TAB E

This is Exhibit "E" referred to in the

Affidavit of Li Yin Fan,

sworn before me this _20_

day of August, 2012

_____
Person Authorized to take Affidavits

Katherine K. Y. Lam
Solicitor,
Hong Kong SAR
Messrs. Simon Si & Co.

⊙ PÖYRY

Report

38A08032
15 March 2007
Final

Valuation of China Forest Assets
As at 31 December 2006

Sino-Forest Corporation
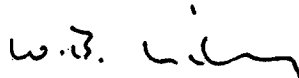
Competence. Service. Solutions.

PÖYRY

PÖYRY

PÖYRY

PÖYRY

PREFACE

This report is issued by Pöyry Forest Industry Ltd (**Pöyry**) to Sino-Forest Corporation (**Sino-Forest**) for its own use. No responsibility is accepted for any other use.

The report contains the opinion of Pöyry as to the **Value of Sino-Forest's Plantation Forest Assets as at 31 December 2006**. Nothing in the report is, or should be relied upon as, a promise by Pöyry as to the future growth, yields, costs or returns of the forests. Actual results may be different from the opinion contained in this report, as anticipated events may not occur as expected and the variation may be significant. Pöyry has no responsibility to update this report for events and circumstances occurring after the date of this report.

W B Liley
ASSOCIATE PRINCIPAL

O D Somerville
CONSULTANT

Contact

Bill Liley
Level 5
HSBC Building
1 Queen Street
Auckland, New Zealand

Tel. +64 9 918 1100
Fax +64 9 918 1105
E-mail: bill.liley@poyry.com

Pöyry Forest Industry Ltd

⊙ PÖYRY

CERTIFICATION

Pöyry certifies to the following statements to the best of our knowledge and belief:

- The statements of fact contained in this report are true and correct.
- The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are our personal, impartial, and unbiased professional analyses, opinions, and conclusions.
- Pöyry has no present or prospective interest in the subject property, and no personal interest or bias with respect to the parties involved.
- Pöyry's compensation for completing this assignment is not contingent upon:
    1. the development or reporting of a predetermined value or direction in value that favours the cause of the client,
    2. the amount of the value opinion,
    3. the attainment of a stipulated result, or
    4. the occurrence of a subsequent event directly related to the intended use of this appraisal.
- Previous high level inspections have been associated with valuations carried out by Pöyry in 2000, 2001, 2003, 2004 and 2005.
- Qualitative inspections were made of a sample of Sino-Forest areas in the provinces of Hunan and Guangxi over the period 15 January 2007 to 25 January 2007.
- The report has been prepared by staff consultants, retained consultants and office support personnel of Pöyry.

Pöyry is a global consulting and engineering firm focusing on the energy, forest industry and infrastructure & environment sectors. Pöyry employs 6000 experts, and Pöyry Plc is listed on the OMX Nordic Stock Exchange.

Management Consulting is one of the key practice areas of the Pöyry Forest Industry Group. The Management Consulting segment of this group maintains permanent offices in 11 countries. This includes offices in Vantaa, Stockholm, Moscow, Munich, London, New York, Montreal, Singapore, Shanghai, Auckland and Melbourne. The Auckland office currently values some USD4 billion worth of forest assets annually, located in all parts of the world.
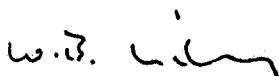
Our clients include a range of forest sector participants; forest owners, managers, institutional investors and financiers. Forest valuations are prepared for a variety of purposes:

- Financial reporting
- Insurance
- Taxation
- Compensation
- Acquisition/divestment/restructuring

PÖYRY

Clients cover a wide spectrum including governments, commercial and private sector owners and investors. Changing international accounting standards are increasingly emphasizing the concept of "fair-market value" as the basis for asset reporting. This requires careful attention to transaction evidence for which Pöyry's global presence is invaluable.

All Pöyry's valuation activities for the Asia-Pacific area including China, South America, North and South East Asia, South Africa, Australia, New Zealand and the Pacific Islands are coordinated from the Auckland office. The Auckland team, includes personnel with specialist skills in forest valuation and modelling. Within the firm's substantial track record are valuations of natural and planted forests throughout the Southern Hemisphere and Asia, including: Australia, New Zealand, Brazil, Argentina, Uruguay, Suriname, Guyana, Chile, Fiji, South Africa, Indonesia, Malaysia, the Philippines and China.

Pöyry Forest Industry Ltd

W B Liley
ASSOCIATE PRINCIPAL

PÖYRY

ASSUMPTIONS AND LIMITING CONDITIONS

This report was prepared at the request of and for the exclusive use of the client, Sino-Forest Corporation. This report may not be used for any purpose other than the purpose for which it was prepared. Its use is restricted to consideration of its entire contents. This valuation represents an update of Pöyry's 31 December 2005 forest valuation that was presented in Report 38A06804 Valuation of China Forest Assets as at 31 December 2005.

Details concerning the location and basic physical characteristics of the subject property were taken from data provided by Sino-Forest.

Pöyry has viewed a sample of cutting right purchase contracts and has assumed legal descriptions to be authoritative. Maps, diagrams and pictures presented in this report are intended merely to assist the reader.

Pöyry has undertaken a limited visual inspection of the forest resource from the ground in January 2007. Previous limited inspections have been associated with valuations carried out by Pöyry in 2000, 2001, 2003, 2004 and 2005. This appraisal assumes that the sites visited by Pöyry during its January 2007 field inspection represent the full range of conditions present. The forest inspection process has been limited to a high-level review.

Legal matters are beyond the scope of this report, and any existing liens and encumbrances have been disregarded, and the forest resource has been appraised as though free and clear under responsible ownership and competent management.

Unless otherwise stated in this report, the existence of hazardous materials or other adverse environmental conditions, which may or may not be present on the property, were neither called to the attention of Pöyry, nor did the consultants become aware of such during the inspection.

Pöyry recognizes the possibility that any valuation can eventually become the subject of audit or court testimony. If such audit or testimony becomes necessary as a result of this valuation, it will be a new assignment subject to fees then in effect. Pöyry has no responsibility to update this report for events and circumstances occurring after the date of this report.

Any liability on the part of Pöyry is limited to the amount of fee actually collected for work conducted by Pöyry. Nothing in the report is, or should be relied upon as, a promise by Pöyry as to the future growth, yields, costs or returns of the forests. Actual results may be different from the opinion contained in this report, as anticipated events may not occur as expected and the variation may be significant.

⊖ PÖYRY

SUMMARY

Valuation

Pöyry has determined the valuation of the Sino-Forest assets as at 31 December 2006 to be **USD919.0 million**. This is the result of a valuation of the existing planted area and uses an 11.5% discount rate applied to real, pre-tax cash flows.

Pöyry has also prepared an existing forest valuation that **includes** the revenues and costs of re-establishing and maintaining the plantation forests for a 50 – year period (perpetual valuation). However, to date Sino-Forest only has an option to lease the land under the purchased trees for future rotations, the terms of which have yet to be agreed. Sino-Forest is embarking on a 400 000 ha expansion of its estate in Hunan. Pöyry has determined the valuation of the Sino-Forest forest assets based on a perpetual rotation (including the planned expansion in Hunan) using a real pre-tax discount rate of 11.5% to be **USD1 427.6 million** as at 31 December 2006[1].

The following table presents the results of the valuation of the Sino-Forest estate. The results are shown at real discount rates of 10.5%, 11.5% and 12.5% applied to real pre-tax cash flows.

Table S1:
USD Valuation as at 31 December 2006

Forest Component	Real Discount Rate Applied to Pre-tax Cash Flows		
	10.5%	11.5%	12.5%
	USD million		
Existing forest estate of 352 010.2ha, current rotation only	951.2	919.0	888.7
Existing forest, and all future rotations including the 400 000 ha expansion in Hunan	1 550.3	1 427.6	1 323.8

Value Change

The change in appraised value between 31 December 2005 and 31 December 2006 is attributable to the following factors:

- The purchase of new forest areas.

- The sale of existing forest areas within the estate.

- The revision of yields associated with Hunan Chinese fir plantations.

- The revision of current and future log price estimates.

---

[1] This perpetual value estimate is based on the assumptions made with respect to the species composition and age-class structure of the assets yet to be acquired in Hunan province. This value is indicative and should not be relied upon as a promise of future value. Should definitive information describing the species and age-class structure of potential acquisitions become available, this value should be reevaluated.

PÖYRY

- An increase in maturity within the estate because of biological growth.

- Revised wood flow strategy.

Table S2 itemises the components of the overall value change.

Table S2:
Components of Value Change – USD millions

	Incremental Forest Value	Contribution to Change in Value	% Contribution to Change
		USD millions	
Value as at 31 December 2005	**728.5**		
Changes in Log Pricing	819.5	91.1	12.5
Exchange Rate	847.1	27.5	3.8
Residual Attributable to Area, Yield, and Harvest Profile Changes	919.0	71.9	9.9
Value as at 31 December 2006	**919.0**	**190.5**	**26.2**

Discount Rate

As part of the December 2005 valuation of Sino-Forest's assets, Pöyry commissioned Dr Alastair Marsden of Auckland UniServices Limited to prepare a report on the cost of capital for a generic forest investment located in China.

Dr Marsden's December 2005 report concluded that depending on the modelling assumptions a range of discount rates might be proposed for a forest-owning venture in China. His derived ranges of rates are shown in **Table S3**.

Table S3:
Estimate of Post-tax WACC by Marsden

Lower Bound	Average Estimate	Upper Bound
5.0	6.6	8.2

The formulation of WACC employed by Dr Marsden was associated with post-tax cash flows and includes the cost of debt. Dr Marsden also converted his estimate of nominal post-tax WACC to an 'equivalent" real pre-tax WACC through a simple transformation with appropriate qualification. The average estimate of WACC to apply to real pre-tax cash flows is 9.9% (**Table S4**).

Table S4:
Estimate of Real Pre-tax WACC

Lower Bound	Average Estimate	Upper Bound
7.5	9.9	12.3

Implied Discount Rates

In common with other valuers of southern hemisphere planted forests, Pöyry maintains a register of significant forest transactions. The available evidence is then analysed in order to derive the discount rate implied by each transaction. The process involves preparing a credible representation of the forest's future potential cash flows and then relating these to the actual transaction price.

PÖYRY

From this type of exercise conducted in Australia and New Zealand, Pöyry has observed derived discount rates for recent transactions to generally fall within the range of 8-10%. These are real rates, applied to post-tax cash flows.

As yet Pöyry has little implied discount rate data for the Southern China region. As the commercial plantation forest industry develops and more forests change hands, empirical evidence from which to derive implied discount rates will arise. The capacity to utilise implied discount rates in this valuation is limited to considering how the forest investment in China compares with such investment in other locations.

Commercial forestry in Southern China is still developing and faces some challenges, these include:

- The reliability of forest descriptions
- The accuracy of yield prediction
- Achieving high growth in a consistent manner.

It is Pöyry's opinion that for many forest investors, investing in plantation forestry in China would be considered a riskier proposition than, for instance, investing in the industry in Australia or New Zealand.

Incorporating Risk in the Discount Rate

If forest investment in China is at present perceived to be a more risky proposition than like activity in other international counterparts, the issue then becomes how to quantify this difference. The textbook treatments of the subject make it clear that the discount rate cannot be regarded as a simple catch-all for any and all forms of perceived risk. Because the discount rate may be a very blunt instrument in such a role it is preferable instead to attempt to acknowledge risk in the development of the cash flows to which the discount rate is applied. However, despite this principle, there is an inclination by potential purchasers to load the discount rate where they feel uneasy.

The Discount Rate Applied in Valuing the Sino-Forest Resource

Given the complexities in identifying what margin above other implied discount rates that forestry in Southern China should attract, Pöyry is disinclined to place weight on an implied discount rate derivation for this resource. Disconcertingly, the range of rates suggested by the alternative approach - the WACC/CAPM - is very broad.

Ultimately we have exercised our professional judgement in selecting a rate at the upper end of the WACC/CAPM range. This is a real rate of 11.5%. In selecting such a rate we have been inclined to recognise that investors in forestry in Southern China will inherently be taking a long term view, and do have grounds for optimism on the forest industry's future there. The fundamental factors that affect forestry performance are favourable. Importantly, too, the definition of market value for the forests requires that there be not just willing buyers, but also willing sellers. If the only purchase offers to be extended involved very high discount rates we would expect that forests would not be willingly sold.

PÖYRY

In the current market Pöyry considers that 10.5% to 12.5% is representative of the range of real pre-tax discount rates that might be expected in forest transactions in Southern China. A discount rate of 11.5% has been selected and applied to pre-tax cash flows. It is Pöyry's perception that with a carefully timed and managed sale, other buyers could be attracted who would be willing to accept a similar pre-tax discount rate.

Log Prices

Sino-Forest generally sells the plantations on a standing basis and therefore does not sell logs direct to the market. However, current forecast mill gate log prices have been assumed for the purposes of the plantation cash flow forecasts and are presented below in **Table S5**.

Table S5:
Pulpwood and Sawlog Forecast Prices, 2006 – 2011

Pulpwood & Sawlog Grade	Dec 2005 Prices	2006	2007	2008	2009	2010	2011+
	RMB per m^3						
Acacia Pulp	300	300	300	300	300	300	300
Acacia Bark	200	200	200	200	200	200	200
Poplar <8 cm	300	300	300	300	300	300	300
Poplar 8-12cm	355	355	355	355	355	355	355
Poplar 12-20cm	410	417	421	429	433	433	433
Poplar >20cm	485	485	492	500	500	500	500
C.Fir 6-14cm	540	541	541	541	541	541	541
C.Fir 14-20cm	860	782	786	789	792	796	796
C.Fir >20cm	1000	951	957	963	969	974	974
Pine <8 cm	350	391	391	391	391	391	391
Pine 8-14 cm	450	482	482	482	482	482	482
Pine 14-20 cm	550	582	585	589	592	599	599
Pine >20 cm	650	682	685	688	691	696	696
Euc <8 cm	350	303	303	303	303	303	303
Euc 8-14 cm	390	390	390	390	390	390	390
Euc 14-20 cm	440	440	449	455	455	462	462
Euc >20 cm	580	580	592	601	601	610	610

Pöyry's projected log prices are flat in real terms for all but the sawlog grades where a modest improvement in price, supported by strong demand, is assumed.

Change in Area through Forest Acquisitions

Since Pöyry's 31 December 2005 valuation update, Sino-Forest's total plantation assets have increased from 324 296.2 ha to 352 010.2 ha. This represents a net increase of 27 713.9 ha (8.5%). Data provided by Sino-Forest indicates that the net increase is the cumulative effect of:

a) An increase in planted forest areas

b) The purchase of plantations in Guangdong, Guangxi, Hunan and Jiangxi

c) The sale of plantations in Fujian, Guangdong, Heilongjiang, Hunan and Jiangxi.

PÖYRY

As apparent from **Table S6**, while numerous purchases and sales have taken place throughout 2006, the two key drivers of area change have been Sino-Forest's withdrawal from forests in Heyuan (Guangdong), and expansion in Hunan.

Table S6:
Summary of the Existing Sino-Forest Plantation Forest Area

Province	City	Type	Area under trees (ha)		Change in Area (ha)
			31-Dec-05	31-Dec-06	
Fujian		Planted (WOFE)♥	416.2	335.0	(81.2)
		Purchased	2 306.7	0.0	(2 306.7)
Guangdong	Gaoyao	Planted (CJV)♣	6 228.8	4 883.6	(1 345.2)
		Purchased	17 166.9	17 166.9	0.0
	Heyuan	Planted (CJV)	7 481.0	7 168.4	(312.6)
		Planted (WOFE)	11 194.0	25 334.9	14 140.9
		Purchased	97 686.9	32 130.8	(65 556.1)
Guangxi		Planted (CJV)	10 997.2	13 187.6	2 190.4
		Purchased	50 955.1	75 335.9	24 380.8
Jiangxi		Planted (CJV)	7 608.5	7 544.8	(63.7)
		Purchased	108 015.7	99 351.1	(8 664.6)
Heilongjiang		Purchased	4 239.2	0.0	(4 239.2)
Hunan		Purchased	0.0	69 571.2	69 571.2
Sub-Total		Planted (WOFE)	11 610.2	25 670.0	14 059.8
		Planted (CJV)	32 315.5	32 784.4	468.9
		Purchased	280 370.5	293 555.8	13 185.3
Grand Total			324 296.2	352 010.2	27 713.9

♥ – WOFE – Wholly Owned Foreign Enterprise
♣ – CJV – Cooperative Joint Venture

Sino-Forest's Inner Mongolian Log Trading Business

Sino-Forest has requested that Pöyry incorporate the cash-flows and value projections associated with its Inner Mongolian log-trading business as part of the 31 December 2006 valuation.

Sino-Forest has entered into agreements which secure the opportunity to purchase 1.5 million m^3 per annum of predominantly larch and birch logs in Inner Mongolia. It is understood that these agreements will extend for a period of 12 years, commencing in 2006 and concluding at the end of 2017

A summary of the annual cash flows indicates an estimated net annual income of USD12.944 million, or USD8.63/m^3. This corresponds to a Net Present Value of **USD88.177 million** at a discount rate of 10%.

ら PÖYRY

CONTENTS

PÖYRY

PÖYRY

Appendices

PŐYRY

1 INTRODUCTION

Pöyry Forest Industry Ltd (**Pöyry**) has been requested by Sino-Forest Corporation (**Sino-Forest**) to prepare a valuation of its existing and prospective forest assets of Sino-Forest in Southern China. Pöyry has previously conducted forest valuations on specific areas within the forest estate in 2000, 2001, 2003, 2004 and 2005.

This valuation presents an update of Pöyry's 31 December 2005 forest valuation that was incorporated in Report 38A06804.

The data for this valuation has been provided by Sino-Forest and its associated Cooperative Joint Venture (CJV) companies.

On 28 September 2006 Sino-Forest issued a news release[2] announcing its entering into a master agreement to acquire approximately 100 000 ha of pine and fir plantations in Hunan Province. On 7 December 2006, a further news release[2] was issued detailing the signing of an agreement to acquire an additional 300 000 ha in Hunan, thus bringing the total area of planned acquisitions to 400 000 ha.

Within this valuation exercise Pöyry has confined its field visits to the Provinces of Guangxi and Hunan. A field inspection report is presented in **Appendix 1**. It is Pöyry's intention to visit other regions in a process of rolling inspections so that all of Sino-Forest's operations are visited within the annual valuation update process over time.

---

[2] Available from – http://www.sinoforest.com/companyreleases.asp

2   PURPOSE AND SCOPE

2.1   Purpose of the Valuation Update

The purpose of the valuation is to estimate the market value of the forests for asset reporting purposes; "market value" is defined as:

> *"the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming that the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby*

> - *The buyer and seller are typically motivated.*
>
> - *Both parties are well informed or well advised, and acting in what they consider their own best interests.*
>
> - *A reasonable time is allowed for exposure in the open market.*
>
> - *The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale"[3].*

The market value of the assets is estimated as at 31st December 2006.

2.2   Scope of the Valuation Update

The Valuation update employs an income expectation approach based on projected wood flows (Section 3). Asset value has been estimated using pre-tax cash flows and a discount rate expressed in real terms.

As a valuation update, the exercise has specifically addressed the following:

- Material changes to the land base between 31 December 2005 and 31 December 2006.

- Acknowledgement of recent inventory data and their impacts on regional yield estimates.

- Acknowledgement of prevailing log prices.

- Acknowledgement of expectations for future log prices.

- Acknowledgement of new evidence of market perception of forest value demonstrated in recent transaction announcements.

---

[3] Uniform Standards of Professional Appraisal Practice, The Appraisal Institute (www.appraisalinstitute.org).

PÖYRY

- Acknowledgement of WACC estimates as provided by UniServices Auckland Limited.

- Recognition that the forest estate is now 12 months further along the cash flow stream that was projected in the course of the 31 December 2005 valuation.

2.3   Matters Outside the Scope of the Valuation Update

In the absence of any prominent evidence of material change, Pöyry has not adjusted the valuation for the following factors:

- Yield tables (with the exception of Guangxi and Hunan).

- Costs of goods sold (i.e. harvesting and transport) except for costs associated with recent land acquisitions.

- Direct costs of forest operations (establishment, silviculture, etc) except for costs associated with recent land acquisitions.

⊙ PÖYRY

3   **VALUATION METHODOLOGY**

3.1   **Outline of Valuation Methods**

Accompanying the global expansion in planted forests has been ongoing refinement of the processes employed in forest appraisal.

Three main methods of appraisal are commonly distinguished. These are:

1. Comparable sales
2. Expectation value
3. Cost

If these methods are to be effectively utilised within forest valuation then all three of them generally require a discounted cash-flow (DCF) framework. A schematic representation of the relationship between the methods is illustrated in Figure 3-1 below.

Figure 3-1:
Valuation Approaches
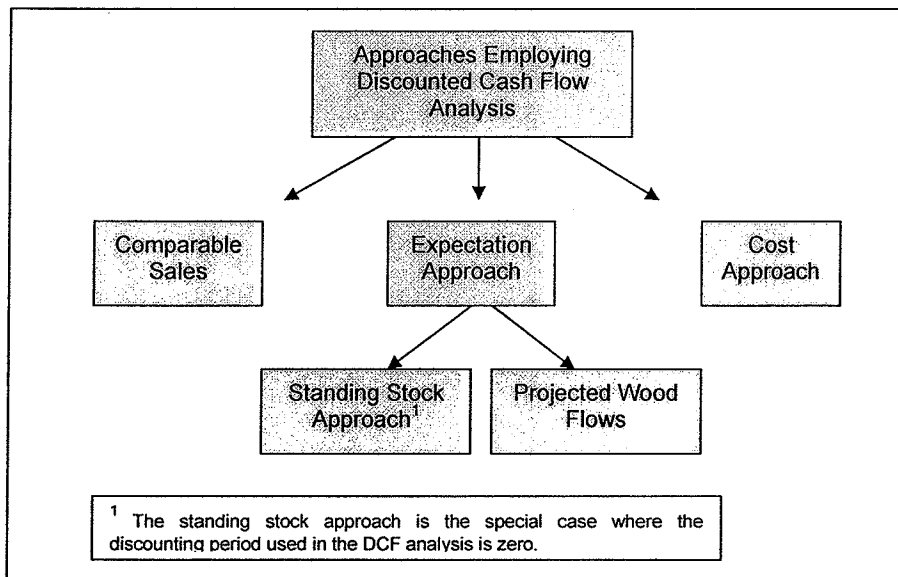
3.2   **Comparable Sales**

In principle, the most satisfactory basis for valuing forests is to turn to the evidence provided by sales transactions.

It is necessary to select the most effective form of expression of the comparable evidence. Comparisons can be conducted at the levels of:

• Forest to forest
• Dollars per hectare
• Dollars per cubic metre of production
• Implied discount rate on forecast cash flow.

PÖYRY

In reviewing the potential role of each parameter it is necessary to consider what factors influence the value of planted forests. Important factors may include:

- Forest maturity
- Species composition
- Site productivity
- Proximity to market
- Forest terrain (and thereby harvesting system)
- Silvicultural history
- Land value

Each of these factors may have a profound effect on forest value. Other factors are also recognised. Examples include the standard of roading infrastructure in the forest, and risk characteristics associated with climatic and pathogenic factors. Forest size can have an influence, although there may not be a consistent trend with changing forest area.

When comparing forests and the prices paid for them it is also necessary to consider the time at which an example sale took place. In the first instance the timing is reflected in perceptions of log prices. These involve not just the current prices, but also expectations of future price development.

Given the range of factors affecting forest value, it is statistically unlikely that forests can be found that are closely similar to a subject forest being valued. This is especially the case given that forest estate transactions in China have not been, to date, particularly frequent. Achieving a forest-to-forest match is extremely unlikely, as it would require finding forests alike in all respects, including size.

Forest appraisers have generally come to accept that the one distillable parameter that can be most usefully extracted from transactions involving heterogeneous forest resources is the Implied Discount Rate (IDR). Derivation of the IDR involves developing a credible projection of anticipated wood flows and then cash flows for each transacted forest, using the best information the analyst can obtain. This is then juxtaposed with the price actually paid for each resource. The discount rate at which the discounted cash flows match the purchase price is the IDR.

The IDR offers a device by which differences in size, timing, markets, location, age-class, volume, operability and other relevant factors are recognised. Further, the approach also recognises that a useful method of arriving at a market comparable result is to employ the same means that market participants utilise in deriving and supporting their negotiating positions. For Southern Hemisphere forest resources, the most common method of negotiating transaction values involves DCF constructions.

Given the lack of available comparable sales data for China, combined with the complexities in identifying what margin above other implied discount rates that forestry in Southern China should attract, Pöyry's preference was to not employ this method in valuing the Sino-Forest assets.

PÖYRY

3.3   **Expectation Approach**

The Expectation approach provides the Net Present Value of the future net revenue stream. It is variously referred to as the "NPV", "PV", or "Income" approach[4]. As the terminology implies, the NPV approach involves projecting the anticipated future net income stream, and then "discounting" this, at a suitable cost of capital, in order to acknowledge the lower economic value of delayed receipts.

- The NPV approach generally involves adopting the standpoint of a potential forest purchaser. To this individual or entity, funds previously invested in the forest are irrelevant – the exclusive focus is on the forest's future earning capability.

- A crucial parameter within the NPV analysis is the "discount rate". The longer the period before income realisation, and the greater the discount rate, the greater the reduction in NPV. Forest investments are generally of a long term and their value is especially sensitive to the discount rate.

- Provided that the eventual revenues are as good as or better than the valuation assumes, an investor purchasing the forest at the derived value is assured of a rate of return on investment at least equivalent to the discount rate.

For the so-called Expectation approach it is common practice to derive a Weighted Average Cost of Capital. This distinguishes the distinct costs of debt and equity. A well-recognised procedure for deriving the cost of equity is through application of the Capital Asset Pricing Model. Pöyry engages the services of an external expert, Associate Professor Alastair Marsden of Auckland University, to prepare a WACC-based derivation of discount rate. Institutional investors are mindful that forestry represents just one opportunity within the full range of capital markets. A thorough consideration of WACC/CAPM evidence has become an increasingly important component of forest valuation.

The manner in which the Comparable Sales and Expectation approaches are applied appears at first impression to be similar. Both employ a DCF formulation and refer to estimates of future cash flows. This does not imply that they should be coalesced into one single method. There is sufficient difference between them that they can potentially lead to quite different results.

3.3.1   **Realisation Value of Current Standing Stock**

This method warrants some distinct discussion because it has had some historical application. It recognises the potential net realisation value of the current timber content of the forest if it were cut down immediately. A value is based on the merchantable content (or "standing stock") at the time of the valuation. It is therefore a special case within the Expectation approach. Because the forest is harvested immediately, the cash flow modelling is confined to a single period. No discounting is required to recognise the cost of capital. This value is both tangible

---

[4] The list is not exhaustive. Other acronyms that may appear include PNW (Present Net Worth) and PW (Present Worth). In some jurisdictions, Net Present Value may include the costs of bringing the valued entity to sale. However in referring to NPV in this document we have used the term in its popular if inexact role, and treated it as providing equivalent results to the income approach.

PÖYRY

and comparatively straightforward to calculate. It does however have obvious limitations:

- For plantation forests, the timber realisation value of the stand may be very low for most of the rotation length. Despite this, the vendor will be mindful of the funds invested in each stand and can be expected to seek some reimbursement.

- By the final years of the characteristic rotation, the marginal rate of value growth of the standing stock becomes considerable. An informed and rational owner will recognise the economic opportunity associated with holding the growing trees rather than selling them. Only if the purchaser's offer matches the vendor's perception of economic opportunity cost can the vendor be indifferent as to whether to hold or sell. Inherently, therefore, the vendor's perspective is based not on the current timber content but instead on the future anticipated revenue.

- For forest resources of significant size (e.g. Sino-Forest) it is unlikely that the market could absorb all of the forest wood content at once without log prices being depressed. Furthermore, Annual Allowable Cut (AAC) constraints prevent such harvesting strategies from being employed operationally.

The first effect leads to an unduly conservative valuation while the third can lead to an overly optimistic result. It is plausible, but unlikely, that the two effects might offset one another. Pöyry's preference in valuing forests is to avoid this method altogether, as it has no rational basis for emulating expected investor behaviour.

3.4   Compounding of Costs

This method takes the costs involved in acquiring or establishing and maintaining the forest and accumulates these with compound interest from their inception of the investment to the current point in time. This forest value is therefore the price that forest owners would have to receive if they were to obtain a satisfactory rate of return on their investment to date. The method is equivalent to the accountants' concept of "capitalising" establishment/acquisition costs plus interest, although the forest valuer is more inclined to adopt assumed costs which are "standard" and current at the time of the valuation.

