rates varied between projects, in accordance with project agreements and related project conditions, when they were standardised at K10 per cubic metre. Levies, premiums and other non-monetary contractual requirements for landowner benefits still vary markedly between projects.

The Project Development Levy (PDL) was announced in the context of the 1996 Budget, to ensure greater consistency in community benefits between projects, notably in terms of a floor level, and to ensure better delivery of longer term community benefits, especially local infrastructure, etc. The PDL was never implemented, as a result of a combination of industry resistance and legal difficulties with its retrospective application to existing projects.

Subsequently, a similar Project Development Benefit (PDB) has been adopted by the National Forest Board on the same basis as the PDL, but restricted only to new projects and those existing projects that come up for contractual review.

It is important to note that the PDL/PDB on log exports was only intended to serve as an interim measure, until a study of domestic processing costs and benefits, and forest revenue was to have been conducted in 1997. Unfortunately, that study did not complete its terms of reference, notably in terms of economic assessment. Options, such as some form of revenue recycling to fund ongoing infrastructure projects, need to be presented/reviewed to address the problem of very long rotations, which effectively remove incentives for individual clan groups to participate in longer term development decision frameworks.

Corporate Income Tax and Transfer Pricing

Apparent transfer pricing is a major issue of concern. For example, published log trade data has revealed unexplained inconsistencies, after accounting for freight and insurance, between PNG FOB log prices and Japanese CIF log prices, of up to US$35 (This refers specifically to taun and calophyllum saw/veneer logs) per cubic metre for premium timber species.

In addition, many logging companies have either never paid corporate income tax or paid very limited tax, despite operating in PNG for many years. Consequently, corporate tax administration with respect to forestry would appear to be the key issue to be reviewed, particularly the extent of transfer pricing, and recommendations should focus on how to improve compliance. In this respect, the log export tax should not, in the first instance, be used beyond economic rent capture to offset compliance inadequacies in corporate tax collections. Recommendations should focus on rectifying these directly if plausible. The structure of corporate taxation would appear appropriate and level playing field considerations should steer the evaluation and recommendations away from altering corporate tax rate structures.

Domestic Processing

Domestic timber processors currently receive preference compared to log exporters, as a result of being exempt from export taxes, PDB and log export premiums of about US$35 per cubic metre. The 2000 Taxation Review raised concerns regarding this apparent distortion. The level of preference depends substantially on the economic rent captured by the log export tax etc. that is the real benefit to processors, not necessarily the current level of the tax. In general explicit tax incentives should be avoided and focus should be on impediments to processing etc. If fiscal incentives are to be granted, then for transparency reasons, direct budget payments should be considered.

Long-term Government policy favours the progressive replacement of log exporting with domestic processing of forest products, so long as the activity is economically viable and sustainable. It is recognised that value-added may be achieved, and greater local employment secured, both in major processing operations and small-scale saw-milling. However, while initial concessions may be justified (as an infant industry), it is important to ensure the fundamental consistency of the basic tax regime. General concessions are already available under the existing Income Tax Act for all resource processing activities. Some minor forest products, such as eaglewood, are currently being exported without any export tax, royalties, or management conditions being applied.

Recommendations in this sector should focus on the measurement of short and long term economic benefits of various downstream processing options.

Log Export Tax

The revenue and many of the costs for timber companies are denominated in US dollars, or other currencies rather than Kina. Fluctuating and generally declining Kina to Dollar exchange rates over the past decade, coupled with the progressive structure of the tax bands, have lead to sharp variations in effective export tax rates. With improved compliance, in large part the result of the contracting of the monitoring to an external company, this would appear to have resulted in less compliance with payment of other forestry taxes and charges. In 2000, the Review briefly considered this issue, but further examination is required. This tax should be predominantly tied to the capture of economic rents.

4 Specific Outputs

The Review shall:

- derive an estimate of economic value[34] for the natural forest resources which can used as basis to underpin a forest revenue regime;
- conduct an economic cost-benefit appraisal for a range of industrial timber processing options, notably:- large and small scale timber processing, veneer/plywood mill, and pulp mill. The appraisal shall assess the income and employment multiplier effect from these options;
- ascertain the level of transfer pricing if any, and recommend strategies to overcome the practice or alleviate the impact of transfer pricing to PNG;
- assess the potential resource rental from log exports;
- establish a broad base for allocation of resource rents;
- recommend a level and an administrative mechanism for industry performance bonds.

Recommendations should be separated into those that can be adopted in the short term and those that will need a longer-term implementation phase and/or require capacity building or further review.

[34] Consisting of environmental value (including watershed management, etc.), customary social and economic resource use (including timber and non-timber forest products for subsistence and cash income, etc.), as well as commercial timber value.

5 Review Team

The Review Team will work closely with the Inter-agency technical working committee from the PNG Forest Authority, Internal Revenue Commission, Department of Treasury, Department of Planning and Monitoring and the Department of Prime Minister and the National Executive Council.

The Review Team will consist of:

- A **Team Leader**, who shall be a highly experienced Forest Economist, with wide-ranging background in natural resource management, including tropical forestry, revenue systems and downstream processing;
- An E**conomist** with experience of economic issues and analysis in Papua New Guinea, including forest revenue systems;
- A **Natural Resource Economist** with experience in resource valuation, externalities and multipliers.
- A **Forestry Specialist** with experience in PNG forestry management and development.
- A **Processing Specialist** with experience in domestic processing.
- A **Forestry Marketing Specialist**, with knowledge of marketing channels, especially for tropical timber (the South Sea Log Trade), costing systems, marketing mechanisms etc.

The review team shall convene a workshop to consult with landowners, non-government organisations, logging and processing industries, and officials.

ANNEX F REVIEW TEAM MEMBERS

Jim Belford, Forestry Specialist, Papua New Guinea

Lachlan Hunter, Team Leader, New Zealand

Chris LaFranchi, Resource Economist, USA

Alan Ogle, Forest Industry Specialist, New Zealand

Craig Sugden, Economist, Australia

Ivan Tomaselli, Forest Products Marketing Specialist, Brazil

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