By using costs that are current, along with a "real" (inflation-corrected) compounding rate, the valuation is updated for inflation. The use of "industry standard" costs ensures that only costs consistent with efficient practice are recognised. Forest valuers are wary of the compounding approach, and likewise capitalisation. In the market place a "high cost" forest does not necessarily prove to be a "high value" forest[5] and yet this is what the method can imply.

---

[5] Davy, A. (1987) Accounting for forestry activities in New Zealand. New Zealand Society of Accountants Research Bulletin R117.

PÖYRY

3.5   **Valuation Methods Applied in Valuing the Sino-Forest Assets**

Within this valuation Pöyry has valued the forests using an expectation approach based on a projected wood flow profile. Cash flows attributable to both the existing rotations and planned future rotations of the forest have been included. The forest estate has been modelled on a perpetual basis for both the existing and succeeding rotations, thereby recognising the expected long-term management intentions and continued sustainability of the estate. The valuation is based on real pre-tax cash flows.
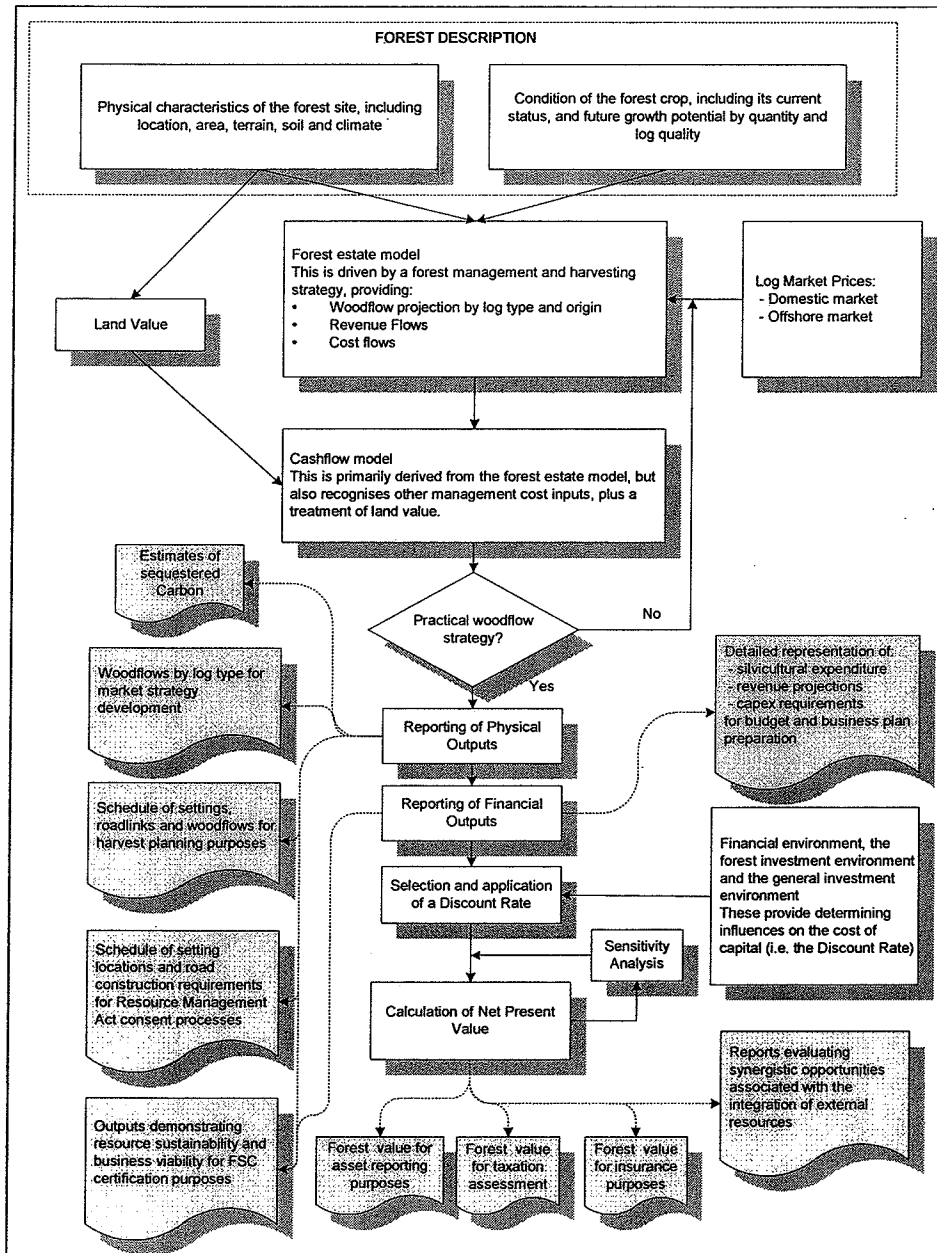
3.6   **Valuation Process**

The process employed in valuing the Sino-Forest estate can be summarised under the following key steps:

i)   Data assembly and updating of the forest description.

ii)   Execution of a field inspection.

iii)   Recognition of field inspection findings into the resource description if required.

iv)   Review of harvest reconciliations and yield tables (total recoverable volume and volume by product).

v)   Identification of land value and costs and how these are to be incorporated in the forest valuation.

vi)   Review and updating of relevant direct and indirect costs.

vii)   Updating of log price data and log price allocation.

viii)   Construction of the forest estate model and projection of the future wood flows by log grade.

ix)   Derivation of cost and revenue flows.

x)   Selection of the appropriate compounding and discounting rates, including analysis of:

     a)   Implied discount rates from transaction evidence (if applicable)

     b)   Discount rates derived from WACC/CAPM formulations.

xi)   Estimation of the value of the forest and tree crop.

xii)   Sensitivity analysis.

xiii)   Value change analysis.

The above process is illustrated in Figure 3-2.

⊙ PÖYRY

Figure 3-2:
Schematic Outline of the Valuation Process

FOREST DESCRIPTION

Physical characteristics of the forest site, including location, area, terrain, soil and climate

Condition of the forest crop, including its current status, and future growth potential by quantity and log quality

Forest estate model
This is driven by a forest management and harvesting strategy, providing:
• Woodflow projection by log type and origin
• Revenue Flows
• Cost flows

Land Value

Log Market Prices:
- Domestic market
- Offshore market

Cashflow model
This is primarily derived from the forest estate model, but also recognises other management cost inputs, plus a treatment of land value.

Estimates of sequestered Carbon

Practical woodflow strategy?   No

Woodflows by log type for market strategy development

Detailed representation of:
- silvicultural expenditure
- revenue projections
- capex requirements
for budget and business plan preparation

Yes

Reporting of Physical Outputs

Schedule of settings, roadlinks and woodflows for harvest planning purposes

Reporting of Financial Outputs

Selection and application of a Discount Rate

Financial environment, the forest investment environment and the general investment environment
These provide determining influences on the cost of capital (i.e. the Discount Rate)

Schedule of setting locations and road construction requirements for Resource Management Act consent processes

Sensitivity Analysis

Calculation of Net Present Value

Reports evaluating synergistic opportunities associated with the integration of external resources

Outputs demonstrating resource sustainability and business viability for FSC certification purposes

Forest value for asset reporting purposes

Forest value for taxation assessment

Forest value for insurance purposes

3.7   Other Aspects of Applying the Expectation Approach

In applying the expectation approach, the following aspects also require consideration:

- Analysis of pre-tax or post-tax cash flows
- The period of analysis.

PÖYRY

3.7.1 Analysis of Pre-tax or Post-tax Cash Flows

Both approaches have been demonstrated in valuing planted forests. For cash flows derived on a pre-tax basis a pre-tax discount rate is applied. Consistent with Pöyry's 31 December 2005 valuation, the valuation has been completed on a pre-tax basis, using cash flows (and discount rate) expressed in real-terms.

3.7.2 The Period of Analysis

Wood flows and associated cash flows may be modelled on a perpetual basis or they may be confined to the current rotation.

Pöyry has observed ongoing changes in forest valuation practices. These have been particularly evident as the level of transaction activity has increased.

Forest estate models have come to be an integral part of the forest valuation process, being applied to identify the forest's long-term supply capability. Despite this extended wood flow-modelling horizon, there has been a general tendency to confine the scope of the financial analysis to those cash flows solely associated with the tree crop that currently exists. This includes all parts of the present forest from the oldest stands to those just established. It excludes, however, trees that are yet to be planted as these are considered to be part of a new investment cycle.

Wider business appraisal practice encourages the confinement of the scope of analysis to the current investment cycle. There are arguments that forest valuation should be no different. The practice of considering the performance of the existing tree crop alone lies with the general preference for avoiding unnecessary conjecture associated with costs, yields, anticipated revenues and the future discount rate.

As generally applied, the current rotation model is not to be confused with the "standing-stock approach". Instead, the harvesting strategy for the current tree crop is assumed to be consistent with a long-term sustainable management policy, and although there will be future rotations, they will not contribute to the net present value calculation, i.e. they are "NPV neutral". In effect, all funds invested in them are assumed to earn such proceeds that the investment generates exactly the discount rate.

The current rotation model effectively assumes that through adaptive management the forest owners will seek to secure at least NPV neutrality on their reinvestment in succeeding rotations. Within the valuation of the Sino-Forest assets Pöyry has modelled the resource over multiple rotations in order to reflect the long-term management outlook of the estate. The current valuation assumes however that second and subsequent rotations will be NPV neutral. The analysis is therefore effectively confined to the cash flows associated with the current rotation.

⊙ PÖYRY

4   **RESOURCE AREA DESCRIPTION**

4.1   **Resource Location**

The location of Sino-Forest's existing forest resource as at 31 December 2006 is presented in Figure 4-1.

Figure 4-1:
Location of Sino-Forest's Forest Assets
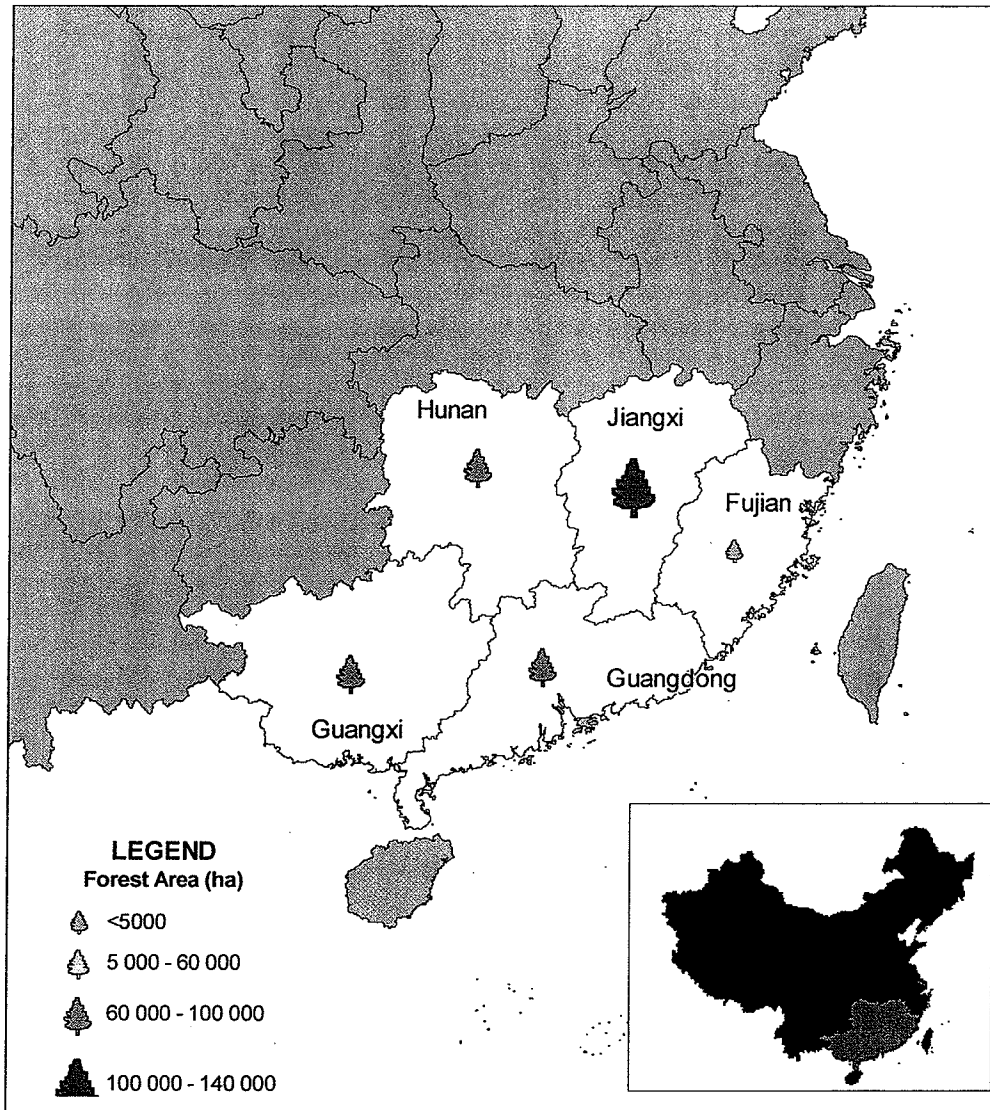
4.2   **Resource Area**

Consistent with previous valuation updates, Sino-Forest has provided Pöyry with a list of plantation sales and purchases for the 2006 calendar year. This list details plantation sales and purchases by location, species and age-group class, and has

PÖYRY

been used to adjust the area statement prepared by Pöyry as part of its 2005 valuation update of Sino-Forest's resources.

In addition to the adjustments detailed in its 2006 sales and purchases, Sino-Forest has also provided information on additional area changes that were required.

Pöyry has verified the derived area statement directly with Sino-Forest and has been advised that the areas are representative of the Company's plantation resources as at 31 December 2006.

4.2.1 Productive Forest Area as at 31 December 2006

Sino-Forest's plantation assets as at 31 December 2006 are summarised in Table 4-1 by Location and Ownership-Type.

Purchases, Sales and Adjustments

The data provided by Sino-Forest details that during the 2006 calendar year, a total of 101 595 ha of forests have been sold and 129 276.3 ha purchased. Further to these records, Sino-Forest indicated it has swapped 10 000 ha and sold an additional 4 496 ha of forests in Heyuan.

Derived Resource Description

Since Pöyry's 31 December 2005 valuation update, Sino-Forest's total plantation assets have increased from 324 296.2 ha to 352 010.2 ha. This represents a net increase of 27 713.9 ha (8.5%). Data provided by Sino-Forest indicates that the net increase is the cumulative effect of:

a) An increase in planted forest areas;

b) The purchase of plantations in Guangdong, Guangxi, Hunan and Jiangxi;

c) The sale of plantations in Fujian, Guangdong, Heilongjiang, Hunan and Jiangxi.

As apparent from Table 4-1, while numerous purchases and sales have taken place throughout 2006, the two key drivers of area change have been Sino-Forest's withdrawal from forests in Heyuan (Guangdong), and expansion in Hunan.

PÖYRY

Table 4-1:
Summary of the Existing Sino-Forest Plantation Forest Area

Province	City	Type	Area under trees (ha)		Change in Area (ha)
			31-Dec-05	31-Dec-06	
Fujian		Planted (WOFE)[▼]	416.2	335.0	(81.2)
		Purchased	2 306.7	0.0	(2 306.7)
Guangdong	Gaoyao	Planted (CJV)[♣]	6 228.8	4 883.6	(1 345.2)
		Purchased	17 166.9	17 166.9	0.0
	Heyuan	Planted (CJV)	7 481.0	7 168.4	(312.6)
		Planted (WOFE)	11 194.0	25 334.9	14 140.9
		Purchased	97 686.9	32 130.8	(65 556.1)
Guangxi		Planted (CJV)	10 997.2	13 187.6	2 190.4
		Purchased	50 955.1	75 335.9	24 380.8
Jiangxi		Planted (CJV)	7 608.5	7 544.8	(63.7)
		Purchased	108 015.7	99 351.1	(8 664.6)
Heilongjiang		Purchased	4 239.2	0.0	(4 239.2)
Hunan		Purchased	0.0	69 571.2	69 571.2
Sub-Total		Planted (WOFE)	11 610.2	25 670.0	14 059.8
		Planted (CJV)	32 315.5	32 784.4	468.9
		Purchased	280 370.5	293 555.8	13 185.3
Grand Total			324 296.2	352 010.2	27 713.9

▼ – WOFE – Wholly Owned Foreign Enterprise
♣ – CJV – Cooperative Joint Venture

The age-class structure of the Sino-Forest plantation resource is uneven. Area age-class distributions by Province and Ownership-Type are presented in Figure 4-2 and Figure 4-3 respectively.

Sino-Forest has two main classes of forest land, those areas planted by the CJV and WOFE companies, and those areas of existing plantation for which the cutting rights have been purchased. The areas planted by the CJVs and WOFEs are primarily fast growing *Eucalyptus urophylla* x *Eucalyptus grandis* hybrids with smaller areas of poplar species (mainly in Jiangxi Province).

The existing forests for which the cutting rights have been purchased comprise a number of species including:

- Masson pine
- Slash pine
- Chinese fir
- Eucalyptus species
- Poplar species
- Acacia species

Data historically provided by Sino-Forest has not differentiated between the areas established under Masson and Slash/Foreign Pine. Consistent with previous valuations, areas planted under Masson or Slash/Foreign pine have been aggregated by Sino-Forest and reported as Pine. An area age-class distribution by species is presented in Figure 4-4.

PÖYRY

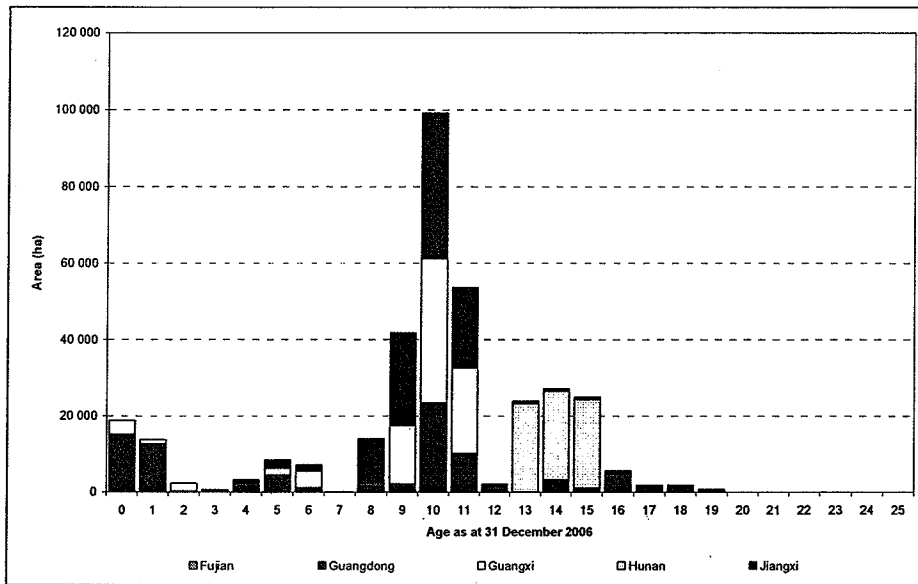Figure 4-2:
Provincial Area Age-class Distribution

Figure 4-3:
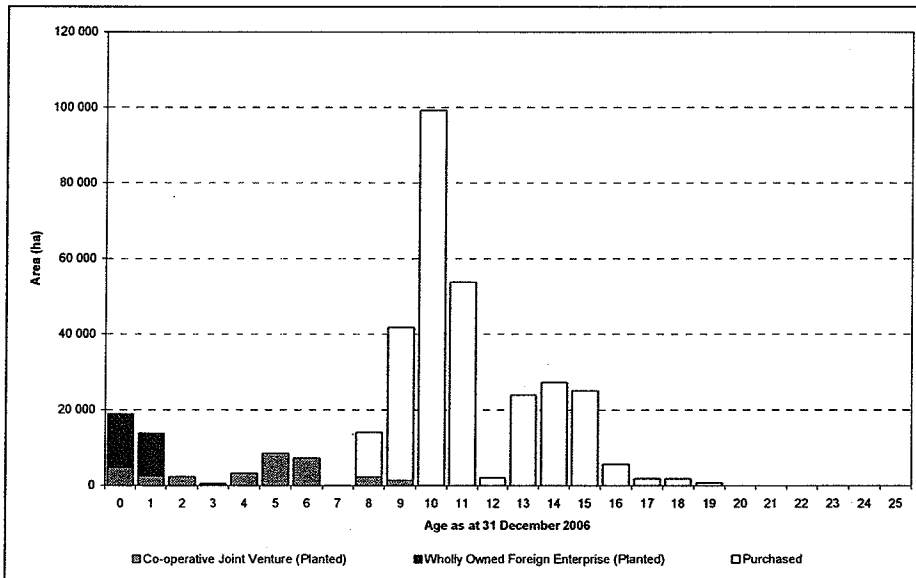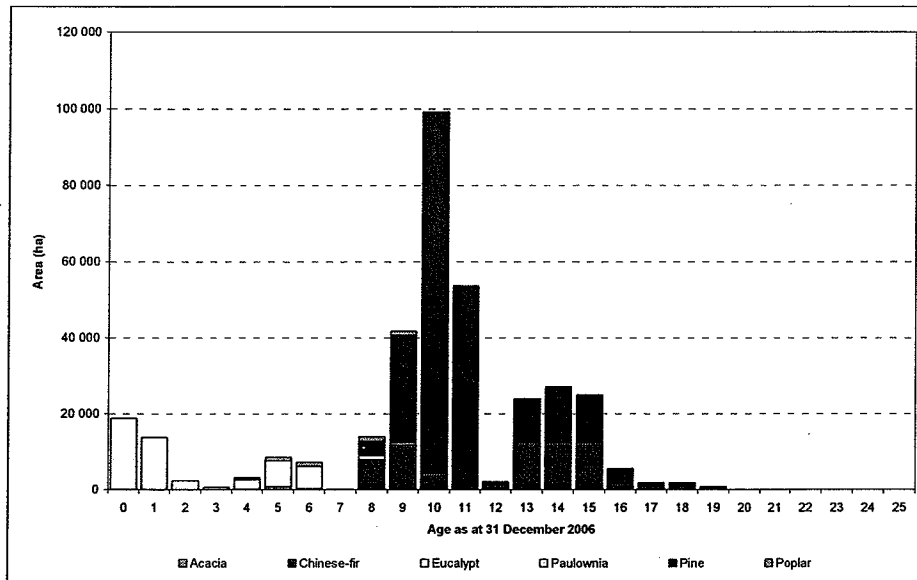**Ownership-Type Area Age-class Distribution**

Figure 4-4:
Species Area Age-class Distribution

4.2.2   Area Revisions and Updates

As part of previous comprehensive valuation exercises, Pöyry has allocated extensive time to the "ground-up" development of up-to-date resource descriptions. This "ground-up" development has involved the compilation of an area statement based on Sino-Forest's latest plantation asset records.

As detailed previously, as part of the valuation update process Sino-Forest has provided Pöyry with a list of plantation sales and purchases which have been used to update the December 2005 area description.

The base area, sales and purchase data provided by Sino-Forest is often aggregated and may not differentiate areas associated with different species (e.g. Masson versus slash pine), or the particular areas associated with plantations established over 2 to 3 years. In an effort to generate realistic resource descriptions, Pöyry has used its experience, field inspection results and professional judgement in applying assumptions to the area data provided.

Pöyry recommends that subsequent valuation exercises incorporate a comprehensive and thorough development of a detailed resource area description. This would involve compilation of Sino-Forest's plantation area asset data rather than modification of asset descriptions applied under previous valuation exercises.

Pöyry recommends that Sino-Forest undertake to develop and maintain a Forest Management Information System (FMIS). The implementation of an FMIS would allow for efficient tracking of plantation-related asset information and management of Sino-forest's changing resource base.

PÖYRY

4.2.3 Field Inspection Area Analysis

As part of the field inspection, Pöyry conducted a series of GPS boundary checks to determine whether stocked areas provided by Sino-Forest were reasonable and accurate. Although some variance was apparent at the individual plantation level, only a 1.1% difference between the Sino-Forest-provided and Pöyry-determined areas was apparent for the plantations sampled (**Appendix 1**).

While this was not an exhaustive sample of Sino-Forest's plantation assets, field inspection boundary checks suggested that the areas provided by Sino-Forest appeared reasonable and accurate. Based on this, no adjustment to the areas provided was deemed necessary.

4.2.4 Plantation Asset Development

In Pöyry's 31 December 2005 valuation of the Sino-Forest assets, it was reported that Sino-Forest was embarking on a 200 000 ha expansion of its estate in Heyuan City. This was reflective of Sino-Forest's management and development intent at that time.

On 28 September 2006 Sino-Forest issued a news release announcing its entering into a master agreement to acquire approximately 100 000 ha of pine and fir plantations in Hunan Province. On 7 December 2006, a further news release was issued detailing the signing of an agreement to acquire an additional 300 000 ha in Hunan, thus bringing the total area of planned acquisitions to 400 000 ha.

Discussions with Sino-Forest suggest that, due to increasing costs, plantation expansion efforts are now focussed on more cost effective locations such as Hunan. Pöyry has accounted for the above-detailed expansion plans in developing perpetual wood flow models. These expansion plans assume the regulated purchase of approximately 28 500 ha/year over the next 14 years. Given that an area of 69 571.2 ha had already been purchased in Hunan as at 31 December 2006, Pöyry has assumed that the 330 428.8 ha of subsequent expansions in Hunan will be at a rate of approximately 23 600 ha/year.

Since there is a lack of available data on areas available for purchase, Pöyry has made a series of assumptions relating to the species and age-class mix of these potential acquisitions. These assumptions have been based on historic acquisitions and expected forest structures.

Wood flows generated based on assumed acquisition areas in Hunan are intended to be indicative and provide a basis for estimating potential wood flows. The assumptions made with respect to the structure of acquisitions in Hunan will not markedly affect the valuation result generated for 31 December 2006.

PÖYRY

5 **GROWTH AND YIELD**

5.1 **History of Yield Table Development**

In July 2003, Sino-Forest and its CJVs provided Pöyry with basic data relating to the growth and yield of their existing plantations. Pöyry combined these with information gathered from its own field measurements and other third party sources available at that point in time, to generate growth and yield curves for existing and future proposed forest plantations.

The development of yield tables usually begins at the time a stand is planted when an area is assigned to a yield table projection based on a number of factors including soil type, location, productivity of surrounding stands and genetic composition.

Tree measurement data collected from inventories undertaken during the 2003 field inspection were used to generate standing tree and stand volume estimates, as described in Section 5.1.1. Volume estimates were then used to generate a suite of yield tables (Section 5.1.2) which have been employed in the Sino-Forest valuations to date.

5.1.1 **Tree Volume Calculations**

Using diameter (D) and height (H) as variables, individual tree volumes were estimated. The tree volume equations used by Pöyry have been as follows:

Eucalyptus

$V (m^3) = 0.01774597 - 0.00429255D + 0.0002008136D^2 + 0.000494599DH + 0.00001125969D^2H - 0.001782894H$

North American

$V (m3) = 0.19328321((D/100)2)H) + (0.007734354(D/100)H + (0.82141915 (D/100)2)$

Chinese fir

$V (m^3) = 0.000037 D^2H$

Slash pine

$V (m^3) = 0.0001155362D(1.9788108856-0.005574216(D+2*H)) \times H(0.5034278471+0.008969134(D+2*H))$

Both D (diameter at breast height) and H (tree height) are expressed in metres.

By multiplying the average tree volumes with the measured stockings, a measure of individual stand yields is produced.

PÖYRY

5.1.2 Existing Yield Table Formulation

A growth curve for each species was formulated using the following non-linear equation:

Equation (1) $\ln (V) = \alpha + \beta / T^2 + \gamma / TN$

where:

V   = volume per hectare (m³/ha)

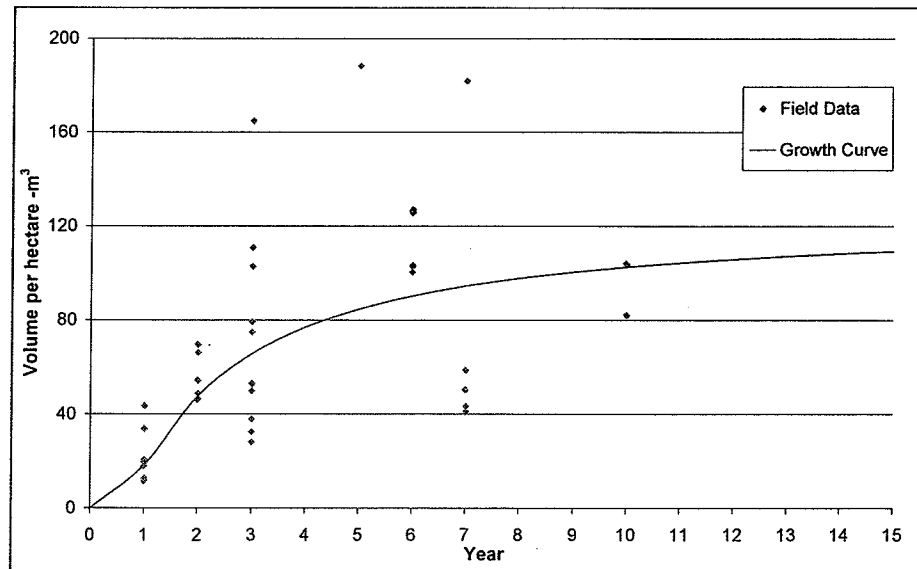T   = age (in years)

N   = stocking (stems per hectare)

 α is the intercept

 β and γ are the x variable parameters.

To replicate observed natural mortality, original stockings were reduced by 5%.

Processing the field data using Equation (1), the following yield curves for each species were produced.
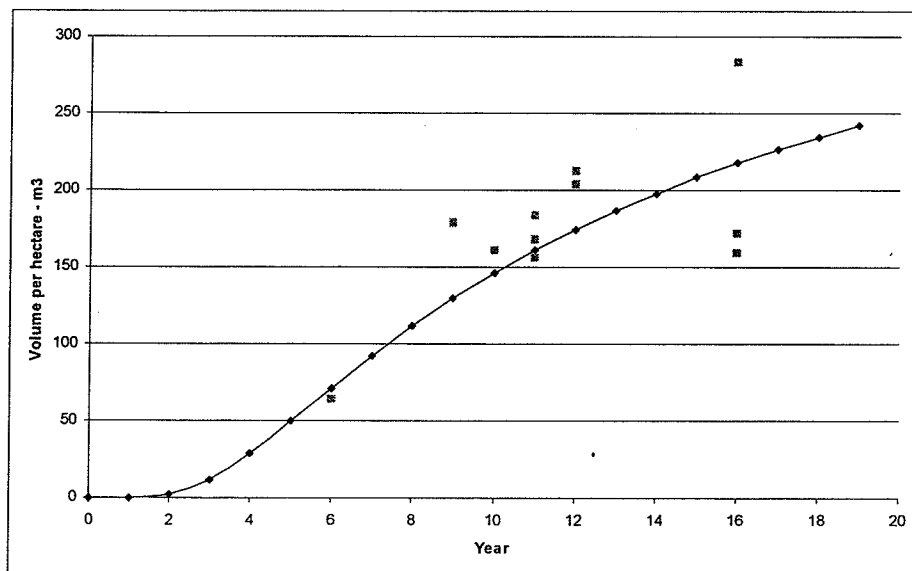
Figure 5-1:
Eucalyptus Growth Curve

Figure 5-2:
Pine Growth Curve
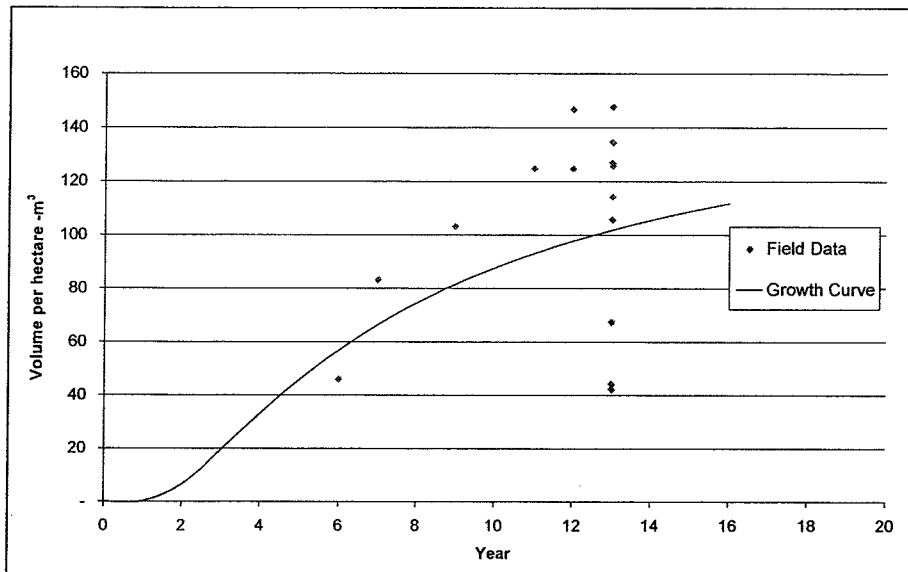
Figure 5-3:
Chinese Fir Growth Curve

The above curves were used to establish and apply a set of yield tables in previous valuations of the Sino-Forest resource.

Poplar forests represent a small component of the Sino-Forest resource (Section 4), and the field data collected for poplar species has typically been insufficient to construct an authoritative yield curve. Data from available sources at the time of initial yield table development were aggregated, and an average mean annual increment (MAI) calculated to determine the recoverable volume estimates to be

PÖYRY

used as part of the forest valuation. A recoverable volume MAI of 8.9m^3/ha/yr has historically been assumed.

5.2 **Inventory Data and Yield Table Revisions**

It is Pöyry's preference that estimates of current and future yields for individual forest assets are periodically refined as more data are collected from sample plots and ongoing inventory activities. Through the ongoing capture of data, the precision of growth and yield estimates are progressively improved. As part of its 31 December 2005 valuation of Sino-Forest's assets, Pöyry recommended that a more effective and accurate inventory program be designed and implemented to better capture the information required to generate reliable yield tables.

Pöyry's field inspections of forests in China commonly include high level inventories from which indicative yield tables can be derived. These inventory initiatives include the measurement of a range of age-classes to provide a basis for estimating current standing volumes and expected rates of growth.

In addition to inspections of the Sino-Forest resources as part of its annual valuations, Pöyry has completed a number of projects in China over recent years that have involved the collection of relevant growth and yield data. These provide a suitable basis for benchmarking yield table assumptions applied in the Sino-Forest valuation.

Due to the high annual turnover of forests through purchases and sales, the original data upon which original yields were based may not necessarily apply to the current resource. Where more appropriate data has been collated via data acquisition and field inspections, yield table assumptions have been updated.

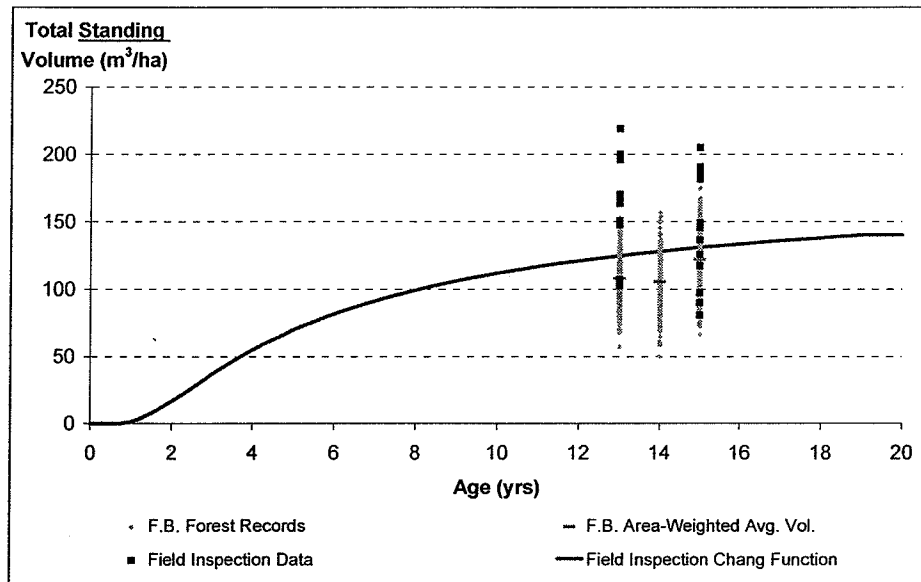5.3 **Yields Assumed in the December 2006 Sino-Forest Valuation**

During the course of the field inspection, Pöyry has targeted the recent purchases in the Hunan and Guangxi provinces. Based on the results of the inspection, Pöyry has adjusted the yield assumptions applied to these regions. The same assumptions as applied in the 2005 valuation have been maintained for the regions not inspected as part of the 2006 valuation.

Hunan

Pöyry was provided with detailed Forest Bureau records representing the current Hunan resource. Additionally, Pöyry conducted a high-level inventory of the Chinese fir plantations, specifically checking reported yields and net stocked areas.
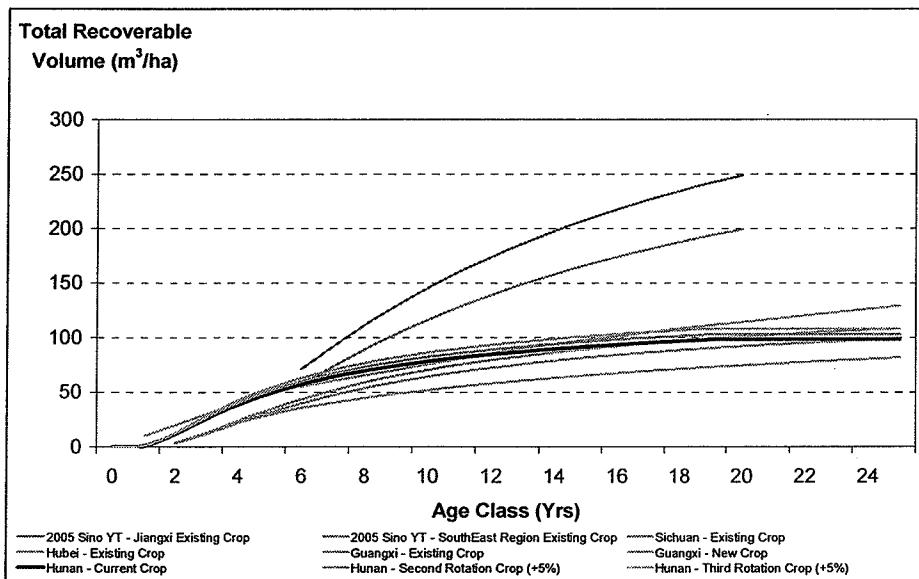
The following Chinese fir standing yield profile was derived from the Pöyry inventory data (Figure 5-4). Although slightly higher, the yield assumptions appear reasonable when compared to the Forest Bureau records.

Figure 5-4:
Hunan Chinese fir Yield Analysis

Total Standing
Volume (m³/ha)

- F.B. Forest Records
- Field Inspection Data
- F.B. Area-Weighted Avg. Vol.
- Field Inspection Chang Function

Pöyry has benchmarked the derived yield profiles against curves derived for other relevant projects completed in recent years (Figure 5-5). Overall, the existing rotation yield estimates fall within the range of utilised profiles.

Figure 5-5:
Hunan Chinese fir Yield Benchmarking

Total Recoverable
Volume (m³/ha)

- 2005 Sino YT - Jiangxi Existing Crop
- Hubei - Existing Crop
- Hunan - Current Crop
- 2005 Sino YT - SouthEast Region Existing Crop
- Guangxi - Existing Crop
- Hunan - Second Rotation Crop (+5%)
- Sichuan - Existing Crop
- Guangxi - New Crop
- Hunan - Third Rotation Crop (+5%)

In assigning the grade out-turn associated with the yield profile, Pöyry has analysed the field inspection data for diameter class frequency and relative grade proportions. Although stems greater than 14cm only account for approximately 32% of all stems measured (Figure 5-6), they contribute disproportionately to total volume. Overall, approximately 50% of stem volume is attributable to the 14-

PÖYRY

20cm diameter class, and a further 10% to the >20cm. This aligns closely with the assumptions applied to the 2005 yield profiles (Table 5-1).

Figure 5-6:
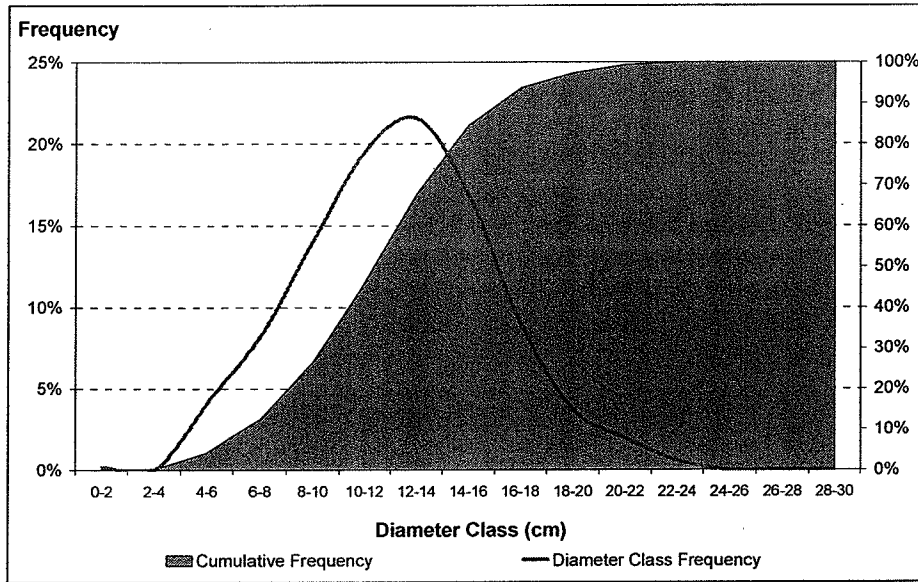**Hunan Chinese fir Diameter Distribution**

Table 5-1:
Percentage of Volume by Diameter Class

Diameter Class (cm)	Measured Volume (m³)	Diameter Frequency	Volume %	2005 YT Grade Allocation
0-14	13.3	67.80%	40.2%	40%
14-20	16.7	25.90%	50.4%	50%
20+	3.1	6.30%	9.4%	10%

Due to time and budget constraints, no pine plantations were visited during the course of the Hunan field inspection, however the pine yields applied in the 2005 valuation have been benchmarked against the Hunan Forest Bureau records (Figure 5-7). The yield tables applied to the 2005 valuation appear to be slightly higher than the average Forest Bureau estimates; however, this is in line with the results from the Chinese fir inventory analysis. Therefore, in the absence of further inventory work, Pöyry has maintained the 2005 yield profiles.

PÖYRY

Figure 5-7:
2005 Pine Yield Profile vs Reported Hunan Forest Bureau Volumes
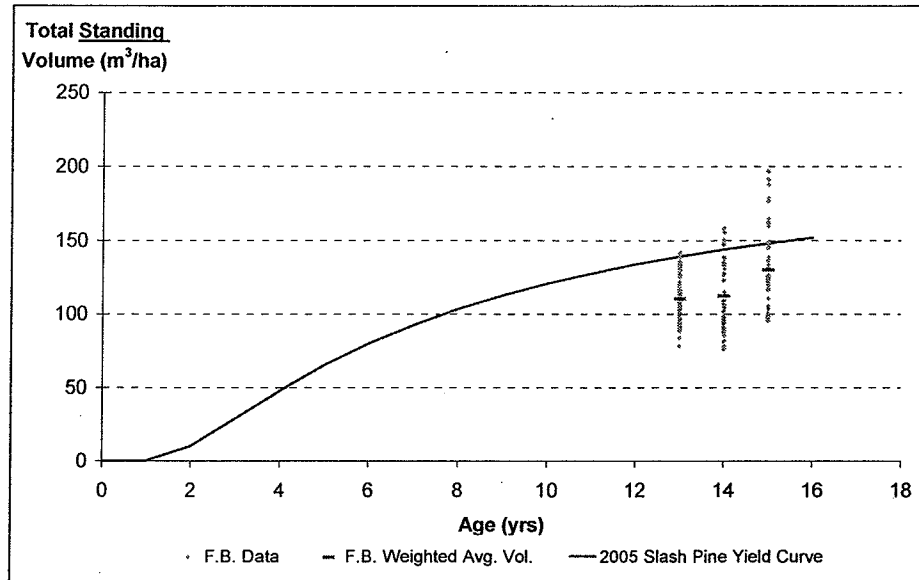
Guangxi

The majority of the forests inspected as part of the 2006 Guangxi field inspection were Masson pine, with the remainder consisting of "foreign" pine. The results of the inventory were analysed and a yield table profile generated. The calculated harvest yield for Guangxi is significantly lower than that applied in the 2005 valuation (Figure 5-8). There are several factors which may contribute to the difference in yield profiles. These include:

- Limited sample size

- Different geographical location - resulting in differing climate, altitude, site fertility and suitability etc.

- Ratio of species – larger proportion of lower yielding Masson pine compared to foreign pine.

Figure 5-8:
Guangxi Pine Yield Analysis
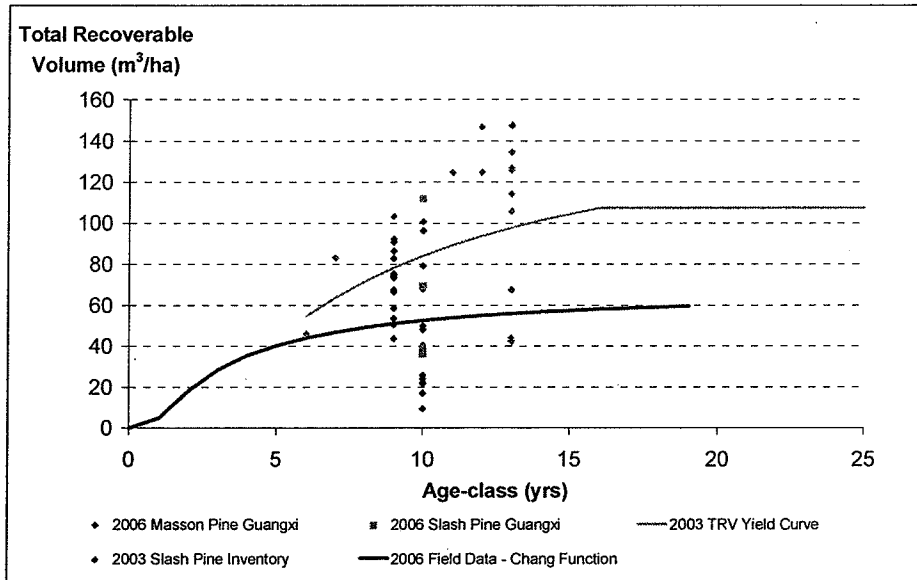
When benchmarked against Pöyry's wider Chinese experience, the calculated yields appear to fall within the experienced range of volumes (Figure 5-9).

Figure 5-9:
Guangxi Pine Yield Benchmarking
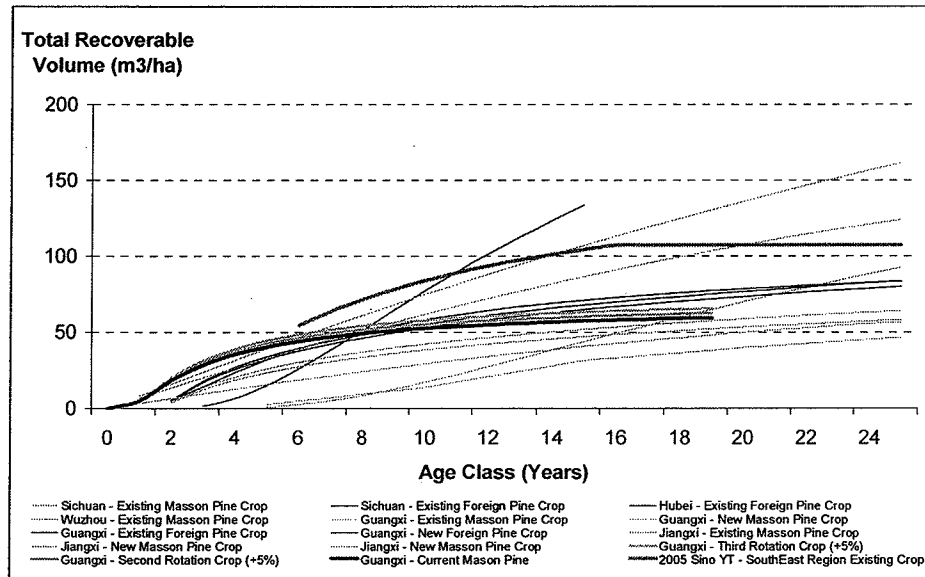
PÖYRY

As with the Hunan resource, Pöyry has analysed the field inspection data for diameter class frequency and relative grade proportions, for the purpose of assigning log-grade out-turn (Figure 5-10). Again, the majority of the stem diameters measured fall within the smaller size-class ranges.

The results of the volume/size-class analysis show a slightly higher ratio of small logs than applied in the 2005 valuation. These new ratios have been applied to the Guangxi pine resource yield tables.

Figure 5-10:
Guangxi Pine Diameter Distribution
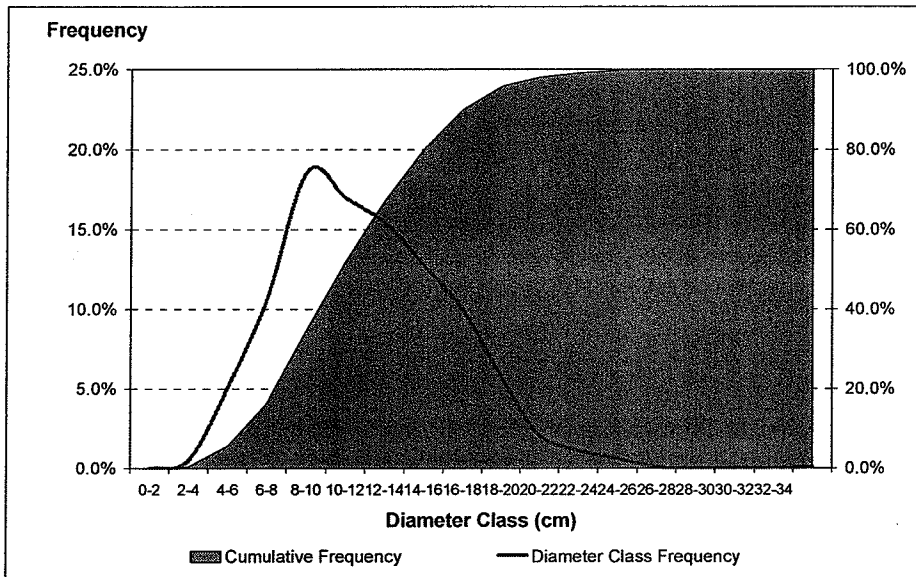
Table 5-2:
Percentage of Volume by Diameter Class

Diameter Class (cm)	Measured Volume (m³)	Diameter Frequency	Volume %	2005 YT Grade Allocation
<8	3.79	16.4%	7.1%	5%
08-14	21.09	51.0%	39.5%	35%
14-20	23.16	28.5%	43.3%	40%
>20	5.41	4.0%	10.1%	20%

5.3.1 Regeneration and Future Yield Profiles

In previous valuation exercises, it has been assumed that all plantations (with the exception of poplar) will be re-established into fast growing eucalyptus plantations following harvesting.

The re-establishment of areas following harvest depends on a range of factors including, but not restricted to, the physical (e.g. soil-type) and climatic (e.g. altitude/temperature/ rainfall) characteristics of the sites.

As part of the 31 December 2006 valuation, Pöyry has reviewed the re-establishment rules applied on a species and provincial basis, and generated a more

realistic and representative regeneration strategy that applies to Sino-Forest's current plantation asset base. The regeneration strategy is based on discussions with Sino-Forest staff and experience gained in additional projects completed in China, and is summarised in Table 5-3 below.

Table 5-3:
31 December 2006 Regeneration Strategy Summary

Province	Species	Regeneration Strategy
Fujian	Eucalypt	Regenerate to Eucalypt
Guangdong	Acacia	Regenerate to Eucalypt
	Broadleaves	Regenerate to Eucalypt
	Eucalypt	Regenerate to Eucalypt
	Chinese Fir	Regenerate to Pine
	Pine	Regenerate to Pine
Guangxi	Eucalypt	Regenerate to Eucalypt
	Pine	Regenerate 40% to Eucalypt and 60% to Pine
Hunan	Chinese Fir	Regenerate 50% to Chinese Fir and 50% to Pine
Jiangxi	Acacia	Regenerate to Eucalypt
	Eucalypt	Regenerate to Eucalypt
	Paulownia	Regenerate to Poplar
	Pine	Regenerate 30% to Eucalypt and 70% to Pine
	Poplar	Regenerate to Poplar

An improvement in the yield from subsequent rotations is feasible through establishment of improved genetic stock and silvicultural management. Consistent with previous valuations, Pöyry has assumed that a 5% increased in recoverable volume will be achieved in each of the second and third rotation crops re-established.

6 PLANTATION RISKS

In addition to risks relating to the key assumptions there are other risks associated with establishing a biological resource. In the Sino-Forest plantations the key identifiable risks include:

- Fire
- Frost
- Pest and Disease
- Typhoons

6.1 Fire

Fire has historically not been a major threat in South China plantation forests. However, with the increase in eucalyptus plantation area there is a correspondingly greater fire risk. This risk can be mitigated by the implementation of fire prevention techniques such as the construction of firebreaks inside plantations, the development of human resources trained in fire fighting and supported by physical infrastructure such as portable fire fighting equipment. Given that the resource is geographically fragmented and comprises discreet forest blocks that are generally less than 500 ha in size the opportunity for a singular catastrophic event is remote.

It is evident from field visits in some regions that farmers have used burning as a land preparation tool in the past. Sino-Forest has previously used fire to prepare land for planting but is moving away from this practice to mitigate the negative impacts on soil fertility as organic matter is volatilised and lost to the atmosphere.

Recently established and young stands are at greatest risk to fire damage as they are more likely to suffer crown damage that compromises their growth. In older stands close to harvest age the impact of fire may be less significant as much of the timber affected is able to be recovered and marketed with little discount.

Pöyry understands that Sino-Forest has fire insurance cover.

6.2 Frost

Frost damage is a risk on high altitude inland sites and was responsible for the poor yield seen in much of the 1996 eucalyptus plantings. The risk of frost damage is mitigated by careful attention to site selection in order to avoid frost prone sites.

6.3 Pests and Disease

As the area of single species plantations increases so does the potential risk of pest and disease problems. To date there appears to have been no serious pest or disease outbreaks. This risk is mitigated by the large research and development effort assigned to eucalyptus development.

Most of the pest and disease problems have so far occurred in the poplar plantations. Two pathogens impact the growth and quality of the poplar hybrid resource. Borer impacts on the quality of logs and has the effect of increasing the

pulpwood supply by making the butt log unsuitable for veneer where an attack is severe. The caterpillar of the 'Yangzhou Moth' predates the leaves and can compromise growth if an attack is left unchecked. Adult borer is controlled by the application of a biological pesticide. Larvae are controlled by inserting a 'poisonous stick' into the hole in the stem that represents the entry point of the larvae.

Leaf eating caterpillars are controlled by the application of pesticide if levels of infestation are such that 30% of the crown is affected. Poplar plantations are currently inoculated against these problem pests and disease as a routine part of plantation establishment and maintenance. Local Forest Bureaus maintain disease control stations and provide forecasts on pathogen levels and the need for control. In keeping with good forest practices, Sino-Forest plants trees produced from a number of different clones; this reduces the risk of a weakness in any one clone being propagated throughout the plantations and provides genetic diversity. The clones that have been planted to date have been assessed for resistance against disease.

6.4   Typhoons

On average the coastal areas of Southern China suffer a number of typhoons each season during July to September. While in general the forest damage is localised and confined to young age-classes, every 20 years or so a typhoon is likely to cause significant damage. The inland coastal strip affected is in the region of up to 200 km from the coast. The risk of typhoons is generally limited to some Sino-Forest's plantation areas in Guangxi. This risk is reduced by the high stocking rates and short rotations of the eucalyptus plantations.

⊘ PÖYRY

7 COSTS

7.1 Operational Costs

Pöyry has developed and maintained a detailed forest cost database which includes data recorded and acquired during the course of various China based projects. This allows for the range of individual cost operations to be calculated, against which the costs associated with the December 2005 Sino-Forest valuation can be easily benchmarked. The operational costs tend to fall within the ranges contained in the database, and therefore are assumed to still be appropriate for application as part of the December 2006 valuation.

As China's economy develops, cost structures will change and, as such, operational costs will continue to be the subject of attention in future valuations.

Eucalyptus Species

The following tables give the operation costs for establishing *Eucalyptus spp.* in Southern China. Values vary slightly from district to district but for the purposes of this valuation regional average costs have been employed (Table 7-1) for regions other than the recent acquisition areas in Heyuan.

Table 7-1:
Operation Costs for Eucalyptus Planted Rotation (RMB per ha)

Operations	Planted Forest (R1)						
	Year						
	0	1	2	3	4	5	6
Planning	12	0	0	0	0	0	0
Operations design	9	0	0	0	0	0	0
Site preparation	450	0	0	0	0	0	0
Terracing	1395	0	0	0	0	0	0
Fertiliser	975	975	975	0	0	0	0
Planting (incl. seedling cost)	570	0	0	0	0	0	0
Thinning	0	0	0	0	0	0	0
Tending	0	345	345	0	0	0	0
Protection	0	75	58	58	57	57	57
R&D	0	120	30	30	7	7	7
FB Service Charge	0	493	141	9	6	6	6
Overheads	150	150	150	150	150	150	150
Lease	150	150	150	150	150	150	150
Total	3711	2308	1849	397	371	371	371
Total RMB per ha							9378

The largest individual cost is terracing. Terraces are manually formed on the contour prior to planting. Sino-Forest employs this technique in the belief that it facilitates soil conservation through preventing erosion that might otherwise occur in heavy rain events.

The operational decision to re-establish, by either coppice or 'new seedlings', is made on a case-by-case basis. It is anticipated that the second rotation will be established largely by way of coppice. Operational costs associated with coppicing are lower than those associated with establishment by seedling as there is no site

PÖYRY

preparation or terracing required. The growing costs associated with the coppiced rotation are approximately two thirds that of the first rotation crop (Table 7-2).

Table 7-2:
Operation Costs for Eucalyptus Coppice Rotation (RMB per ha)

Operations	Coppiced Plantation Forest (R2)				
	Year				
	7	8	9	10	11
Planning	0	0	0	0	0
Operations design	9	0	0	0	0
Site preparation	0	0	0	0	0
Terracing	0	0	0	0	0
Fertiliser	900	600	0	0	0
Planting (incl. seedling cost)	0	0	0	0	0
Thinning	900	0	0	0	0
Tending	345	345	345	0	0
Protection	75	58	58	57	57
R&D	120	30	30	7	7
FB Service Charge	235	103	43	6	6
Overheads	150	150	150	150	150
Lease	150	150	150	150	150
Total	2884	1436	776	371	371
Total RMB per ha					**5838**

The total cost associated with the first two rotations is given in Table 7-3.

Table 7-3:
Total Operation Costs for Planted Crop and First Coppice

Total Operation Cost	Planted Crop (Rotation 1)	First Coppiced Crop (Rotation 2)	Total Cost
Total RMB per ha	9378	5838	15216

First rotation establishment costs associated with the acquisition areas in Heyuan City are detailed in Table 7-4. The total cost for the first rotation in the acquisition areas is greater than the cost assumed for Sino-Forest's other operation. Much of the increase is associated with fertiliser costs with four fertiliser operations specified in the costing presented to Pöyry.

Table 7-4:
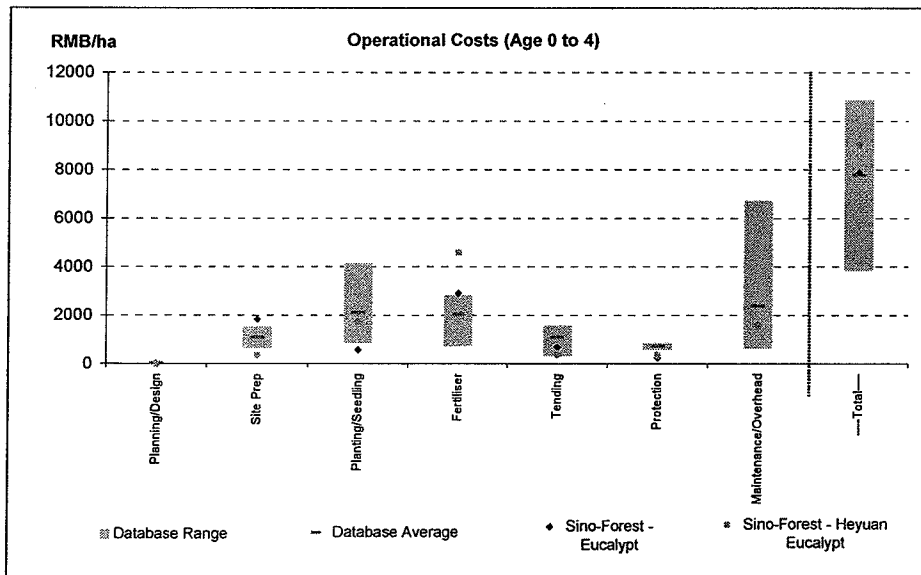**Operation Costs for Eucalyptus Planted Rotation (RMB per ha)**

Operations	Planted Forest (R1 - Heyuan)						
	Year						
	0	1	2	3	4	5	6
Operations Design	12	0	0	0	0	0	0
Site preparation	359	0	0	0	0	0	0
Fire Break	45	0	0	0	0	0	0
Roading	180	0	0	0	0	0	0
Planting (incl. seedling, hole digging etc)	1753	0	0	0	0	0	0
Fertiliser	2554	1018	1018	0	0	0	0
Tending	390	0	0	0	0	0	0
Supervision	180	30	30	0	0	0	0
Maintenance	45	45	45	45	45	45	45
Protection	45	90	57	57	57	57	57
R&D	0	120	30	30	7	7	7
Contingency	45	15	15	15	15	15	15
Overheads	210	150	150	150	150	150	150
Lease	225	225	225	225	225	225	225
Total	6043	1693	1571	522	500	500	500
Total RMB per ha							**11329**

PÖYRY

Figure 7-1 compares the operational costs associated with the Sino-Forest eucalypt resource to the range of costs found within Pöyry's wider database. While there is an apparent degree of variation between the average values from the database figures and the valuation figures, the Sino-Forest costs tend to fall within the maximum and minimum recorded estimates.

Some of the variation may result from the way in which some costs are categorised. The total operational cost (over a five year period) is more closely aligned. Figure 7-2 shows the total year on year costs associated with the eucalypt resource. There appears to be a closer alignment between the database averages and the Sino-Forest valuation figures.

The one exception is the Heyuan eucalypt resource, which requires a greater level of fertiliser application during the first year of operation.

Figure 7-1:
Benchmarking Eucalyptus Individual Operation Costs (to fourth year of operation)

PÖYRY

Figure 7-2:
Benchmarking Eucalyptus Operation Costs by Year
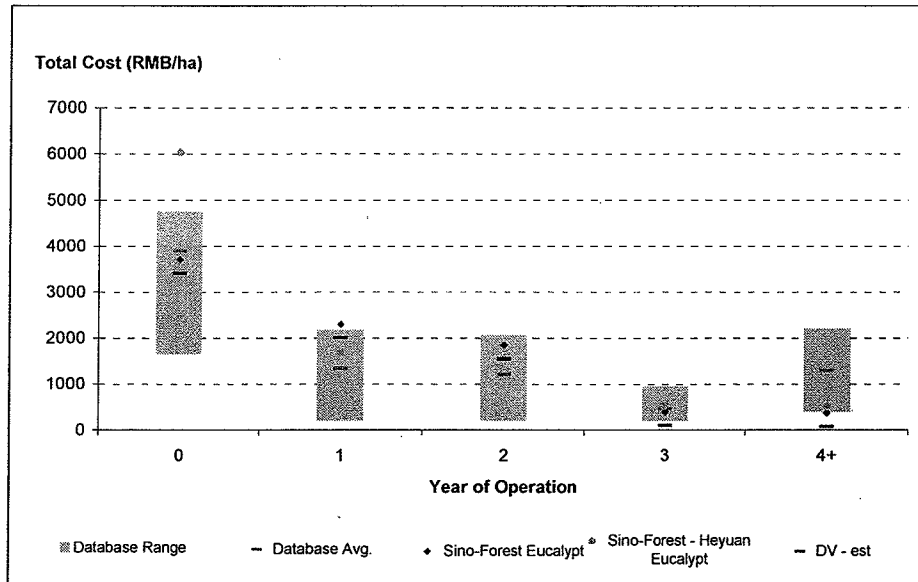
Chinese fir and Pine

The operation costs associated with the Chinese fir and pine species are assumed to be the same as those applied to the eucalypt resource (Table 7-5). Due to the generally older age-class structure of the Chinese-fir and pine resource, operational costs will have already been incurred and will not affect the December 2006 Valuation result.

Table 7-5:
Operation Costs for Eucalyptus Planted Rotation (RMB per ha)

Operations	Planted Forest (R1)						
	Year						
	0	1	2	3	4	5	6
Planning	12	0	0	0	0	0	0
Operations design	9	0	0	0	0	0	0
Site preparation	450	0	0	0	0	0	0
Terracing	1395	0	0	0	0	0	0
Fertiliser	975	975	975	0	0	0	0
Planting (incl. seedling cost)	570	0	0	0	0	0	0
Thinning	0	0	0	0	0	0	0
Tending	0	345	345	0	0	0	0
Protection	0	75	58	58	57	57	57
R&D	0	120	30	30	7	7	7
FB Service Charge	0	493	141	9	6	6	6
Overheads	150	150	150	150	150	150	150
Lease	150	150	150	150	150	150	150
Total	3711	2308	1849	397	371	371	371
Total RMB per ha							9378

Figure 7-3 and Figure 7-4 detail the benchmarking analysis of the Chinese fir and pine costs respectively. Overall, the total operational costs are at the higher end of the database ranges.

PÖYRY

Figure 7-3:
Benchmarking Chinese fir Individual Operation Costs (to fourth year of operation)
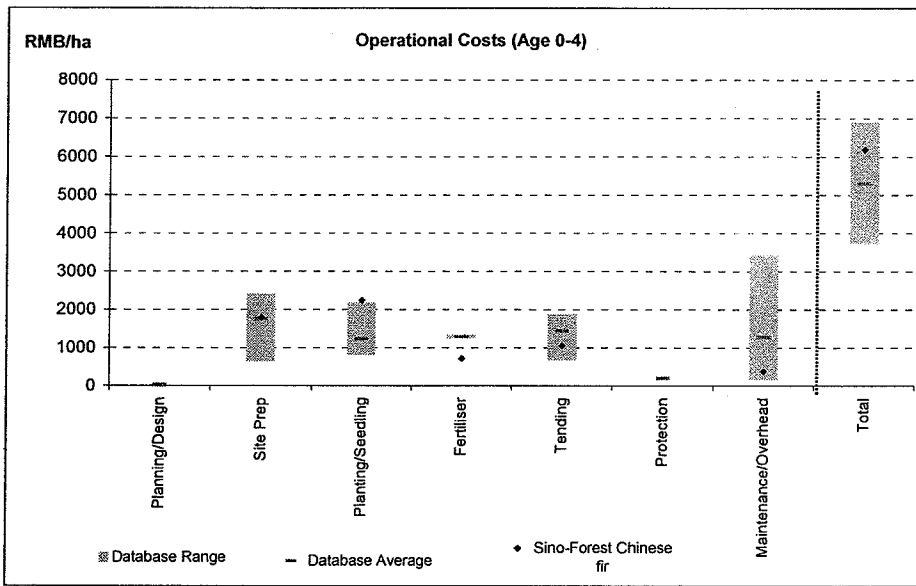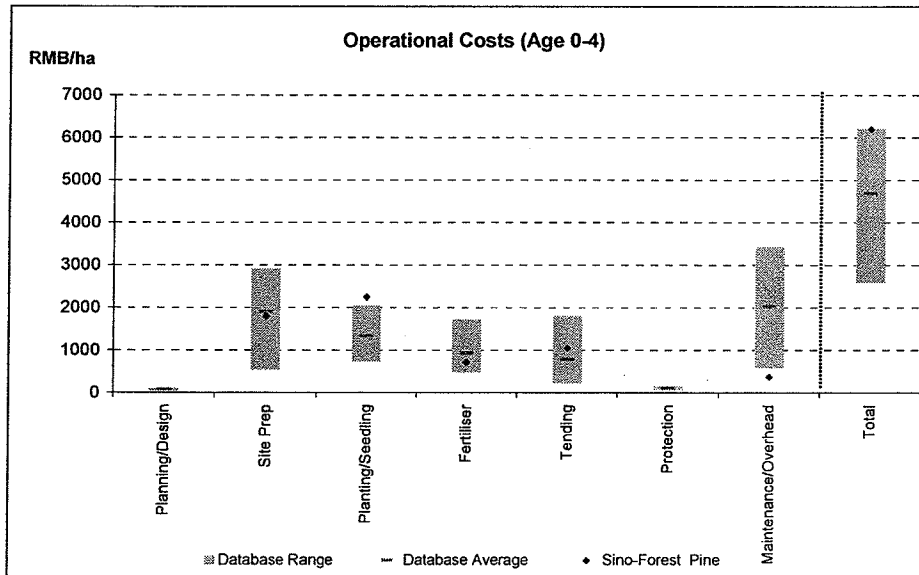

Figure 7-4:
Benchmarking Pine Individual Operation Costs (to fourth year of operation)

7.2 Costs of Production

7.2.1 Harvesting Costs

Harvesting costs differ significantly between provinces and have therefore been treated separately (Table 7-6). Harvesting methods in all six provinces were generally manually based with little or no mechanical assistance. The rates applied in the December 2005 valuation have been indexed against the Chinese PPI to derive the 2006 figures. These harvesting costs have been applied to all species.

Table 7-6:
Harvesting Costs by Province

Province	Harvest Rate (RMB/m^3)
Fujian	36.05
Guangdong	51.50
Guangxi	56.65
Heilongjiang	56.65
Hunan	80.00
Jiangxi	51.50

Pöyry has identified that the key factors influencing manual harvesting costs include labour cost, tree size, log length and topography.

7.2.2 Transport Costs

Individual transport rates for each province have been employed (Table 7-7)[6]. A loading and unloading cost of RMB4.92/m^3 was applied to all provinces. Average distances are based on distances to major mills and have been limited to 150 km, as it is assumed that longer haul distances will be avoided by marketing volume to smaller local mills closer to the resource.

Table 7-7:
Transport Costs by Province

Province	Transport Unit Rate RMB/m^3/km	Loading (RMB/m^3)	Unloading (RMB/m^3)	Average Distance (km)	Average Total Cost (RMB/m^3)
Guangxi	0.574	4.92	4.92	150	95.94
Fujian	0.574	4.92	4.92	100	67.24
Guangdong	0.328	4.92	4.92	80	36.08
Heyuan City	0.492	4.92	4.92	150	83.64
Jiangxi	0.738	4.92	4.92	150	120.54
Hunan	0.574	4.92	4.92	150	95.94

When Sino-Forest sells its standing timber to wood-traders, both the harvest and transport costs are accounted for by the wood-trader at the time of purchase.

7.3 Taxes at Harvest

Once the trees are harvested and sold, taxes to both local provincial government and state government are levied. These include reforestation, forest protection and infrastructure taxes. The taxes can vary between location and between species. A summary of the taxes used in the valuation is presented in the following table.

Table 7-8:
Taxes at Harvest (Average all Species)

Province	Harvest Tax (RMB/m^3)
Fujian	20.60
Guangdong	48.41
Guangxi	56.65
Heilongjiang	74.16
Hunan	74.16
Jiangxi	74.16

[6] Rates include road tolls.

PÖYRY

7.4   Overhead Costs

The cost of the direct supervision required for plantation establishment and management has been identified as 10% of the direct operational costs.

The overhead costs associated with both the CJV companies and the management of the purchased trees has been identified by the companies as RMB150/ha/year. As per the December 2005 valuation, Sino-Forest has not identified any corporate overhead costs related to running this business. Pöyry has allocated a further RMB150/ha/yr for corporate overheads.

7.5   Cooperative Joint Ventures

The forest area originally planted by Sino-Forest has been managed under a Cooperative Joint Venture (CJV) set up between Sino-Forest and PRC incorporated forestry trading companies (the commercial arms of government forestry bureaus). The key points of the CJV agreements are:

- The forestry trading company provides the land for the plantation forests.
- Sino-Forest will pay all the plantation establishment and maintenance costs.
- At harvest the wood produced is shared 30% to the forestry trading company and 70% to Sino-Forest.
- Pöyry has only valued Sino-Forest's 70% share in this valuation.

It is assumed that areas currently planted under CJV agreements will be replanted under this model into the future. Table 7-9 below identifies the existing planted area by CJV company:

Table 7-9:
Planted Area by CJV Company

Province	City	CJV Company	Planted Area (ha)
Guangxi		Guangxi Guijia Forestry Company Ltd.	13188
Jiangxi		Jiangxi Jiachang Forestry Development Company Ltd	7545
Guangdong	Heyuan	Heyuan City Jianhe Forestry Development Ltd.	7168
	Gaoyao	Gaoyao City Jiayao Forestry Development Ltd.	4884
Fujian		Zhangzhou Jia Min Forestry Development Ltd.	335
Total			33120

Note that the Fujian company is not a CJV but a Wholly Owned Foreign Enterprise (WOFE), and thus rather than a CJV agreement this company operates under articles of association.

7.6   Land Rental

In previous valuations, it has been assumed that the existing purchased forest areas will be harvested and replanted in fast growing eucalyptus hybrids and that the land will be leased and an annual rental paid. Replanting to eucalypts may not be appropriate in areas of cooler climate such as Hunan where significant areas of Chinese fir and pine plantation have recently been purchased. It is assumed that in these cooler climates, replanting to fast growing pine or back into Chinese fir will occur.

PÖYRY

Sino-Forest has advised that it expects to pay an annual land rental of RMB10/mu/year. The land rental associated with the recent acquisitions in Heyuan is reported as RMB15/mu/year. These levels of land rental are common in Southern China for land designated for forestry i.e. RMB8 to 15/mu/year. These rentals are associated with hill country that it is generally unsuited to agricultural purposes.

Annual land rentals as high as RMB40/mu/year have been observed for forestry designated land in Southern China. Rentals of this magnitude are associated with flat land that is suitable for agricultural purposes

7.7 Log Traders Margin

Sino-Forest currently sells most of its logs to log traders on the stump (that is standing in the forest). Pöyry has calculated the stumpage price as the delivered to mill gate log price minus the cost of transport and harvest which the log trader must pay. However, in addition to the harvest and transport costs the log traders' margin must also be deducted from the stumpage price paid for the logs. Pöyry has assumed the log traders margin to be 5% of the gross stumpage price.

PÖYRY

8   **LOG MARKETS AND PRICING**

8.1   **Log Price Benchmark**

In reviewing the log prices employed in the Dec 2006 valuation, Pöyry has in the first instance turned to log prices associated with wider industry data collated by Pöyry from recent projects within China.

As well as updated price estimates acquired as part of the field inspection process, other factors such as the changing nature of the Sino-Forest resource in terms of location and species mix since the December 2005 valuation, and any generic changes to China's forest industry policies have been considered.

Based on the results of this analysis, several revisions have been made to specific log grade prices. The revisions relate to log prices associated with Chinese fir logs and eucalyptus small diameter logs.

8.1.1   **Eucalyptus**

In 2005 a Value Added Tax (VAT) rebate was removed from chip exports by the government in an effort to reduce export volumes.

In May 2005 the 13% VAT payment rebate to woodchip exporters was removed by the Chinese government. This has had the effect of reducing the FOB price for woodchips from Zhanjiang port in Guangdong from USD109/BDMT in April 2005 to USD95/BDMT in May 2005.

This in turn has reduced eucalyptus small diameter log prices delivered to Zhanjiang port from USD42.50/m^3 (RMB352/m^3) in April 2005 to USD34.53/m^3 (RMB286/m^3) in May 2005.

This removal of VAT has meant that Poyry has revised its price estimate for small diameter eucalypts (i.e. less than 8cm SED) downwards by 13% from RMB350/m^3 to RMB305/m^3. This price is closer aligned with the wider industry averages that Poyry has observed on recent projects in Southern China as shown in Figure 8-1.

⊙ PÖYRY

Figure 8-1:
Eucalyptus Log Price Benchmarking
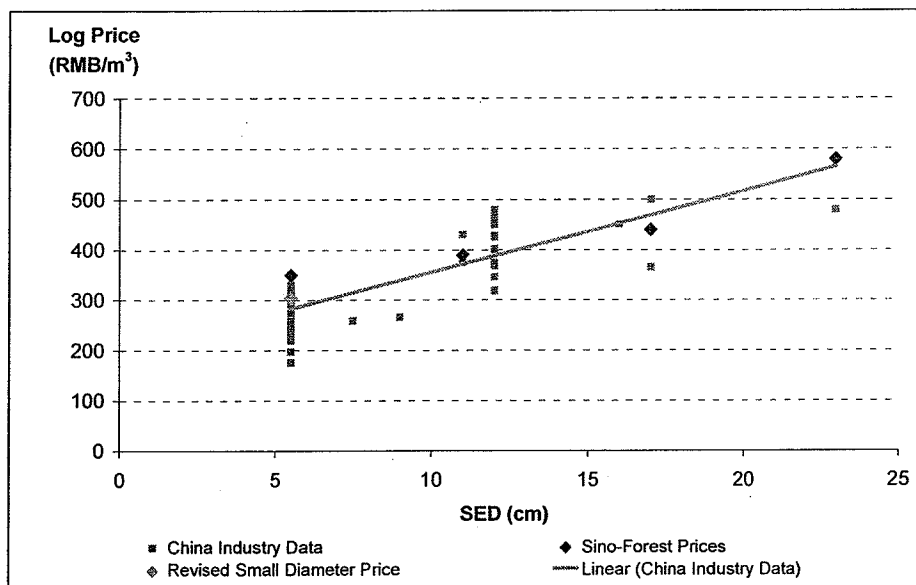
8.1.2 Chinese fir

Since the previous December 2005 valuation, there has been a shift towards increased expansion in Hunan Province which has resulted in a significantly increased area of Chinese fir plantations. In total, Hunan Province now accounts for over 52% of Sino-Forest's Chinese fir plantation area. Due to this shift in resource size and location, Pöyry has reviewed the log prices previously assigned to Chinese fir.

Sino-Forest has provided Pöyry with several log trader agreements specifying agreed Chinese fir prices. There are no volumes associated with these contracts, which are relatively short in term (four months).

The prices associated with the contracts are typically higher than current market prices released to Pöyry under other relevant projects.

In determining an appropriate Chinese fir log price for the December 2006 valuation, Pöyry has turned to the average of these industry prices as well as the contracts supplied by Sino-Forest. Pöyry has given equal weighting to both sources. In the absence of further information from Sino-Forest it has not been possible to apply a more refined approach.

Figure 8-2 details the prices employed in the December 2006 valuation against data representative of the wider China industry.

PÖYRY

Figure 8-2:
Chinese fir Log Price Benchmarking
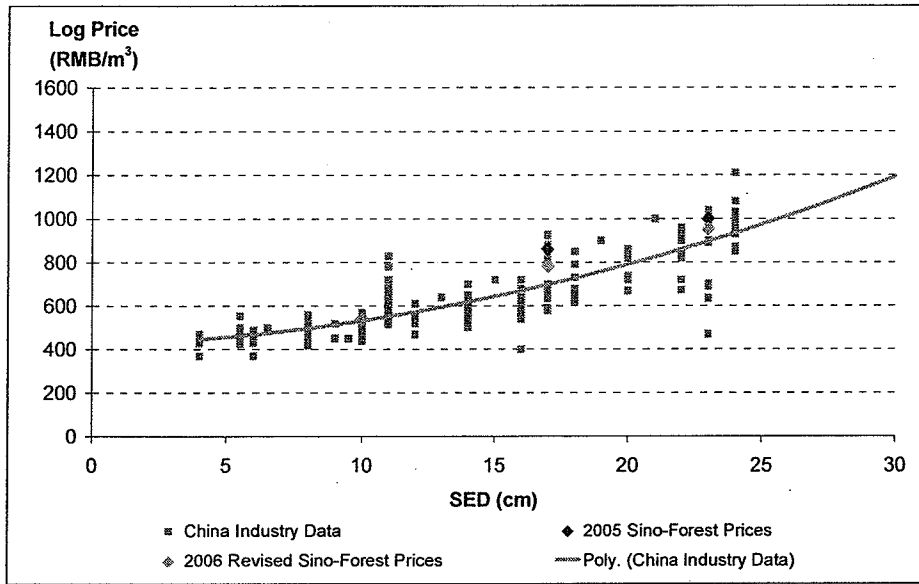
8.1.3   Pine Species

In determining an appropriate pine log price for the December 2006 valuation, Pöyry has again turned to the prices released to Pöyry under other relevant projects (Figure 8-3). The prices employed have increased since the December 2005 valuation, reflecting the strengthening domestic market environment.

Figure 8-3:
Pine Log Price Benchmarking

PÖYRY
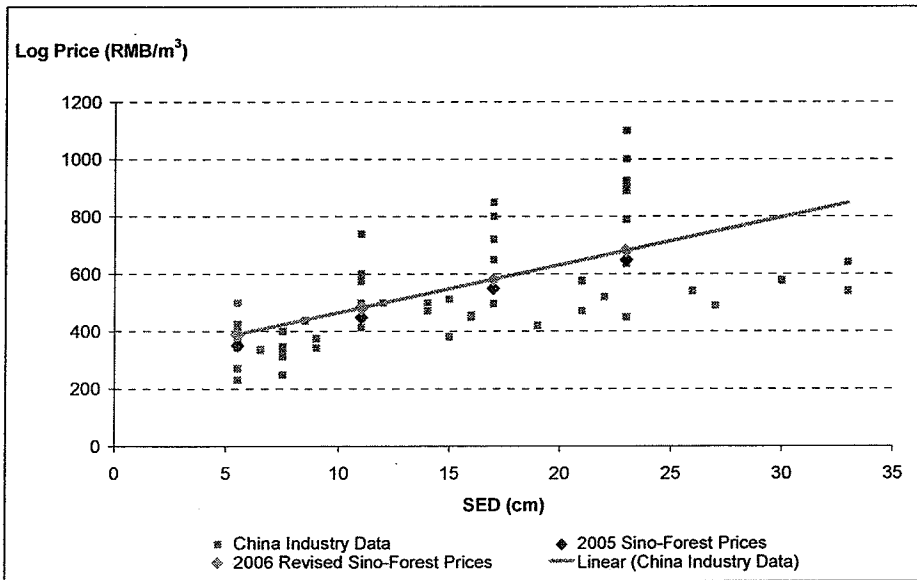
8.2   **Logs Prices Employed in the December 2006 Valuation**

Sino-Forest generally sells the plantations on a standing basis and therefore does not sell logs direct to the market. However, current forecast mill gate log prices have been assumed for the purposes of the plantation cash flow forecasts and are presented below in Table 8-1.

Table 8-1:
Pulpwood and Sawlog Forecast Prices, 2006 – 2011

Pulpwood & Sawlog Grade	Dec 2005 Prices	2006	2007	2008	2009	2010	2011+
	RMB per m³						
Acacia Pulp	300	300	300	300	300	300	300
Acacia Bark	200	200	200	200	200	200	200
Poplar <8 cm	300	300	300	300	300	300	300
Poplar 8-12cm	355	355	355	355	355	355	355
Poplar 12-20cm	410	417	421	429	433	433	433
Poplar >20cm	485	485	492	500	500	500	500
C.Fir 6-14cm	540	541	541	541	541	541	541
C.Fir 14-20cm	860	782	786	789	792	796	796
C.Fir >20cm	1000	951	957	963	969	974	974
Pine <8 cm	350	391	391	391	391	391	391
Pine 8-14 cm	450	482	482	482	482	482	482
Pine14-20 cm	550	582	585	589	592	599	599
Pine>20 cm	650	682	685	688	691	696	696
Euc <8 cm	350	303	303	303	303	303	303
Euc 8-14 cm	390	390	390	390	390	390	390
Euc 14-20 cm	440	440	449	455	455	462	462
Euc >20 cm	580	580	592	601	601	610	610

Pöyry's projected log prices are flat in real terms for all but the sawlog grades where a modest improvement in price, supported by strong demand, is assumed.

8.3   **Market Overview**

Pöyry has provided an in-depth analysis and forecast of the various China forest products markets in Appendix 2 of this report. This analysis has provided the basis for the review and formation of the log price forecast shown in Table 8-1 above.

**⊃ PÖYRY**

9　　　　**WOOD FLOW AND ALLOCATION MODEL**

9.1　　　**Overview**

For any forest, but particularly forests of significant size, there is an important choice in how the forest's future management is modelled. The alternatives are:

- A stand-based (bottom-up) approach. Individual stands within the forest are effectively considered in isolation. Once their yield potential at a certain target age is identified, data are accumulated to provide a result for the forest as a whole.

- A forest estate (top-down) approach. All stands are modelled collectively to achieve some desired result from the total forest resource.

The most common manifestation of the distinction is in the production profile of the resource. The age-class distribution of an example forest is shown below. Characteristically, most plantation forests have an irregular age distribution and Figure 9-1 illustrates this feature.

Figure 9-1:
Example Forest Estate Age-class Distribution
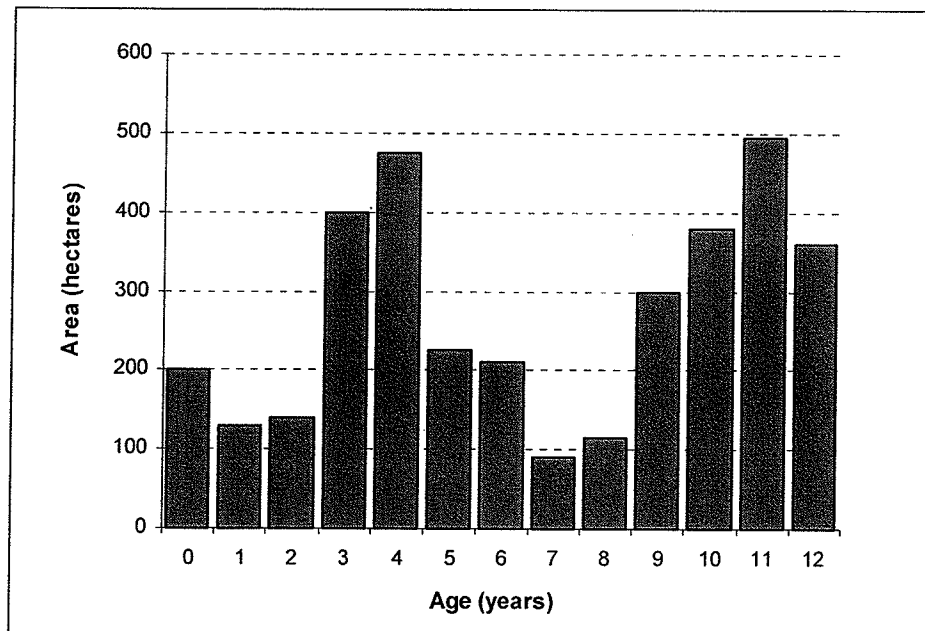
Assume, for convenience that all stands share the same yield table as illustrated by Figure 9-2.

Figure 9-2:
Example Forest Estate Yield Table

Were the forest to be managed on the stand-based approach, each stand might be cut at some externally determined target age. A commonly applied concept is that of the optimum economic rotation age. Accumulating the results gives an irregular wood production, as shown below. The harvest profile effectively becomes the mirror image[7], with a scaling factor, of the age-class distribution (Figure 9-3).

Figure 9-3:
Example Harvest at Fixed Rotation Age

---
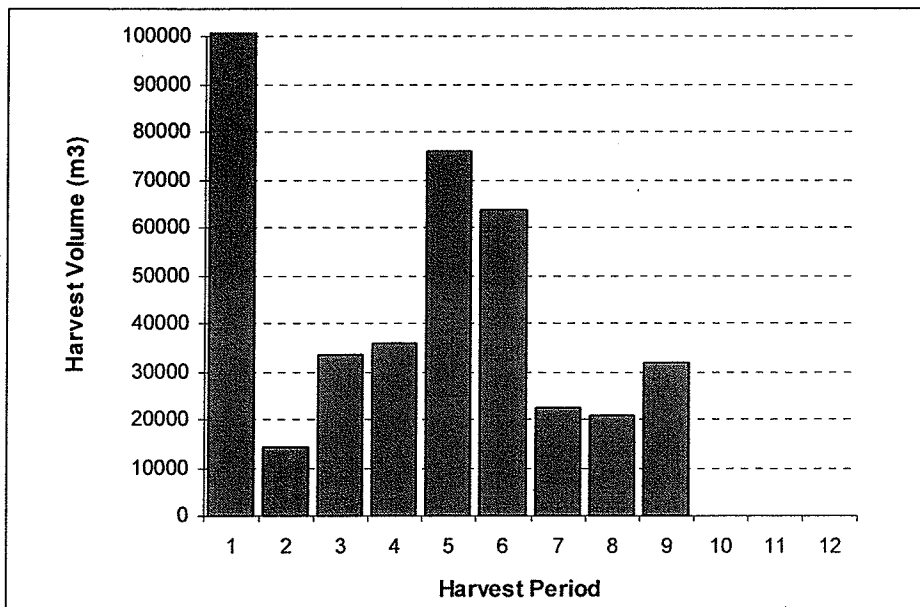
[7] Note that the full extent of the harvest in the first period is not shown as all ages >9 years are assumed harvested.

PÖYRY

In practice, it may be unrealistic to harvest all stands at a fixed rotation age. Most plantation forest estates have, through various circumstances, an uneven age-class distribution. A harvesting strategy that employs a fixed rotation age will lead to a wood flow profile that reflects the age-class distribution as illustrated in Figure 9-3 previously.

An irregular wood flow may be inappropriate for various reasons:

- Marketing - an irregular supply may prejudice market confidence.
- Logistical considerations of harvesting and transport.
- Supply commitments to associated processing plants.
- Regularity of cash flow from which to fund ongoing forest management.

To meet these considerations other harvesting strategies are likely to be preferred. A forest estate modelling approach can therefore be used to smooth the harvest rate, achieving this by manipulating both the age and area of harvest[8] (Figure 9-4).

Figure 9-4:
Example Smoothed Forest Harvest
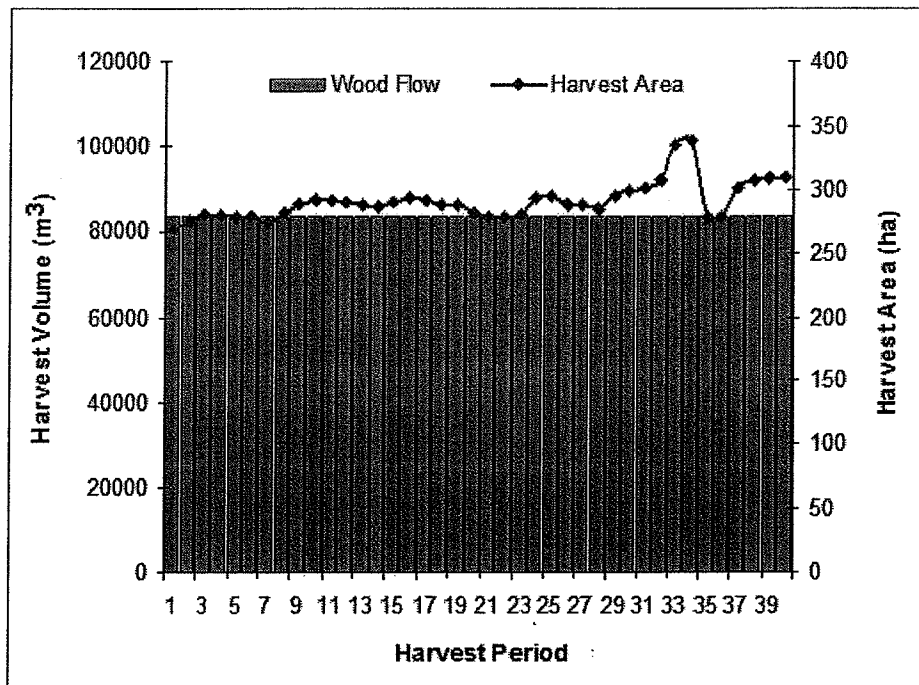
The choice of modelling method has a bearing on the results of a forest valuation. For each stand, examined in isolation, it is possible to identify an optimum economic rotation age. At this rotation length, the NPV of the stand is maximised. If the optimum economic rotation is employed as the target clearfelling age in a stand-based model, this will produce the highest theoretical value for the forest.

However, if a forest estate modelling approach is employed, this invariably involves some departure from the optimum economic rotation age and results in a lower value for the forest. The extent of difference between the modelling

---

[8] Note that the chart series for the average age of harvest is not shown. It does however vary over time.

approaches depends on the degree to which the harvest age varies from the theoretical optimum.

9.2 Observed Practice in Wood Flow Modelling

It is Pöyry's observation that wood flow modelling for valuation purposes invariably involves smoothing of wood flows. For large resources (in excess of a few hundred hectares) a non-declining yield is the most common default representation. To a large extent the degree of smoothing implemented is determined by the resource's age-class distribution.

The modelling profile adopted in forest valuations is guided by two factors:

- What the forest valuer believes is a credible and pragmatic profile, and
- What the market evidently assumes in determining what forest purchase value it is prepared to pay.

Figure 9-5:
Example Non-Declining Yield Profile
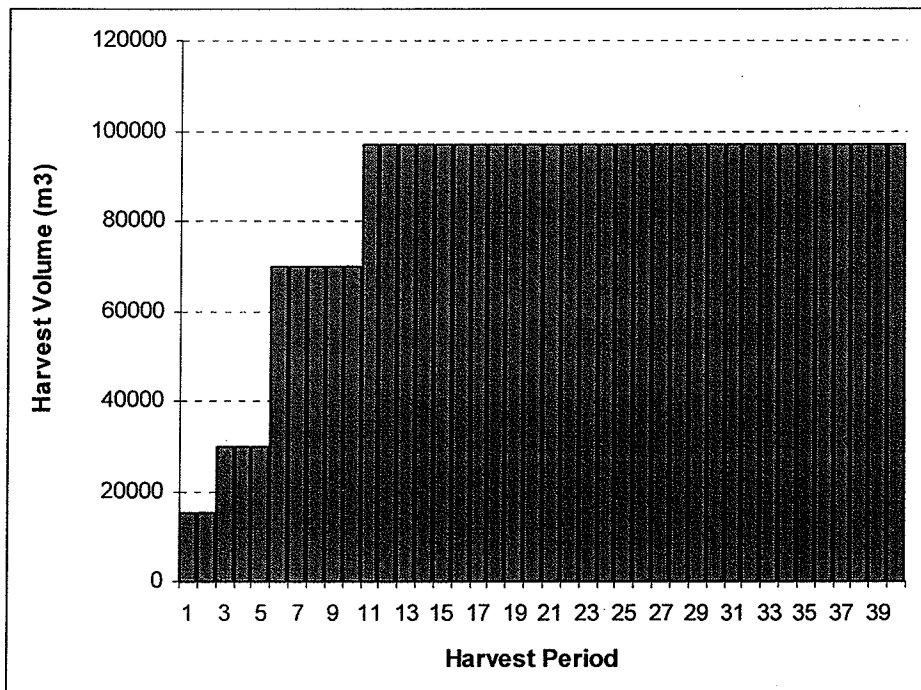
Pöyry has profound misgivings with production profiles for any particular forest that involve large fluctuations in wood flow. They may lead to real inefficiencies in start-up and withdrawal of harvesting operations, a less than enthusiastic participation by market partners, and forest financial flows that are most inefficient to manage.

Pöyry's perception of the market for forests is that most investors prefer valuations based on pragmatic wood flow profiles. Pöyry has consistently been engaged in preparing and evaluating managed wood flow profiles for intending forest investors.

⌾ **PÖYRY**

9.3   **Modelling Supply and Demand**

Forest estate modelling provides the means to manage the collective output of the estate to best effect, managing supply chain optimisation by matching production by log type to the various markets. These include; local sawmills, panel mills and pulpmills, local and distant forest product users, and export ports.

A schematic outline of the entire forest estate modelling concept used to project future wood flows as well as projected costs and revenue by destination is shown below.

Figure 9-6:
Schematic Illustration of the Forest Estate Model
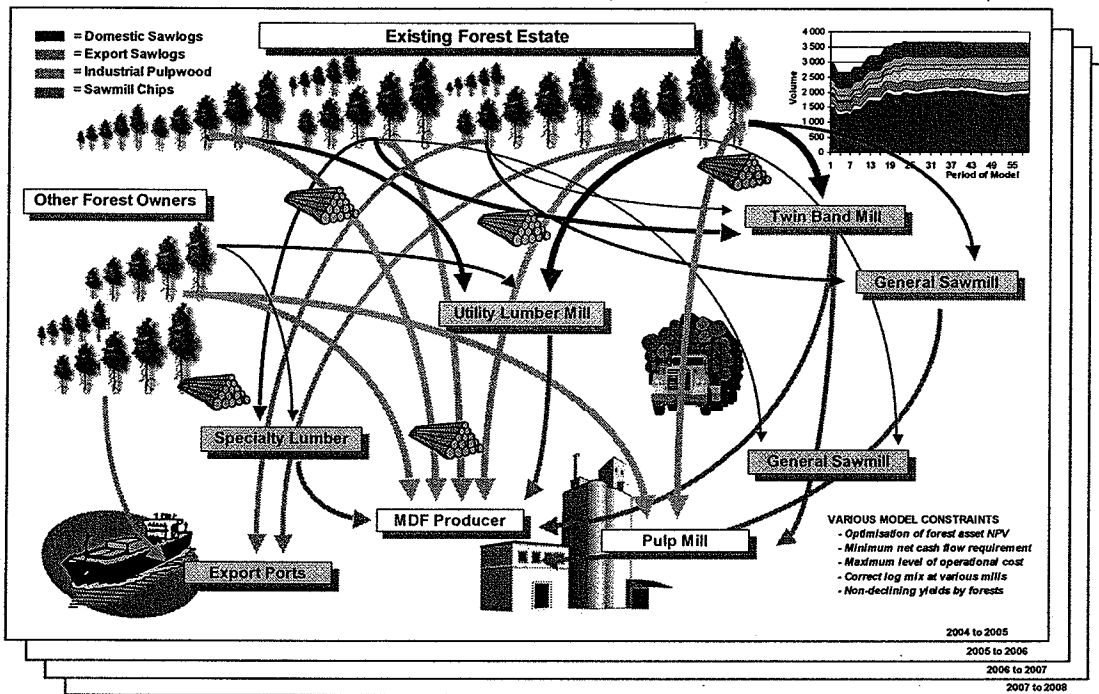
As illustrated, the model maintains the identity of the forest units within the collective resource.   Each has a distinct age-class distribution.   The linear programming model operates on a year-by-year basis, with each year being unique in respect to clearfell age, location of harvest and the quantities delivered to various destinations.

9.4   **Croptype Allocation**

Forest estate modelling has conventionally taken the approach of allocating each stand in the forest to a croptype. Croptype definition is initially productivity-based, with all stands within a croptype expected to share the same yield table. Factors affecting yields include the species, site characteristics and silvicultural regimes of the stands - thus croptypes are normally distinct with respect to these attributes. With increasing sophistication in the modelling process, other criteria for

PÖYRY

differentiation may also apply. Forest location, slope classification, soil type and tenure are also commonly distinguished.

The practice of aggregating stands into croptypes has largely been driven by limits on the computational capacity of available computers. With processing speeds continuing to increase rapidly, the requirements for aggregation are diminishing. It is increasingly practicable to construct models in which each stand is a croptype in its own right. The improved modelling resolution that this offers is attractive, although greater automation of model construction also becomes necessary. The forest estate model that has been constructed to describe the Sino-Forest estate employs a substantial measure of aggregation, but retains a high degree of resolution inasmuch as geographical identities are maintained and the coppicing of future stands is modelled.

9.5　Model Constraints

The linear programming based framework allows the specification of a variety of constraints. The following types of constraint are included within both the wood flow model and the supply chain optimisation model:

- Lower and upper harvest age limits.

- Overall objective of optimising the NPV of future cash flows.

- Croptype allocation for replanting/regeneration of future crops, with an accompanying variety of replanting constraints and limits.

- Harvest constraints, which in turn include a range of further options such as non-declining yields and product smoothing capabilities.

- Cash flow and budgeting constraints, such as maximum expenditure and minimum cash flow requirements on an annual basis.

- Supply chain management such as the delivery of required product mixes to specific destinations over a managed time horizon.

9.5.1　Clearfell Age Constraints

In order to provide variations in the mix and volume of the products available from each stand at clearfell, the age at which harvest can occur is allowed to vary. The linear programming model determines the year of harvest and is constrained to a range of ages that are realistic industry standards. The minimum and maximum clearfell ages for each species are shown in Table 9-1.

PÖYRY

Table 9-1:
Clearfell Age Restrictions

Period	Species	Minimum Clearfell Age	Maximum Clearfell Age
1..5	Acacia	6	60
1..5	Chinese fir	15	60
1..5	Paulownia	6	60
1..5	Pine	10	60
1..5	Poplar	6	60
1..5	Eucalypt (existing crop)	5	60
1..5	Eucalypt (new crop)	6	60
1..5	Eucalypt (coppice)	5	60
6..50	Acacia	6	10
6..50	Chinese fir	15	25
6..50	Paulownia	6	10
6..50	Pine	10	25
6..50	Poplar	6	12
6..50	Eucalypt (existing crop)	5	12
6..50	Eucalypt (new crop)	6	8
6..50	Eucalypt (coppice)	5	6

After an initial period when croptypes are allowed a wide range of clearfelling ages, the maximum harvest age is reduced so that a more tightly defined clearfell range exists. The reasons for doing this are threefold:

- At the start of the modelling process there are some stands containing old trees, and the model must acknowledge these exist.

- Lowering the maximum clearfell age after a period of time prevents the model from deferring the harvest age unduly in so-called end-play effects.

- A narrower band of possible harvest ages enhances the model's processing speed.

9.5.2 Wood Flow and Allocation Constraints

It is possible to specify periods within which the harvest of a class of products may increase at any time but cannot subsequently decline. As the concept suggests, this is commonly referred to as a non-declining yield (NDY) constraint.

The forest estate model has used both NDY constraints and smoothing constraints to allow the harvest of any mix of log products from various forest origins to be smoothed between annual periods. Table 9-2 below details the NDY constraints applied to the December 2006 model.

Table 9-2:
Non-Declining Yield Constraints

Period		Croptype Range	Products
From	To		
1	50	All Croptypes	Clearfell Volume
1	50	Existing Crop	Clearfell Volume

Table 9-3 details the nature of the smoothing constraints. The main objective of the smoothing constraints is to limit the year-on-year fluctuation of harvest levels at a provincial level.

Table 9-3:
Smoothing Constraints

Period				Maximum	
From	To	Croptype Range	Products	% Increase	% Decrease
2	10	All Croptypes	Clearfell Volume	0	25
40	50	All Croptypes	Clearfell Volume	0	0
10	50	Existing Croptypes	Clearfell Volume	5	5
10	50	Future Purchases	Clearfell Volume	5	5
1	5	Guangdong Province	Clearfell Volume	85	85
5	50	Guangdong Province	Clearfell Volume	15	15
1	5	Guangxi Province	Clearfell Volume	85	85
5	50	Guangxi Province	Clearfell Volume	15	15
1	5	Jiangxi Province	Clearfell Volume	85	85
5	50	Jiangxi Province	Clearfell Volume	15	15
5	50	Hunan Province	Clearfell Volume	40	40

It is anticipated that the future replanting operations will target faster growing and higher yielding species where possible. The ratio by which each species will be replanted is detailed in Table 9-4 below.

Table 9-4:
Replant Constraints

Period			Current	Replant	
From	To	Origin	Species	Species	% Replanted
1	50	Guangdong	All	Eucalypt	100
1	50	Hunan	Chinese fir	Chinese fir	50
1	50	Hunan	Chinese fir	Pine	50
1	50	Hunan	Chinese fir	Chinese fir	50
1	50	Hunan	Chinese fir	Pine	50
1	50	Jiangxi	Pine	Pine	70
1	50	Jiangxi	Pine	Eucalypt	30
1	50	Jiangxi	Pine	Pine	70
1	50	Jiangxi	Pine	Eucalypt	30
1	50	Jiangxi	Hardwoods	Eucalypt	100
1	50	Guangxi	Pine	Pine	60
1	50	Guangxi	Pine	Eucalypt	40
1	50	Guangxi	Pine	Pine	60
1	50	Guangxi	Pine	Eucalypt	40
1	50	Guangxi	Pine	Pine	60
1	50	Guangxi	Pine	Eucalypt	40
1	50	Future Purchase	Pine	Pine	60
1	50	Acquired	Pine	Eucalypt	40

9.6   Wood Flow and Allocation Model Results

Figure 9-7 illustrates the wood flow profile for the collective resource over the 50-year period of the valuation.

Figure 9-7:
Wood Flow by Species
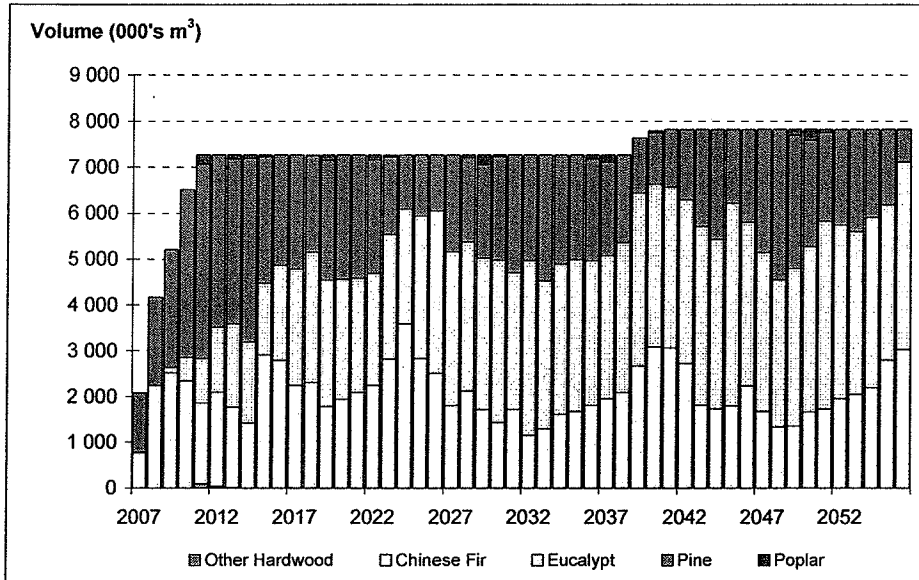
Pöyry has modelled the Sino-Forest estate over a 50 year period. This enables the current estate to be harvested close to its optimum economic rotation age and results in a wood flow profile that shows long-term variation between 7 000 000 m^3 and 8 000 000 m^3. Figure 9-8 details the wood flow by specific log type.

Figure 9-8:
Wood Flow by Log Type
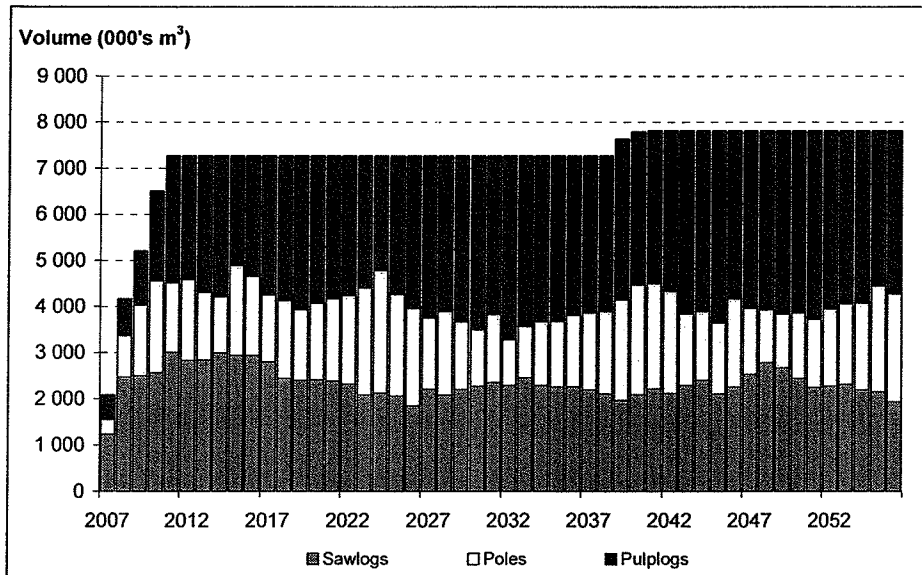
The reported wood flow includes the planned future acquisitions in Hunan province. Figure 9-9 shows the split between the current existing resource and the planned purchases associated with the perpetual wood flow. It should be noted that

PÖYRY

the future acquisition has little bearing on the current rotation valuation as it has been excluded from the financial analysis.

Figure 9-9:
Wood Flow by Ownership Status

⊙ PÖYRY
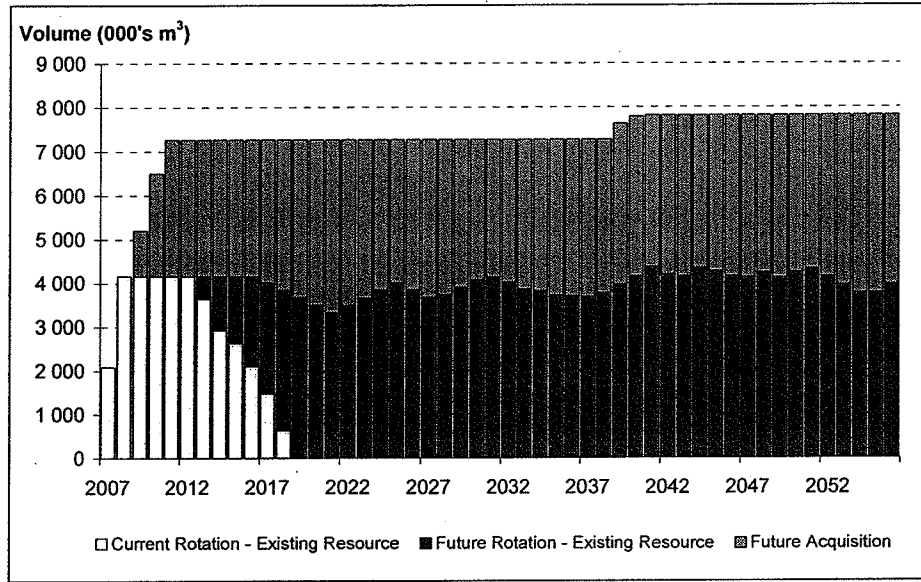
10   DISCOUNTED CASH FLOW VALUATION

10.1   Overview

The diagram below illustrates the structure of the valuation model. Generation of the initial inputs (the wood flows) has been described in the previous section. These wood flows are then optimised in their delivery throughout the supply chain to the various end-use markets. Revenue is generated at each destination, the price point being delivered at mill gate (AMG) or at wharf gate (AWG). Harvesting and transport costs, annual forest management costs, indirect overhead costs and the net cost of land are deducted from this revenue to give an operating margin.

The linear programming model generates all of these costs streams, since their profile depends on the harvesting strategy and age-class structure of the forest.

Figure 10-1:
Schematic Illustration of the Forest Valuation Process

PŐYRY
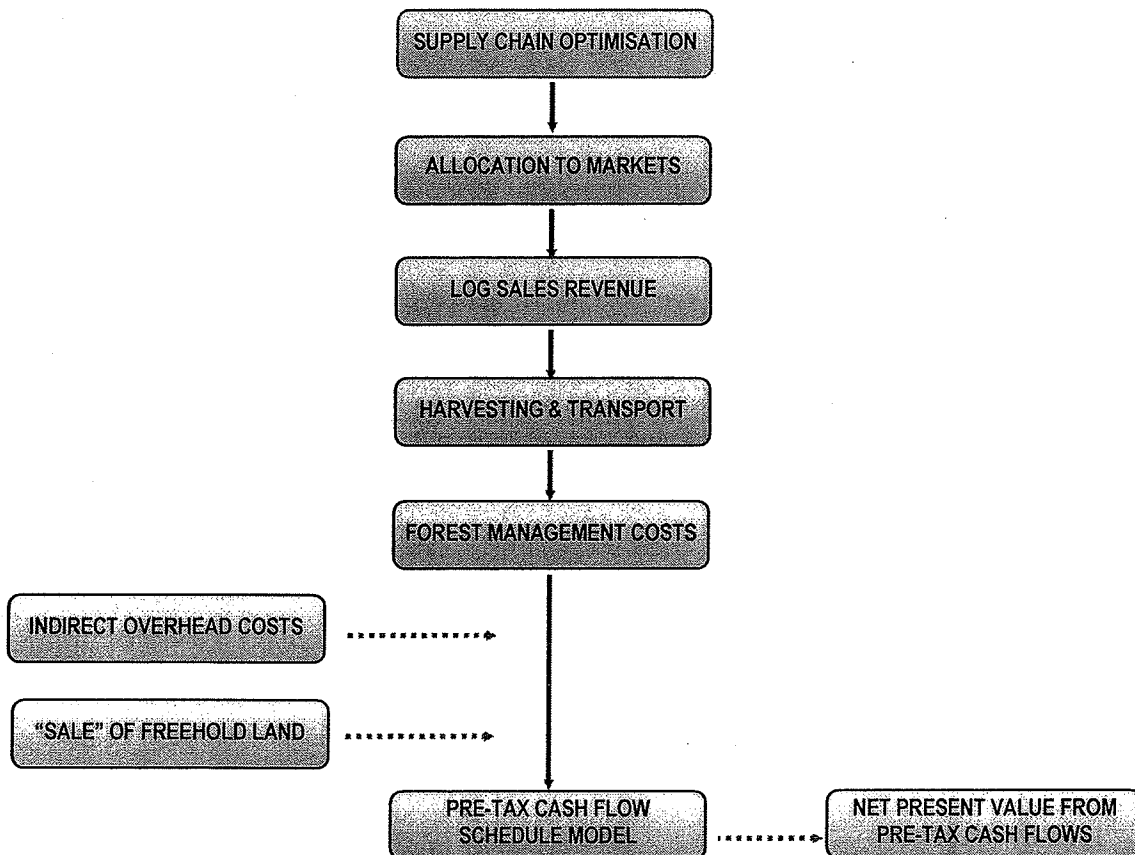
10.2 Treatment of Taxation

Astute forest investors are expected to prepare valuations on the basis of post-tax cash flows. However, in general the accessible information with which to interpret transaction evidence almost always excludes any evidence of the buyer's taxation position. Accordingly, when forest valuers have sought to derive implied discount rates, these have largely been based on pre-tax cash flows.

This valuation has been based on real pre-tax cash flows.

10.3 Scope of the Analysis

In this context, scope refers to the time span of the analysis. The forest estate modelling process can provide projections of cash flows far into the future. Providing the existing forest is replanted into productive croptypes, it would be possible to run the analysis indefinitely. Two alternatives are demonstrated in forest valuation:

- **Perpetual cash flows** - the forest is modelled as an ongoing business, where stands are replanted as they are felled. All revenue and costs associated with the sustained venture are modelled in perpetuity. In practice, the model is extended to the point where, after the discounting process, incremental cash flows are effectively immaterial. A figure in the order of sixty years is not uncommon when modelling a large plantation resource.

- **Current rotation analysis** - only the revenue and costs associated with the existing tree crop are included in the analysis.

In general, Pöyry prefers to confine the analysis to the current rotation. The justification for this approach is that future rotations, which include a degree of conjecture, are excluded from the analysis. The current rotation approach is especially compelling when future rotations appear either spectacularly profitable, or especially unprofitable. In either case it could be anticipated that some modifying influence would prevail.

If subsequent rotations are unprofitable, the forest owner will look to contain costs and increase log prices. If there is no prospect of either, a rational investor will quit forest ownership.

If subsequent rotations appear super-profitable, it can be anticipated that there will be competition for the underlying land and its price will increase. When charged with a higher land price, the profitability of the tree crop, and hence its value, will decline.

The approach is consistent with wider business appraisal that generally seeks to confine the analysis to the current investment cycle, and thereby avoid unnecessary conjecture. However, a disadvantage of the current rotation approach is the requirement to identify any terminal value associated with the investment. In forest valuations, the obvious candidate for the terminal value is the value of the land. Application of the current rotation approach assumes that the freehold land is either actually or notionally sold as the current crop is harvested.

10.4   **Timing of Cash Flows**

Tree planting within the Sino-Forest estate most commonly takes place over the months, February to April. By convention, stands are generally assumed to have been fully established by 30 June. The yield estimation process has generated yields that are projected to apply on the full anniversary of planting. Thus, for example, trees planted in 1975 were aged 23 full years on 30 June 1998 and the yields corresponding to 23 years of age were assumed to be available at that date.

With large forests that are subject to continuous harvesting, it would be impractical to fell all stands just as they turn their nominated target age. Instead, in a valuation model of the type represented here, they are expected to be felled across the span of a year. Commonly applied financial modelling procedures would suggest that the assumption that revenues arise at year-beginning would seem unduly aggressive. Seemingly, a more realistic approach would be to assume that cash flows arise no sooner than mid-year.

However, between the exact anniversary of planting and the felling operations, the tree crop will have grown. If the harvest age is near to the optimal economic rotation age, the marginal rate of value growth will be close to the discount rate.

Treating the revenue flow as a point event at the planting anniversary is therefore an acceptable assumption. In principle, cost flows should be treated differently – it would appear more realistic to consider them as occurring at mid-year. For convenience they, like revenues, have been treated as coinciding with the stand anniversary. This approach results in them being discounted less, and therefore represents conservatism in the valuation process.

10.5   **Date of Valuation**

The date of the valuation is 31 December 2006. Pöyry uses proprietary software that allows the isolation of both the cash flows arising from the current rotation and all future rotations at any point in the valuation horizon. The cash flows contributing to the Sino-Forest valuation arise during the 50-year period beginning 1 January 2007 and ending 30 June 2056.

⊙ PÖYRY

11 DISCOUNT RATE

A valuation based on an NPV approach requires the identification of an appropriate discount rate. In selecting the rates there are two broad approaches:

- Deriving the discount rate from first principles. The most common expression of this approach turns first to the Weighted Average Cost of Capital (WACC). This recognises the costs of both debt and equity. The cost of equity may be derived using a Capital Asset Pricing Model (CAPM) method.

- A second approach is to derive implied discount rates from transaction evidence.

11.1 Discount Rate Derived from WACC/CAPM

As part of the December 2005 valuation of Sino-Forest's assets, Pöyry commissioned Dr Alastair Marsden of Auckland UniServices Limited to prepare a report on the cost of capital for a generic forest investment located in China.

Dr Marsden's December 2005 report concluded that depending on the modelling assumptions a range of discount rates might be proposed for a forest-owning venture in China. His derived ranges of rates are shown in Table 11-1.

Table 11-1:
Estimate of Post-tax WACC by Marsden

Lower bound	Average estimate	Upper bound
5.0%	6.6%	8.2

The formulation of WACC employed by Dr Marsden was associated with post-tax cash flows and includes the cost of debt. Dr Marsden also converted his estimate of nominal post-tax WACC to an 'equivalent" real pre-tax WACC through a simple transformation with appropriate qualification. The average estimate of WACC to apply to real pre-tax cash flows is 9.9% (Table 11-2).

Table 11-2:
Estimate of Real Pre-tax WACC by Marsden

Lower bound	Average estimate	Upper bound
7.5%	9.9%	12.3

11.2 Implied Discount Rates

In common with other valuers of Southern Hemisphere planted forests, Pöyry maintains a register of significant forest transactions. The available evidence is then analysed in an effort to derive the discount rate implied by each transaction. The process involves preparing a credible representation of the forest's future potential cash flows and then relating these to the transaction price.

From this type of exercise conducted in Australia and New Zealand, Pöyry has observed derived discount rates for recent transactions to generally fall within the range of 8-10%. These are real rates, applied to post-tax cash flows.

Pöyry has little implied discount rate data for Southern China. As the commercial plantation forest industry develops and forests are transacted, empirical evidence from which to derive implied discount rates is expected to arise.

The capacity to utilise implied discount rates in this valuation is limited to considering how the forest investment in China compares with such investment in other locations.

Commercial forestry in Southern China is still its infancy and faces some challenges, these include:

- The reliability of forest descriptions
- The accuracy of yield prediction
- Achieving high growth rates in a consistent manner.

It is Pöyry's opinion that for many forest investors, investing in plantation forestry in China would be considered a riskier proposition than investing in the industry in Australia or New Zealand, for instance.

11.3   Incorporating Risk in the Discount Rate

If forest investment in China is at present perceived to be a more risky proposition than like activity in other international counterparts, the issue then becomes how to quantify this difference. The textbook treatments of the subject make it clear that the discount rate cannot be regarded as a simple catch-all for any and all forms of perceived risk. Because the discount rate may be a very blunt instrument in such a role it is preferable instead to attempt to acknowledge risk in the development of the cash flows to which the discount rate is applied. However, despite this principle, there is an inclination by potential purchasers to load the discount rate where they feel uneasy.

As detailed in Section 5.2, Pöyry has detailed the need for more extensive analysis of inventory and yield related data. The yield tables employed in the valuation are based on limited data. While the continued sale and purchase of forests by Sino-Forests makes the long-term monitoring of forest growth more challenging, analysis of inventory data collected by Pöyry over recent years warrants further consideration and application in the yield tables assigned to the Sino-Forest assets.

Pöyry has considered the risk and uncertainty associated with yield tables in selecting an appropriate discount rate for the 31 December 2006 valuation.

11.4   The Discount Rate Applied in Valuing the Sino-Forest Resource

Given the complexities in identifying what margin above other implied discount rates that forestry in Southern China should attract, Pöyry is disinclined to place weight on an implied discount rate derivation for this resource. This is consistent

PÖYRY

with the position taken by Pöyry in its 2005 valuation. The range of rates suggested by the alternative approach - the WACC/CAPM - is very broad.

Ultimately we have exercised our professional judgement in selecting a rate at the upper end of the WACC/CAPM range. This is a real rate of 11.5%. In selecting such a rate we have been inclined to recognise that investors in forestry in Southern China will inherently be taking a long term view, and do have grounds for optimism on the forest industry's future there. The fundamental factors that affect forestry performance are favourable. Importantly, too, the definition of market value for the forests requires that there be not just willing buyers, but also willing sellers. If the only purchase offers to be extended involved very high discount rates we would expect that forests would not be willingly sold.

In the current market Pöyry considers that 10.5% to 12.5% is representative of the range of real pre-tax discount rates that might be expected in forest transactions in Southern China. A discount rate of 11.5% has been selected and applied to pre-tax cash flows. It is Pöyry's perception that with a carefully timed and managed sale, other buyers could be attracted who would be willing to accept a similar pre-tax discount rate.

ⓖ PÖYRY

12 VALUATION RESULTS

12.1 Exchange Rate

The cost and price data applied in the valuation is in Chinese renminbi (RMB). The resulting cash flows generated from the forest estate wood flow and allocation model are also in RMB.

For reporting, Pöyry has assumed an US dollar to RMB (USD: RMB) exchange rate of 7.8075[9]. This is the published rate for 31 December 2006.

12.2 Valuation as at 31 December 2006

Pöyry has determined the valuation of the Sino-Forest assets as at 31 December 2006 to be **USD919.0 million**. This is the result of a valuation of the existing planted area and uses an 11.5% discount rate applied to real, pre-tax cash flows.

Pöyry has also prepared an existing forest valuation that **includes** the revenues and costs of re-establishing and maintaining the plantation forests for a 50 – year period (perpetual valuation). However, to date Sino-Forest only has an option to lease the land under the purchased trees for future rotations, the terms of which have yet to be agreed. Sino-Forest is embarking on a 400 000 ha expansion of its estate in Hunan. Pöyry has determined the valuation of the Sino-Forest forest assets based on a perpetual rotation (including the planned expansion in Hunan) using a real pre-tax discount rate of 11.5% to be **USD1 427.6 million** as at 31 December 2006[10].

The following table presents the results of the valuation of the Sino-Forest estate. The results are shown at real discount rates of 10.5%, 11.5% and 12.5% applied to real pre-tax cash flows.

Table 12-1:
USD Valuation as at 31 December 2006

Forest Component	Real Discount Rate Applied to Pre-tax Cash Flows		
	10.5%	11.5%	12.5%
	USD million		
Existing forest estate of 352 010.2 ha, current rotation only	951.2	919.0	888.7
Existing forest, and all future rotations including the 400 000 ha expansion in Hunan	1 550.3	1 427.6	1 323.8

---

[9] Source: XE.com Interactive Currency Table (http://www.xe.com/ict/)

[10] This perpetual value estimate is based on the assumptions made with respect to the species composition and age-class structure of the assets yet to be acquired in Hunan province. This value is indicative and should not be relied upon as a promise of future value. Should definitive information describing the species and age-class structure of potential acquisitions become available, this value should be reevaluated.

🌀 PÖYRY

12.3 Merchantable Volume

Table 12-2 outlines the merchantable standing volume of the existing Sino-Forest plantations. Merchantable standing volume has been calculated from the planted areas that are at least four full years of age as at 31 December 2006. Thus 35 583.6 ha aged less than 4 years are not included.

Table 12-2:
Merchantable Standing Volume as at 31 December 2006

Planting Year	Planted Area	Average Standing Volume	Total Volume
	(ha)	(m³ per ha)	(m3)
2002	3 285	4	13 591
2001	8 520	73	618 627
2000	7 234	84	609 809
1999	90	69	6 271
1998	14 077	97	1 359 935
1997	41 838	84	3 506 316
1996	99 286	77	7 659 894
1995	53 693	78	4 175 536
1994	2 126	120	256 011
1993	23 951	98	2 338 655
1992	27 225	101	2 762 582
1991	25 052	104	2 606 622
1990	5 568	134	745 819
1989	1 861	159	295 463
1988	1 861	162	301 585
1987	760	242	184 078
Total	316 427	86.7[11]	27 440 794

---

[11] Weighted average volume.

⊙ PÖYRY

13   SENSITIVITY ANALYSIS

A sensitivity analysis has been conducted that addresses the main drivers of value within the current rotation valuation model. These are:

- Discount rate and log price changes (in combination)
- Changes in the level of fixed overhead costs
- Changes in the costs of production (logging and loading, transport etc).

Table 13-1:
USD Current Rotation Valuation Only – Log Price Sensitivity

Scenario	Real Discount Rate Applied to Pre-tax Cash Flows		
	10.5%	11.5%	12.5%
	Current Rotation Value (USD million)		
5% Real Price Increase	1 033.5	998.5	965.6
No Real Price Increase (Base)	951.2	919.0	888.7
5% Real Price Decrease	868.9	839.4	811.7

Table 13-2:
USD Current Rotation Valuation Only – Overhead Cost Sensitivity

Scenario	Real Discount Rate Applied to Pre-tax Cash Flows		
	10.5%	11.5%	12.5%
	Current Rotation Value (USD million)		
RMB400 fixed cost per ha/year	963.9	906.5	876.4
RMB300 fixed cost per ha/year	951.2	919.0	888.7
RMB200 fixed cost per ha/year	938.5	931.4	900.9

Table 13-3:
USD Current Rotation Valuation Only – Harvest Cost Sensitivity

Scenario	Real Discount Rate Applied to Pre-tax Cash Flows		
	10.5%	11.5%	12.5%
	Current Rotation Value (USD million)		
10% Harvest Cost Increase	913.8	882.9	853.7
Base Harvest Cost	951.2	919.0	888.7
10% Harvest Cost Decrease	988.6	955.1	923.6

⊙ PÖYRY

14   **VALUE CHANGE ANALYSIS**

The change in appraised value between 31 December 2005 and 31 December 2006 is attributable to the following factors:

- The purchase of new forest areas.

- The sale of existing forest areas within the estate.

- The revision of yields associated with Hunan Chinese fir plantations.

- The revision of current and future log price estimates.

- An increase in maturity within the estate because of biological growth.

- Revised wood flow strategy.

Table 14-1 itemises the components of the overall value change.

Table 14-1:
Components of Value Change – USD millions

	Incremental Forest Value	Contribution to Change in Value	% Contribution to Change
	USD millions		
Value as at 31 December 2005	**728.5**		
Changes in Log Pricing inc. Advanced 1 Yr	819.5	91.1	12.5
Exchange Rate	847.1	27.5	3.8
Residual Attributable to Area, Yield, and Harvest Profile Changes	919.0	71.9	9.9
Value as at 31 December 2006	**919.0**	**190.5**	**26.2**

⌁ PÖYRY

15 SINO-FOREST'S INNER MONGOLIAN LOG TRADING BUSINESS

Sino-Forest has entered into agreements which secure the opportunity to purchase 1.5 million m^3 per annum of predominantly larch and birch logs in Inner Mongolia. It is understood that these agreements will extend for a period of 12 years, commencing in 2006 and concluding at the end of 2017. Pöyry has previously conducted an assignment to estimate and review the cash-flows associated with this opportunity[12].

Sino-Forest has requested that Pöyry incorporate the cash flows and value projections associated with its Inner Mongolian log-trading business as part of the 31 December 2006 valuation. Pöyry has rolled-forward its projections associated with the Inner Mongolian business.

The only change to the input assumptions is the removal of forestry production costs (including silvicultural management costs, forestry worker wages, harvesting costs etc.) which are not incurred by Sino-Forest. This equates to a **USD3.00 Million/an.** reduction in total cost.

All other remaining input assumptions including areas, yields, management costs, annual stumpage fees, and prices are assumed to be the same as those presented in Pöyry's previous review[12].

A summary of annual cash flows is presented in Table 15-1, indicating an estimated net annual income of USD12.944 million, or USD8.63/m^3.

Table 15-1:
Projected Pre-Tax Cash Flows for Sino-Forest's Inner Mongolian Log Trading Business

Year Ending 31 December	2007	2008		2017
Woodflow Volumes				
Total Volume (000 m³)	1 500.0	1 500.0		1 500.0
Log Sales Revenues				
Unit Gross Revenue (USD/m³)	81.03	81.03		81.03
Total Gross Revenue (000 USD)	121 538.5	121 538.5		121 538.5
Cost of Goods Sold				
Unit Log Stumpage Fee (USD)	106 163.5	106 163.5		106 163.5
Total Cost of Goods Sold (000 USD)	106 163.5	106 163.5		106 163.5
Management Costs				
Total Management Cost (000 USD)	2 430.8	2 430.8		2 430.8
Net Earnings and Cash Flow (Pre-Tax)				
Unit Net Earnings (USD/m³)	8.63	8.63		8.63
Total Net Earnings (000 USD)	12 944.2	12 944.2		12 944.2

Corresponding NPV estimates based on these cash flows and a variety of discount rates are presented in Table 15-2.

---

[12] Report Number 38A06247B – Sino-Forest Corporation - Review of Forestry Business Plan, Inner Mongolia China. Jaakko Pöyry Consulting, 16 January 2006.

⊙ PÖYRY

Table 15-2:
**Net Present Value Estimates of Sino-Forest's Inner Mongolian Log Trading Business
as at 31 December 2006**

Discount Rate	Value (USD Millions)
12.0%	81.34
11.0%	84.64
10.0%	**88.18**
9.0%	91.97
8.0%	96.03

APPENDIX 1

Field Inspection

⊖ PÖYRY

1   **BACKGROUND**

During the 10 day period of the 15th to 25th of January 2007, two consultant teams from Pöyry undertook a high-level field inspection of the Sino-Forest resource. The field inspection exercise included:

- Meetings with local Sino-Forest staff to discuss key events and inputs which may influence the forest valuation

- Meetings with local Forest Bureau staff regarding local forestry related issues, relevant local governmental restrictions, taxation, general forest costs etc.

- A high-level inventory of key yield characteristics including stocking, height, diameter, volume and grade out-turn,

- Verification of stand boundaries and areas via the use of hand held GPS devices and Forest Bureau maps.

One team focused on the new acquisitions within Guangxi Province while the other targeted the Chinese fir forests in Hunan.

1.1   **Guangxi**

Guangxi Province covers a total area in excess of 23.5 million ha. Around 39% (9.2 million ha) of this area is classified as forested, and approximately 67% (6.1 million ha) of these forested areas are managed commercially.

According to the data provided, Sino-Forest owns and manages a total of 88 523.4 ha of plantation forests throughout Guangxi. Area by age-class distributions by ownership, species group and city are presented in the following figures.

PÖYRY

Figure 1-1:
Guangxi Area Age-Class Distribution by Ownership Type
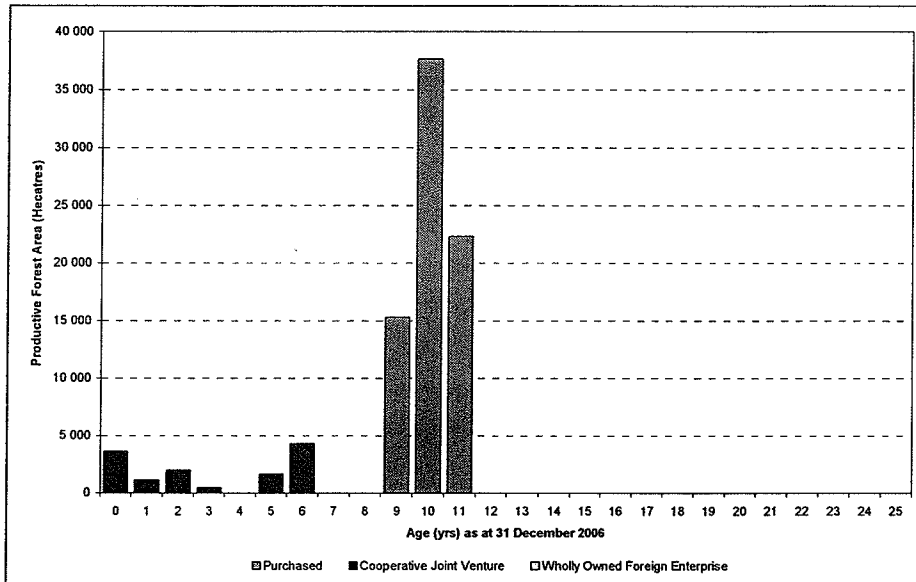
Figure 1-2:
Guangxi Area Age-Class Distribution by Species Group
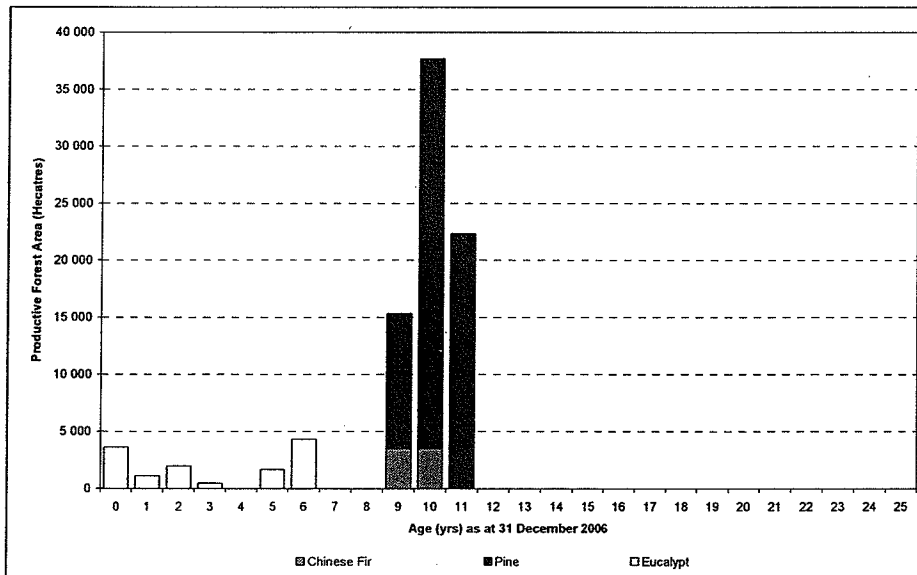
Figure 1-3:
Guangxi Area Age-Class Distribution by City
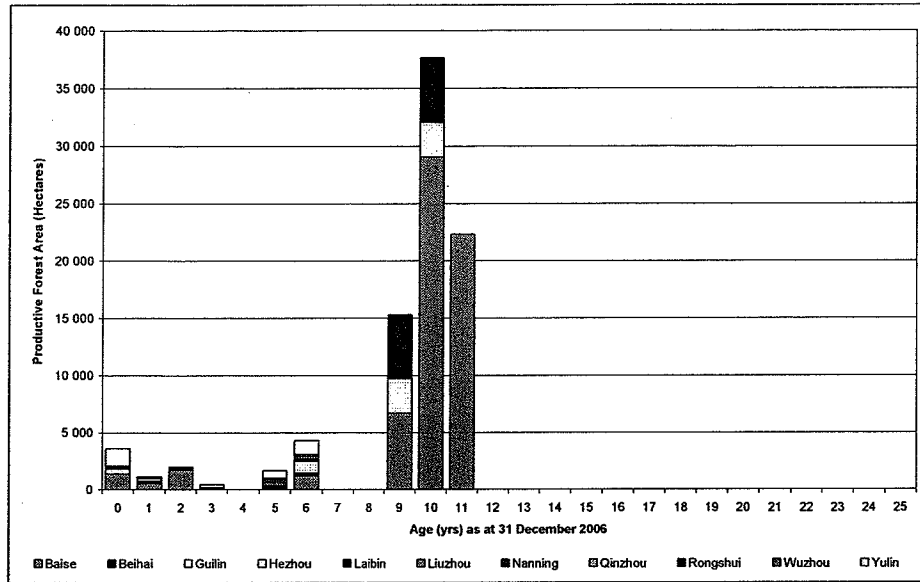
An overview of the Guangxi field inspection route is shown in Figures 1-4 and 1-5.

Figure 1-4:
Guangxi Field Inspection Overview Map1

PÖYRY
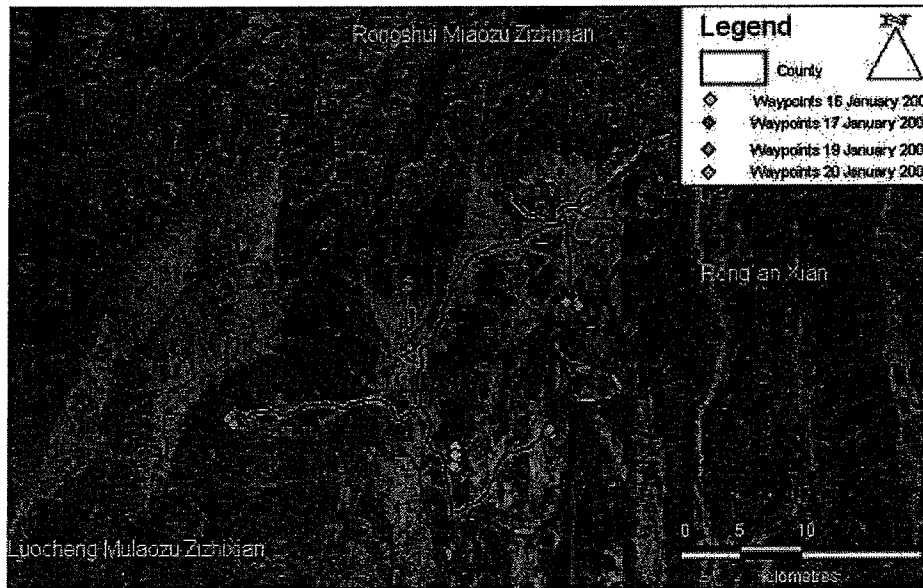
Figure 1-5:
Guangxi Field Inspection Overview Map2
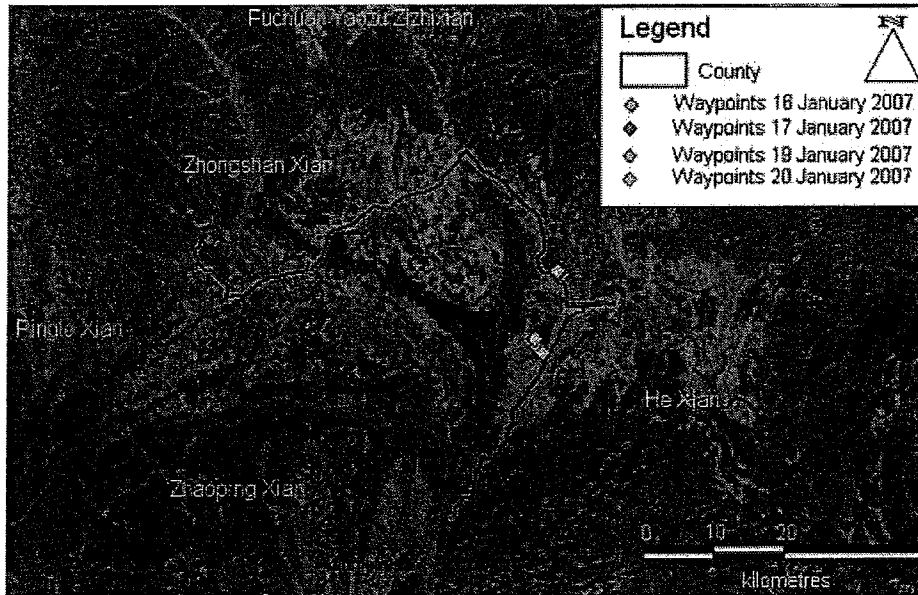
1.2 Hunan

According to the data provided, Sino-Forest owns and manages a total of 69 571 ha of plantation forests throughout Hunan, although it is understood that it is Sino-Forest's intent to increase this asset base to around 400 000 ha over the next 14 years. Area by age-class distributions by ownership, species group and city are presented in the following figures.

Figure 1-6:
Hunan Area Age-Class Distribution by Ownership Type

PÖYRY
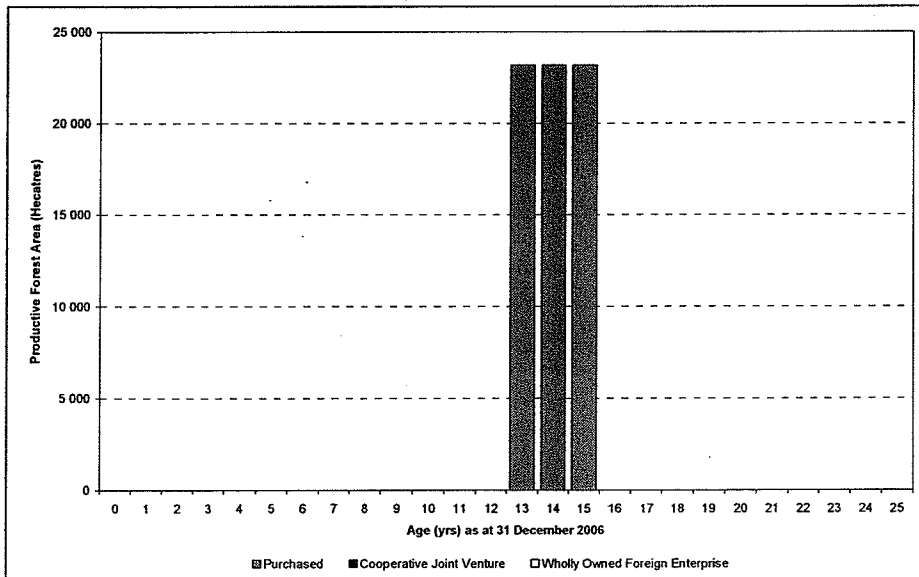
Figure 1-7:
Hunan Area Age-Class Distribution by Species Group
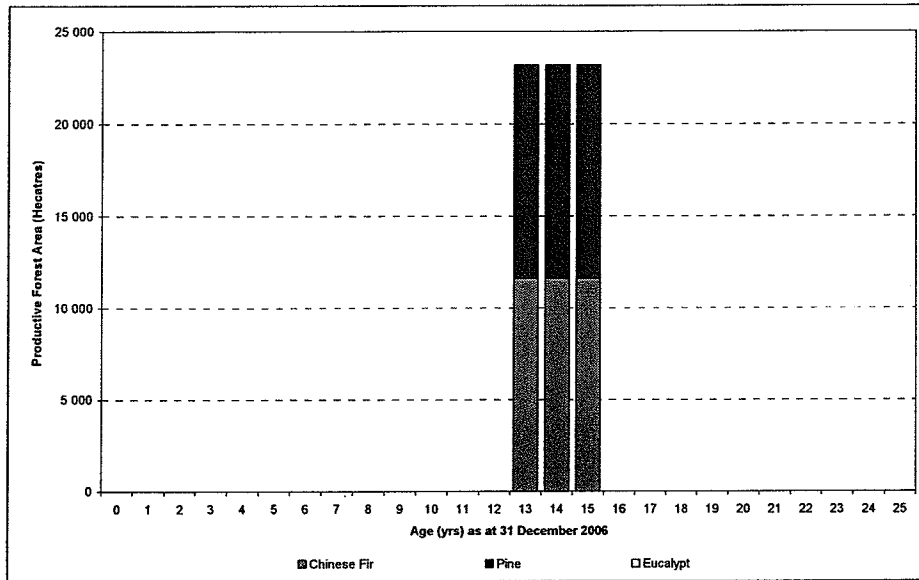
Figure 1-8:
Hunan Area Age-Class Distribution by City
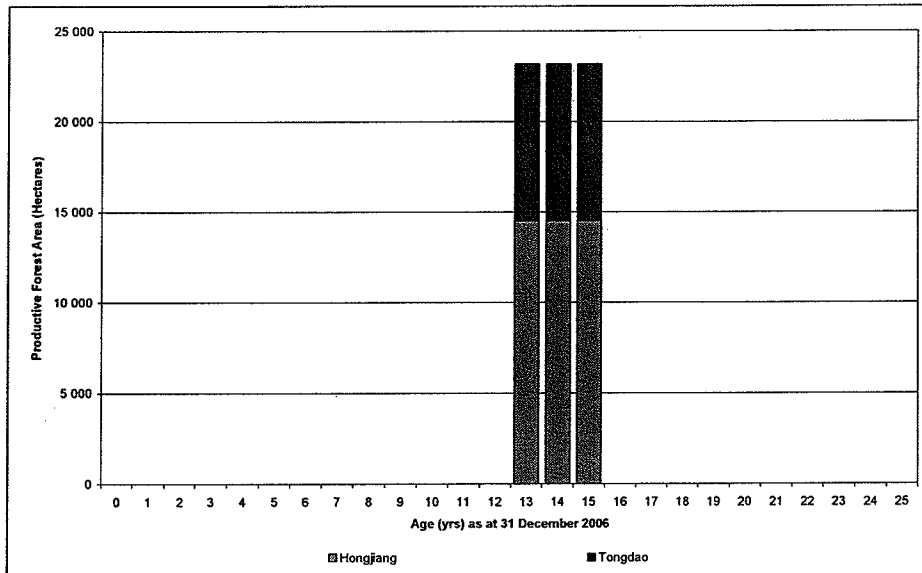
An overview of the Hunan field inspection route is shown in Figure 1-9.

ⓢ PÖYRY

Figure 1-9:
Hunan Field Inspection Overview

PÖYRY
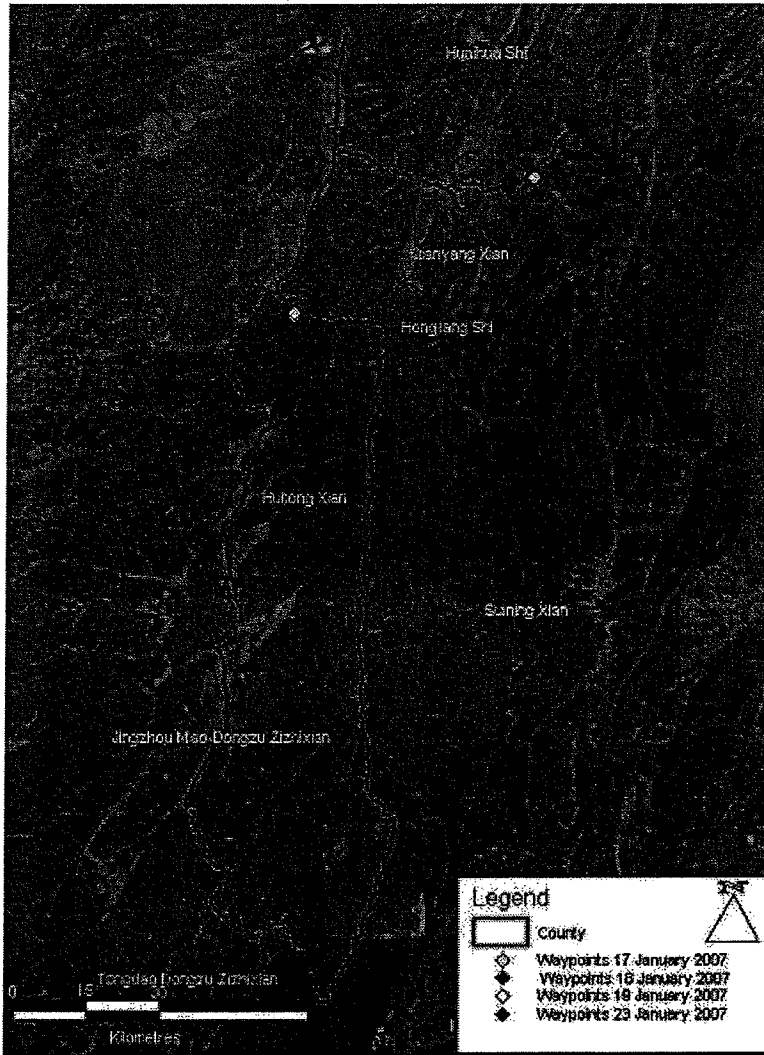
2   MAPPING AND AREA ANALYSIS

Accurately measuring the area of forests within China is problematic as surveying techniques such as aerial photography are often unavailable. Instead, forest managers rely on contour maps and GPS boundary checks to determine stocked areas. The simplistic nature of the mapping process lends itself to some uncertainty as to the accuracy of the area estimates, particularly where forest blocks are fragmented and/or contain numerous unplanted gaps. Similarly, if any significant events have occurred since the maps production (such as major land movements, windfall events, or significant tomb construction) the accuracy of the maps will be undermined.

In an attempt to verify the reported areas, Pöyry consultants walked the boundaries of several forest blocks with hand held GPS equipment. Inherently there will be a degree of error associated with this measuring technique as the accuracy of the GPS equipment can be widely variable, however, it is anticipated that the area calculated should fall within +/- 10% of the actual.

The results of the boundary analysis are detailed in Table 2-1 below.

Table 2-1:
Summary of Boundary Analysis Results

Province	County	Town	Cpt No.	Area Description Source			Inspection vs. Registered Maps
				Stand Records	Registered Map	Pöyry Inspection	
				Area – ha			
Hunan	Hongjiang	Qincheng	17	10.30	22.46	21.35	4.9%
Hunan	Hongjiang	Xuefeng	46	4.93	5.63	5.55	1.4%
Hunan	Tongdao	Dilian	1	N/A	3.57	5.17	-44.8%
Sub-total					*31.66*	*32.07*	*-1.3%*
Guangxi	Liuzhou	Rongshui	1	N/A	0.83	0.77	7.2%
Guangxi	Babu	Hezhou	5	N/A	2.86	1.31	54.2%
Guangxi			13	N/A	12.02	14.27	-18.7%
Guangxi	Zhongshan	Hezhou	4	N/A	9.31	8.86	4.8%
Sub-total					*25.02*	*25.21*	*-0.8%*
Total				**15.23**	**56.68**	**57.28**	**-1.1%**

The following maps compare registered Forest Bureau maps with the Pöyry GPS boundary track-logs. There are a number of cases where the actual GPS track appears to bear little resemblance to the forest maps, however the actual difference in area is often not as great as may be anticipated. Also, the larger compartment areas tend to correspond more closely to the areas associated with the registered maps than the smaller forest blocks, so that on a weighted average basis, the overall difference is less pronounced.

☉ PÖYRY

Appendix **1**

Figure 2-1:
Boundary Analysis – Cpt 17, Qincheng Town, Hongjiang City, Hunan Province
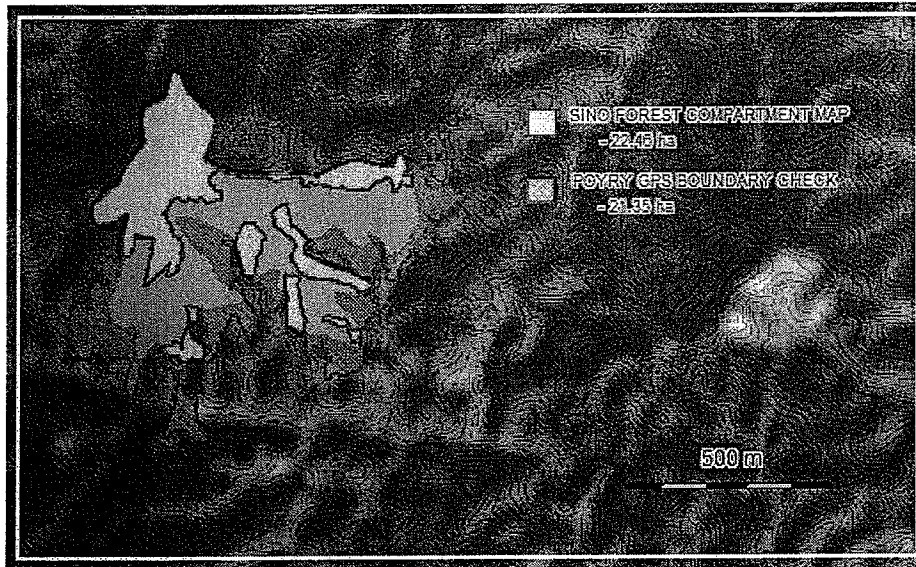
Figure 2-2:
Boundary Analysis – Cpt 46, Xuefeng Town, Hongjiang City, Hunan Province
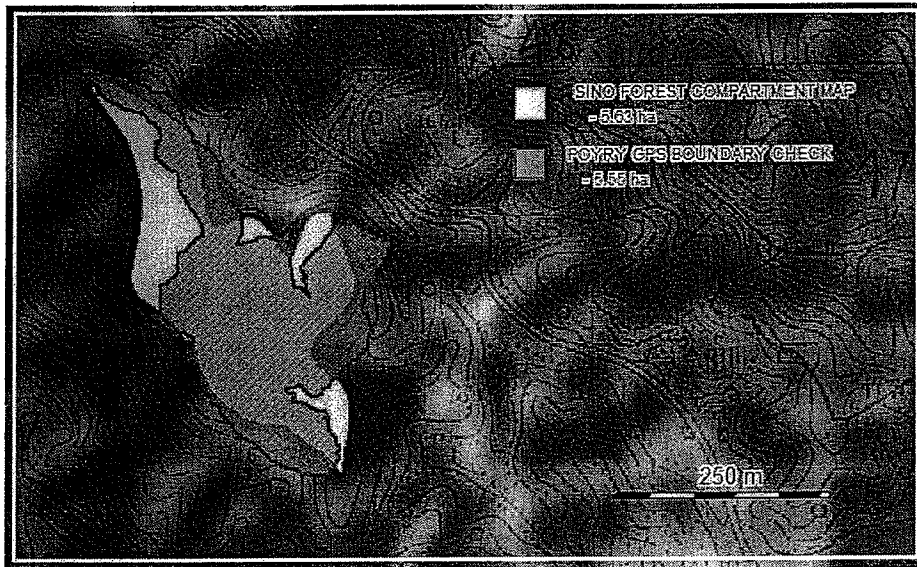
8

S PÖYRY

Figure 2-3:
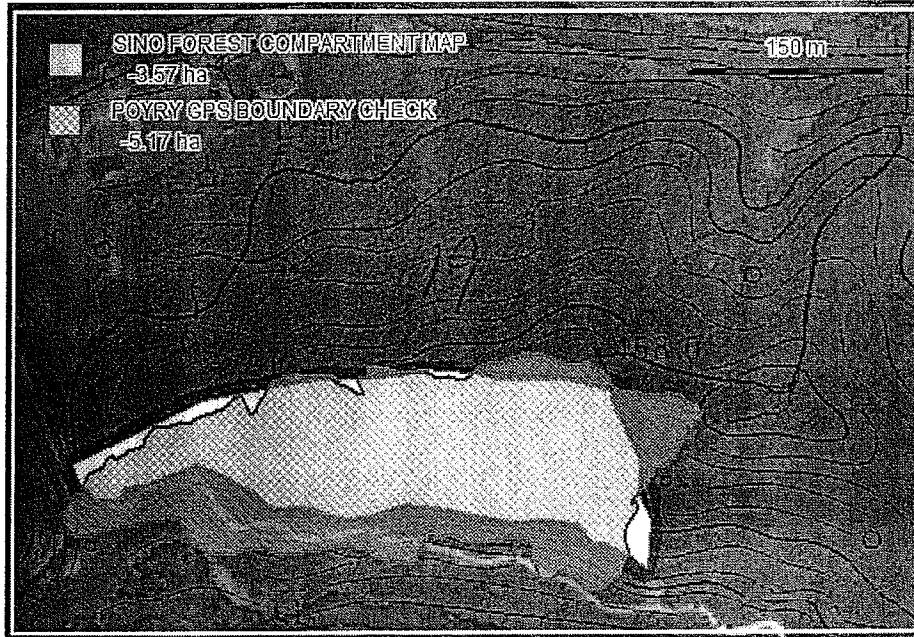**Boundary** Analysis – Cpt 1, Dilian Town, Tongdao City, Hunan Province

Figure 2-4:
Boundary Analysis – Cpt 1, Rongshui Town, Liuzhou City, Guangxi Province

PÖYRY

Figure 2-5:
Boundary Analysis – Cpt 5, Babu County, Hezhou City, Guangxi Province
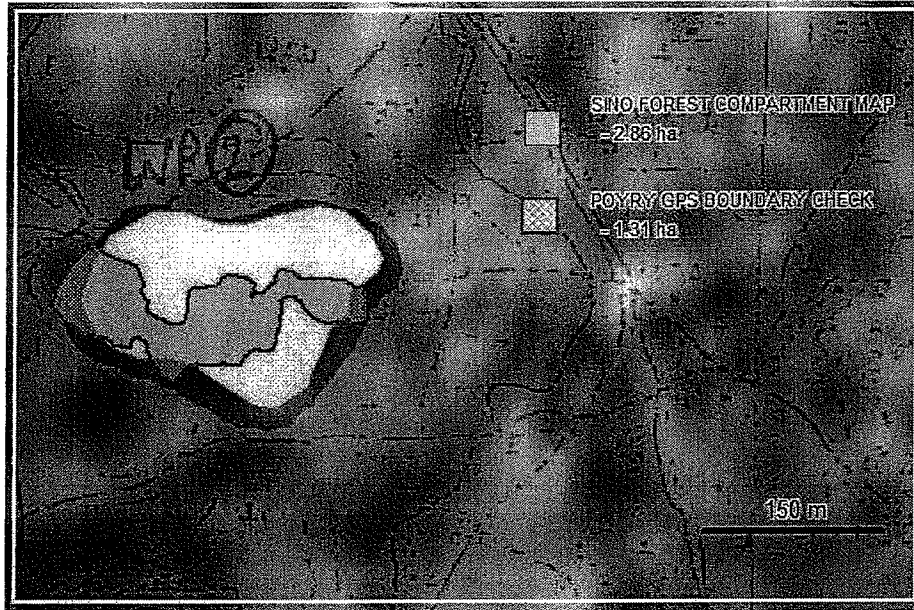
Figure 2-6:
Boundary Analysis – Cpt 13, Hezhou Town, Babu City, Guangxi Province

PÖYRY

Figure 2-7:
Boundary Analysis – Cpt 4, Hezhou Town, Zongshan City, Guangxi Province

SINO FOREST COMPARTMENT MAP
- 9.31 ha

POYRY GPS BOUNDARY CHECK
-8.85ha

250 m

3 . **INVENTORY AND YIELD ANALYSIS**

A high-level forest inventory survey was undertaken as part of the field inspection exercise. The main objectives of the inventory were to test the appropriateness of Sino-Forest's forest records against actual measurements and to evaluate the anticipated standing volumes and grade recoveries.

The results of the inventory analysis are reported in Section 5.3 of the main body of the report.

4 **GENERAL FIELD INSPECTION RESULTS AND PHOTO ESSAY**

4.1 **Hunan**

Due to time and budget constraints, the Hunan field concentrated on the Chinese fir resource which represents the majority of the current Hunan acquisition.

Overall, the forests visited as part of the inspection were well stocked, with typically uniform size and stem form. The average standing volume measured was 164 m^3/ha from an average stocking of 2327 stems per hectare. Stocking levels for this species are typically high, however it is in Pöyry's opinion that future replant stocking levels could be reduced to encourage greater diameter growth (Photo 4-7).

Access to the forests was generally satisfactory and, with the development of a new provincial level motorway, the transportation of harvested trees will become easier in the near future.

The overall terrain profile is moderate to steep, with the majority of plots being located on slopes greater than 25 degrees. The weighted average slope recorded was 31 degrees. Sino-Forest will need to be diligent during the harvesting and site establishment phases to retain adequate ground cover and avoid excessive soil disturbance/mass movement.

PÖYRY

Photo 4-1:
Cpt48, Lanxichong Village, Xuefeng Town, Hongjiang County. Well stocked Chinese fir plantation. Growth and form appears good.

Photo 4-2:
Cpt46, Lanxichong Village, Xuefeng Town, Hongjiang County. This compartment was selected as part of the boundary survey exercise. The boundary was generally easy to identify allowing for a more accurate measurement.

PÖYRY

Photo 4-3:
Cpt20, Qunfong Town, Hongjiang County. Temperatures can be below freezing in winter and snowfall events are not uncommon. Some snow damage was observed however it did not appear to be at a significant level.

PÖYRY

Photo 4-4:
Cpt14, Qunfong Town, Hongjiang County. Typical Chinese fir plot with a standing volume of approximately 150m³/ha. The overall weighted average standing volume for the entire Hunan field inspection exercise was 164m³/ha.
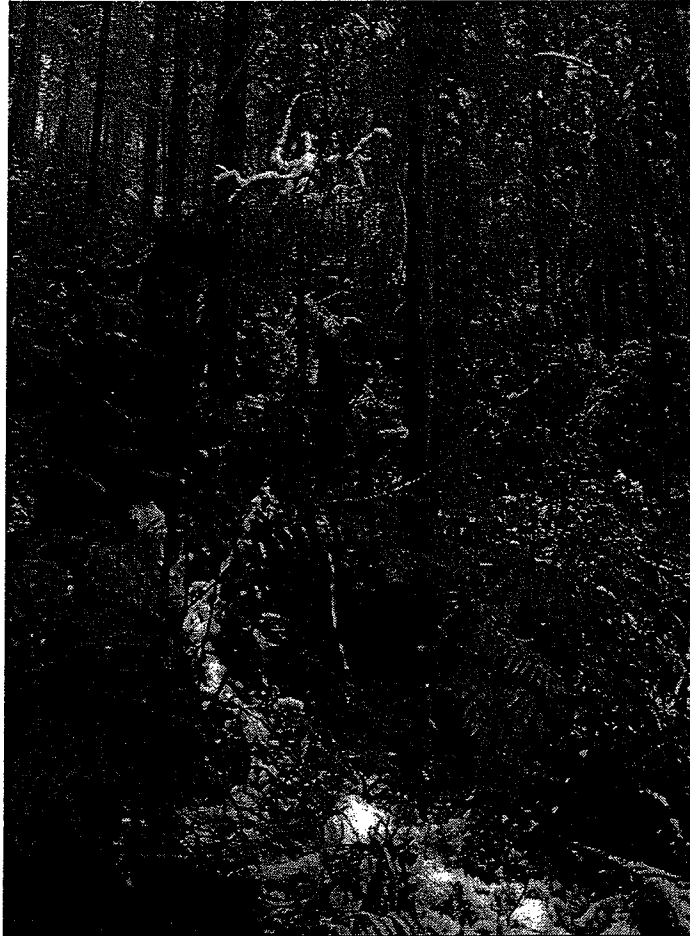
Photo 4-5:
Cpt17, Gaoqiao Village, Qincheng Town, Hongjiang County. Chinese fir has been used in the construction of this farm house. The method of construction employed avoids the use of nails.
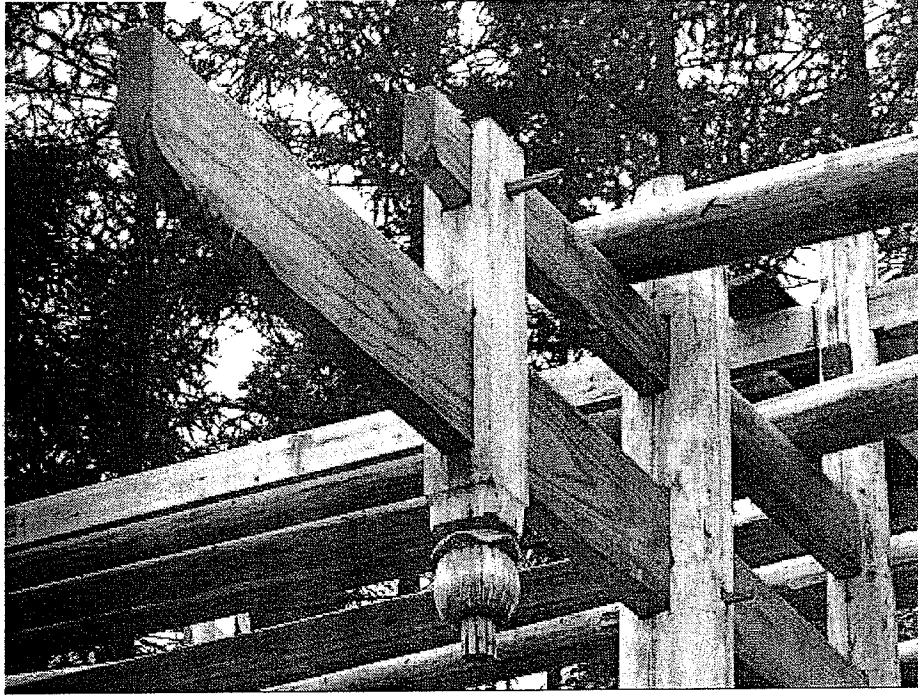
Photo 4-6:
Cpt17, Gaoqiao Village, Qincheng Town, Hongjiang County. Many of the Hunan forests are located on moderate to steep slopes. Sino-Forest will need to be diligent during the harvesting and site establishment phases to retain adequate ground cover and avoid excessive soil disturbance/mass movement.

POYRY

Photo 4-7:
Cpt17, Gaoqiao Village, Qincheng Town, Hongjiang County. A good example of increased diameters where trees are more widely spaced. The overlying chart shows the relationship between stocking and average stem diameter recorded during the field inspection exercise.

PŐYRY
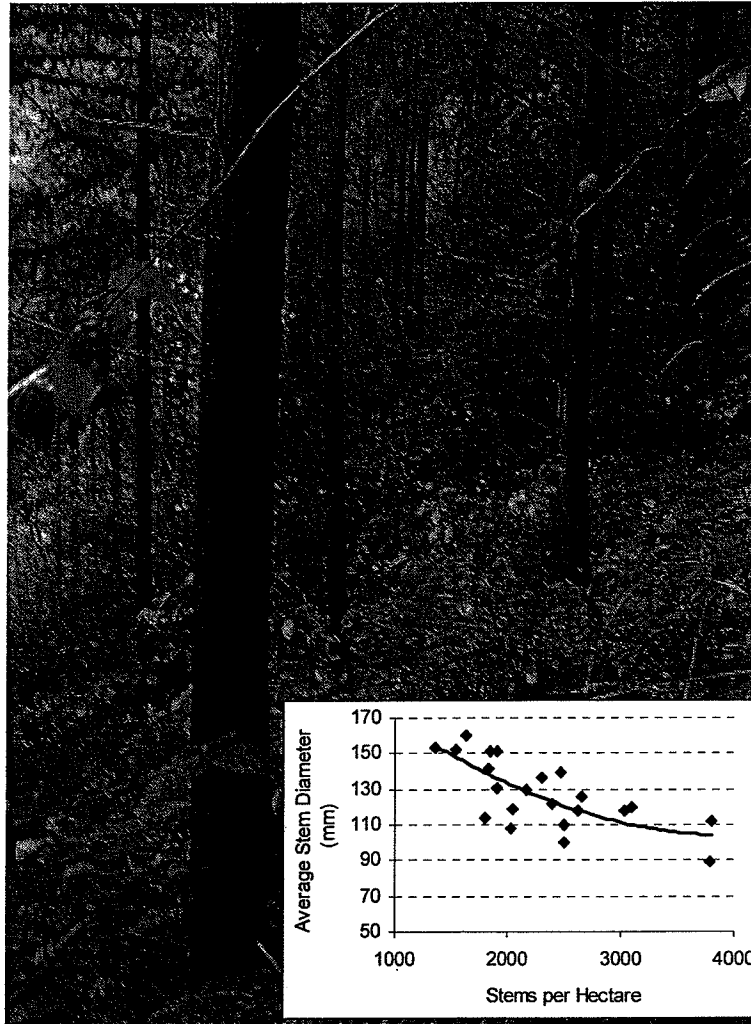
Photo 4-8:
Cpt1, Lincheng Village, Shianjiang Town, Tongdao County. Undergrowth density **of the inspected** forests was generally low to moderate allowing for easy access **for tending** and maintenance operations.

Photo 4-9:
Cpt95, Liyong Village, Jingwuzhou Town, Tongdao County. Trees are typically **uniform with** small branching and straight stems.

PÖYRY

Photo 4-10:
Cpt3, Lumuxi Village, Dachong Town, Hongjiang County. Some areas of this compartment appear to have been regenerated from coppice. Again, the typically steep terrain profile is evident.

⌾ PÖYRY
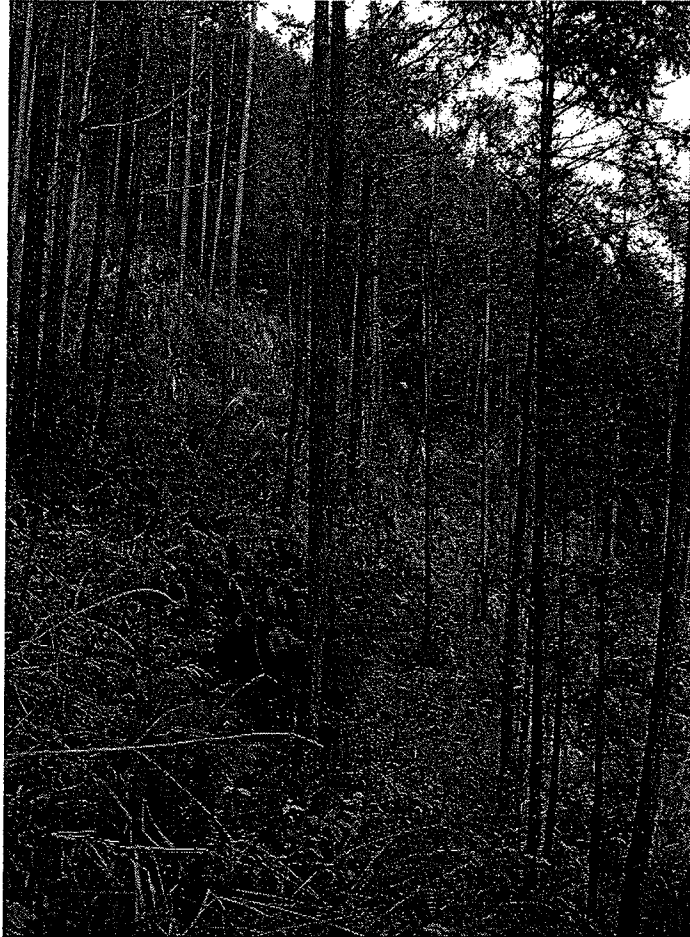
4.2   **Guangxi**

The recent purchases in Guangxi consist mostly of Masson pine, however some faster growing "foreign" pine was also encountered during the field inspection. Several other species are also included, predominantly consisting of Chinese fir and eucalypt species.

Volume estimates based on the high-level inventory were highly varied, ranging between 14 to 160m³/ha, with an average weighed volume of 86m³/ha. Similarly, tree form was also variable with the foreign pine generally superior to the Masson pine species (Photo 4-14).

Tree health was generally good with no significant losses noted, however in many instances pine trees had been tapped for the purpose of collecting resin. This may have an impact on the log grade out-turn, as portions of heavily scarred logs may not be suitable for peeler or sawlog processing operations (photo 4-18).

Photo 4-11:
1997 Masson Pine Plantation – Compartment 6, Rongshui Town, Rongshui County, Luizhou City, Guangxi. Typical Masson pine form and size for 1997 establishment.

PÖYRY

Photo 4-12:
1997 Masson Pine Plantation – Compartment 35, Rongshui **Town, Rongshui County, Luizhou City, Guangxi.** This plantation is well stocked and **typical of the terrain. Growth** rates appear good in this stand.

Photo 4-13:
1997 Masson Pine Plantation – Compartment 3, Hemu **Town, Rongshui County, Luizhou City, Guangxi.** There were some instances of **patchy stocking to the plantation boundary.**

PÖYRY
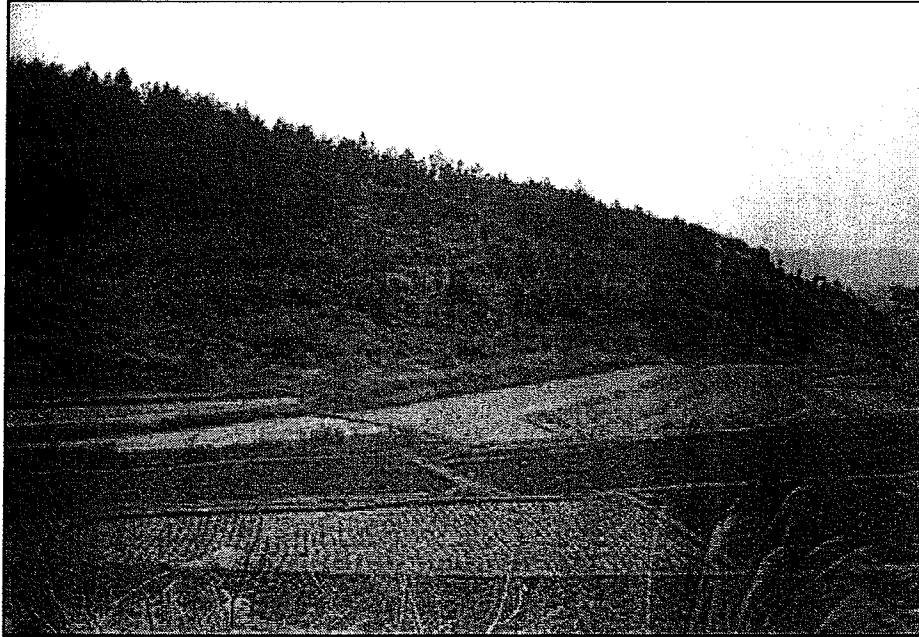
Photo 4-14:
1997 Masson Pine Plantation – Compartment 3, Hemu Town, Rongshui County, Luizhou City, Guangxi. Good consistent stocking, but variable boundary.

Photo 4-15:
1997 Masson Pine Plantation – Compartment 5, Hemu Town, Rongshui County, Luizhou City, Guangxi. Typical Masson pine stand on steep terrain.

PÖYRY

Photo 4-16:
1997 Masson Pine Plantation – Compartment 13, Hemu Town, Rongshui County, Luizhou City, Guangxi. Conducting inventory of a typical 1997 Masson pine stand. Overall, stand appears well stocked with no apparent health issues.

PÖYRY
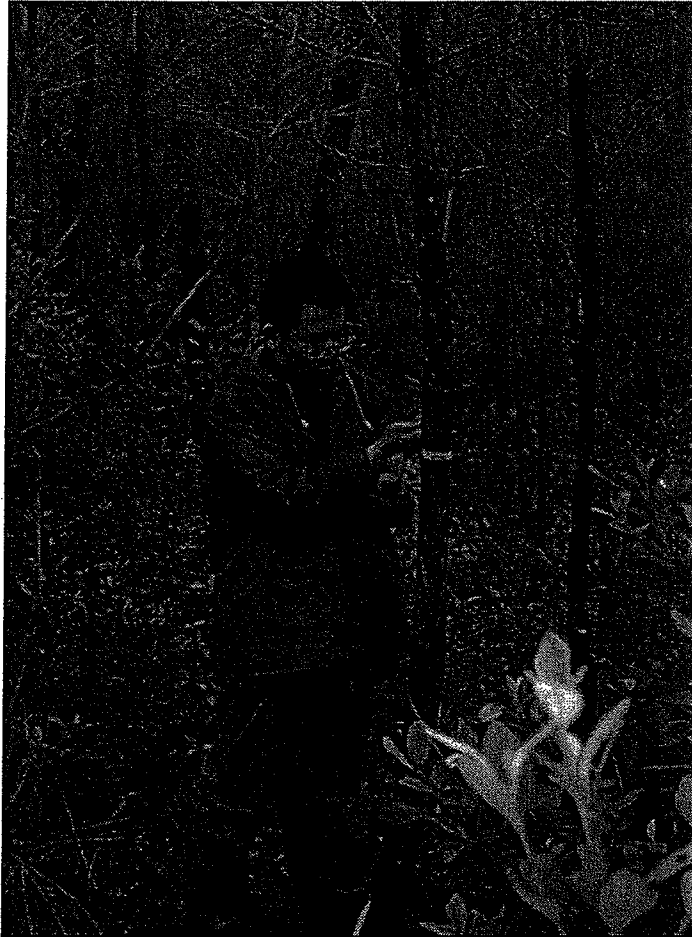
Photo 4-17:
1996 Slash Pine Plantation – Compartment 13, Gong Hui Town, Babu District, Hezhou City, Guangxi. Superior growth and form of the foreign pine is evident compared to that for Masson Pine established under similar conditions.

PÖYRY

Photo 4-18:
1996 Masson Pine Plantation – Compartment 4, Yan Tang Town, Zhongshan County, Hezhou City, Guangxi. Many trees have been heavily tapped for resin and appear to have been established prior to 1996.

⊆ PÖYRY
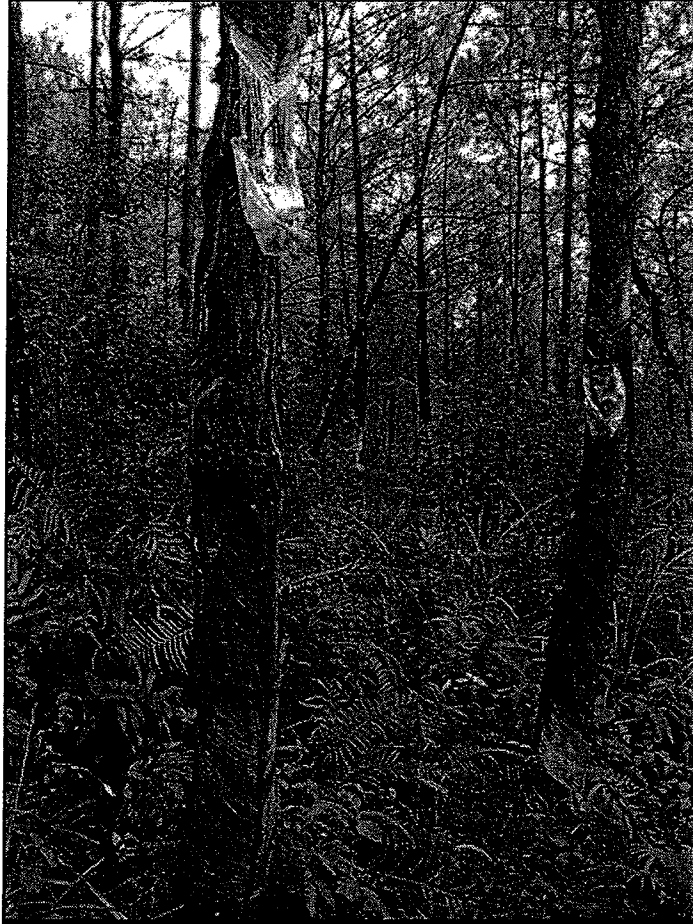
Photo 4-19:
1996 Masson Pine Plantation – Compartment 5, Yan Tang Town, Zhongshan County, Hezhou City, Guangxi. According to Sino-Forest's compartment map, the plantation should extend to the edge of the track.

Photo 4-20:
1996 Masson Pine Plantation – Compartment 3, Yan Tang Town, Zhongshan County, Hezhou City, Guangxi. This plantation appears to be healthy and well stocked.

PÖYRY
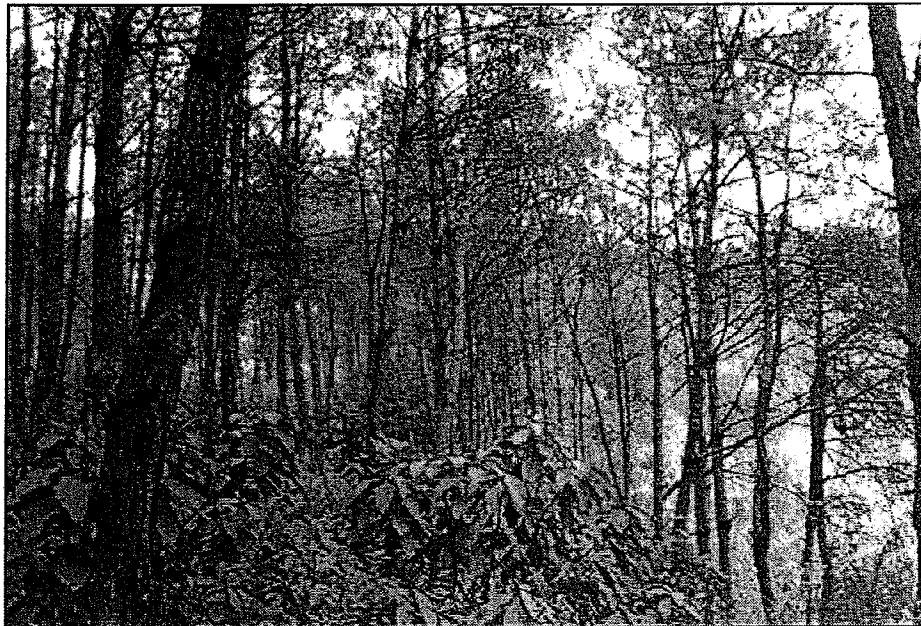
Photo 4-21:
1996 Masson Pine Plantation – Compartment 5, Sha Tian Town, Babu District, Hezhou City, Guangxi. A typical 1996 Masson pine plantation.

APPENDIX 2

China Market Overview

$\mathbb{G}$ **PÖYRY**

1 FIBRE SUPPLY AND DEMAND

1.1 Forest Resource

China is a large country and has vast forest resources from a global perspective, possessing the fifth largest forest area and the sixth largest forest stock in the world. However, China continues to rely on imported wood to satisfy its domestic fibre demand because of the following combination of factors:

- Substantially increased domestic wood consumption

- Restricted harvest from natural forests

- Fast-growing high-yielding forests representing only a small portion of its sizeable forest resources.

According to the sixth (1999-2003) national resources inventory survey, China has 175 million ha of forests, accounting for 18% of the country's total land area of 960 million ha. The forested area has expanded by 30% over the last decade, driven by enhanced plantation forest development activities. Around 42% of the forests in China remain state-owned while the balance is collective-owned. The total forest stock is reported to be approximately 13 billion m^3.

Of China's forested area, it is estimated that 53 million ha are plantation forests, and that some 24 million ha are considered to be available for industrial purposes. Furthermore, approximately 6 million ha can be classified as fast-growing and high-yielding (i.e. commercially productive). The plantation forest stock in China is estimated to be 1.5 billion m^3.

Figure 1-1:
China's Land Use for Productive Plantation Forests
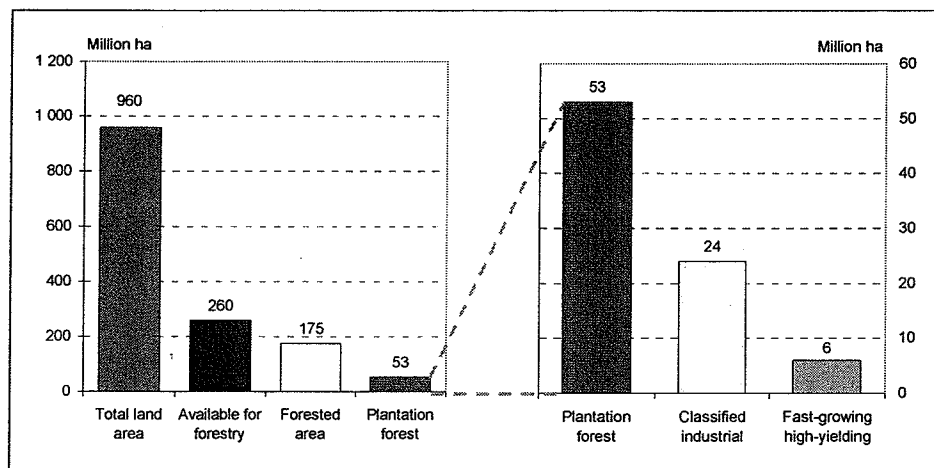
Traditionally the main plantation species are Chinese fir and Masson pine as well as other southern pines and larch, however new plantations consist progressively more of poplar and eucalyptus species.

ⵌ PÖYRY

New plantations of fast-growing high-yielding species are increasingly being planted on land that was formerly planted in pine or Chinese fir, primarily driven in recent years by large private or publicly-listed companies.

1.2 **Domestic Fibre Supply**

To find reliable statistics on China's domestic wood supply is problematic. Various statistics, sometimes conflicting, have been sighted. In this section, the State Forestry Administration (SFA) information and the Food and Agricultural Organisation (FAO) data are presented.

China controls its annual forest cut by means of annual allowable cut (AAC) quotas set by the SFA. The AAC quota was 223 million m^3/a for the 10th Five-Year Plan period (2001-2005) and is planned to increase to 248 million m^3/a during the 11th Five-Year Plan period (2006-2010). Harvest from plantation forests is to increase by 82%, from 86 million m^3/a to 157 million m^3/a, which coincidentally matches the volume allocated for commercial uses.

Figure 1-2:
China AAC Quotas
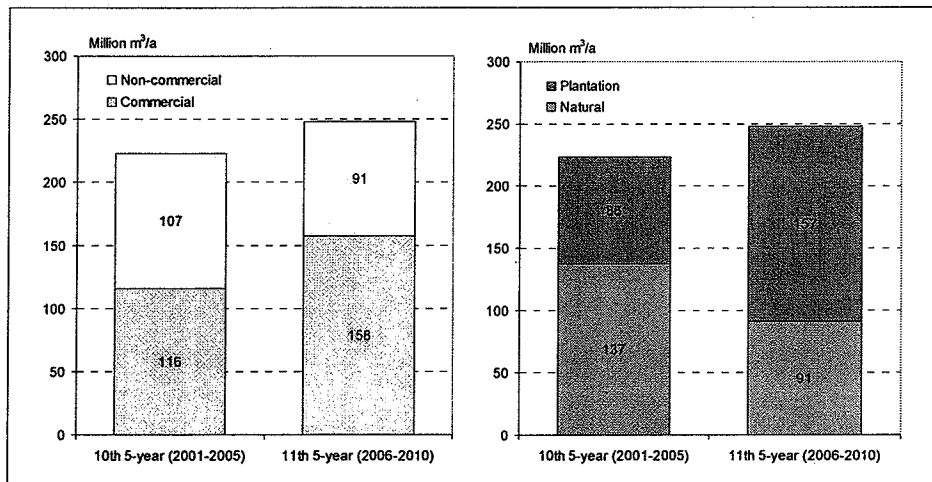
It should be noted that the AAC figures above include volumes used for non-industrial purposes. Official SFA statistics indicate China's industrial roundwood production has been in the order of 50 million m^3/a over the last decade, and that it reached 56 million m^3 in 2005. The actual number is believed to be appreciably greater than that implied by the SFA, as substantial volumes are harvested by farmers and from other non-official sources.

According to the FAO database, China's industrial roundwood removals have been consistent over the last five years, at around 95 million m^3/a (Figure 1-3). Removals peaked in 1996 with 109 million m^3 and then decreased in the late 1990s due to the Government's harvesting ban on natural forests. The bans were triggered after disastrous flooding of the Yangtze and other major rivers and have had a considerable effect on China's approach towards commercial plantation development.

Figure 1-3:
China Industrial Roundwood Removal
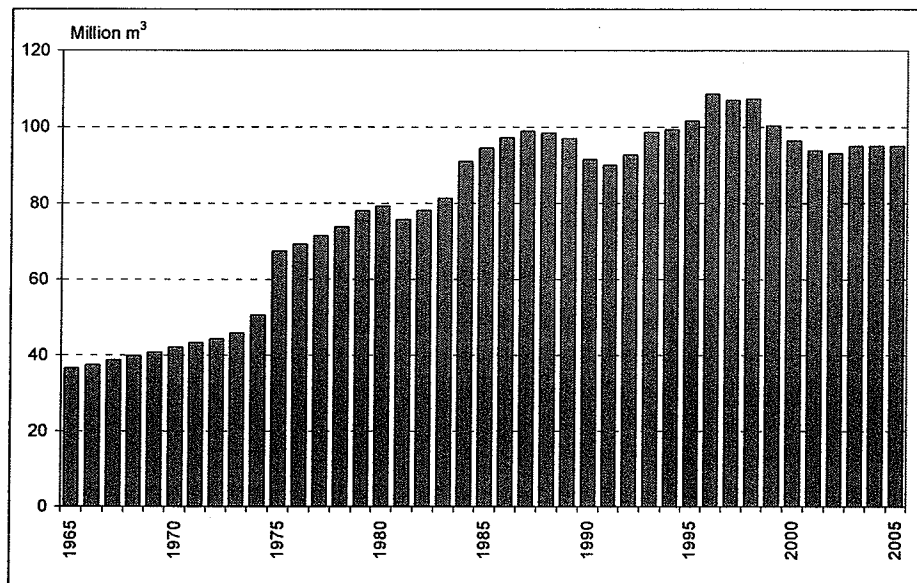
The Chinese government has been investing heavily in new plantation projects with the aim of increasing domestic roundwood production. The official target seems to be somewhat ambitious; however, the provided set of initiatives should nonetheless result in significant growth in China's domestic roundwood supply within the next decade.

Pöyry's World Fibre Outlook (2006) attempted to estimate China's fibre supply outlook as follows. In the report the total supply was forecast to increase at around 3%/a in the 2004-2020 period.

Table 1-1:
China Industrial Roundwood Supply Outlook

	1995	2000	2004	2010	2015	2020
Softwood (million m^3)	52	49	53	62	72	82
Hardwood (million m^3)	39	33	35	46	53	57
TOTAL (million m^3)	91	82	88	108	125	139

1.3   Domestic Fibre Demand

China's domestic fibre demand, including non-industrial applications such as rural housing, mining, agriculture and fuelwood is estimated to be 350-400 million m^3/a today. Industrial uses represent approximately one-third of the total.

As presented in Figure 1-4, it is estimated that China's industrial wood consumption as of 2005 was in the order of 140-150 million m^3, on a roundwood-equivalent (RWE) basis, having grown substantially over the last five years at an average rate of 10%/a. The lumber and reconstituted panel industries have been the major contributors to the considerable growth.

The demand is forecast to continue growing over the next five years, albeit at a slower rate. The bulk of increases are expected to be generated from the development of domestic pulp and reconstituted panel manufacturing industries

e.g. particleboard and medium density fibreboard (MDF). In particular, demand from the pulp making industry is anticipated to expand significantly at 18%/a from 2005 to 2010.

Figure 1-4:
Indicative Industrial Fibre Demand in China
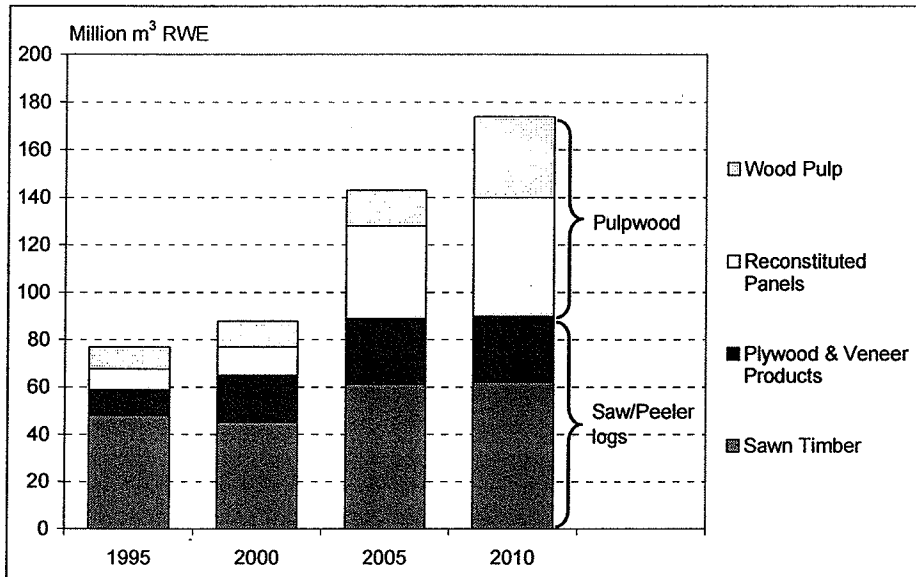
Pulpmills typically enjoy better wood paying capability and utilise higher quality domestic pulpwood as well as imported woodchips, whereas reconstituted panel industries mostly rely upon a range of relatively low quality domestic fibre including minor species and residual materials, and also some non-industrial fibre.

Sawlog and peeler log demand is generated by domestic production of lumber and plywood/veneer products. China has faced significant shortages in domestically produced quality saw and peeler logs, especially after logging bans, and therefore depends heavily on imported logs.

1.4   Imports

1.4.1   Log

Log imports into China have increased remarkably during the last decade, at an average growth rate of 26%/a. The country has in fact become the largest log importer in the world during this period. In 2006, China imported 32 million m^3 of logs, consisting of 20 million m^3 of softwood logs and the balance of hardwood. The share of softwood in China's total log imports has increased sharply over the last decade, being 23% in 1995, 47% in 2000 and 61% in 2006.

As presented in Figure 1-5, Russia has been, by a significant margin, the most important log exporter into China, representing 68% of total log imports in 2006. Further, Russia supplied a dominant 92% of China's softwood log imports in 2006. Papua New Guinea (PNG), Malaysia, Myanmar and Gabon were positioned second to fifth in 2006, supplying mainly mixed tropical hardwood logs. New Zealand has

PÖYRY

been the second largest and the only other sizeable softwood log supplier after Russia.

Growth in China's log imports is anticipated to remain positive but at a slower rate in coming years. The Russian government's latest proposal is for considerable log export tariff increases to take place during the remainder of this decade. This decision could be a critical force for change to Asia's current log trade dynamics, should it be pursued at the announced levels.

Figure 1-5:
China Log Imports by Source
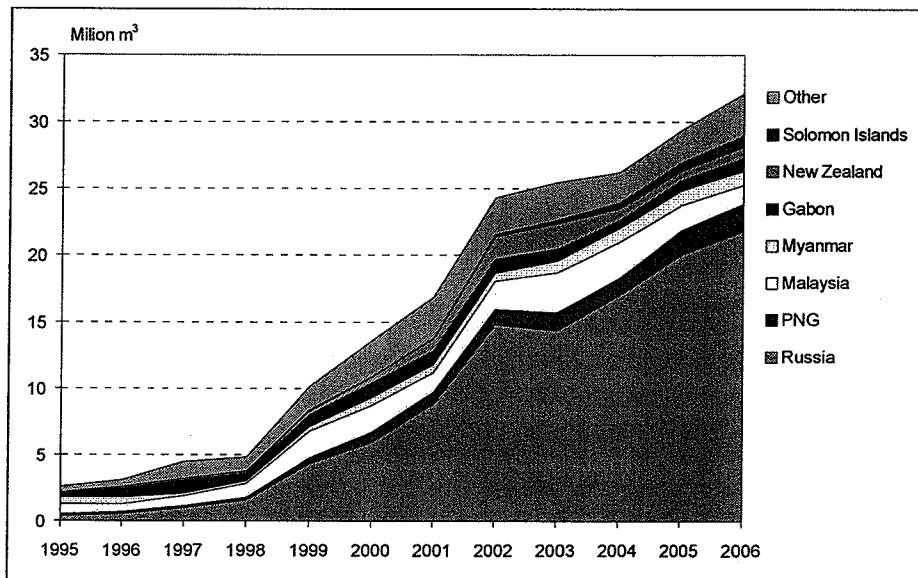
1.4.2 **Woodchips**

China had traditionally been a major exporter of hardwood woodchips into neighbouring countries, such as Japan, Taiwan and South Korea, until in 2006 it became a net importer for the first time in its history.

China imported 894 000 bone-dry tonnes (BDt) of hardwood woodchips, and exported 612 000 BDt, in 2006. Imports had nearly tripled from 2004, driven mostly by the start-up of APP's Hainan Jinnan pulpmill in late 2004 and the upgrade of APRIL's Shandong Rizhao pulpmill in 2005/06. Further, there are a number of domestic pulpmill projects confirmed or planned over the next decade, suggesting that China's woodchip imports will continue to increase in the short to medium term.

Vietnam became the largest supplier of hardwood woodchips into China during 2005 and further increased the quantity in 2006. This level of supply from Vietnam may not be sustained in the future, however. Australia remains a major hardwood woodchip supplier into China, and the considerable increase from Indonesia is also noteworthy. The relatively minor increase in total from 2005 to 2006 was due in part to the high inventory level observed at the end of 2005. Until recently China's softwood woodchip import volume has been negligible.

⊜ PÖYRY

Figure 1-6:
**China Hardwood Woodchip Import by Source**
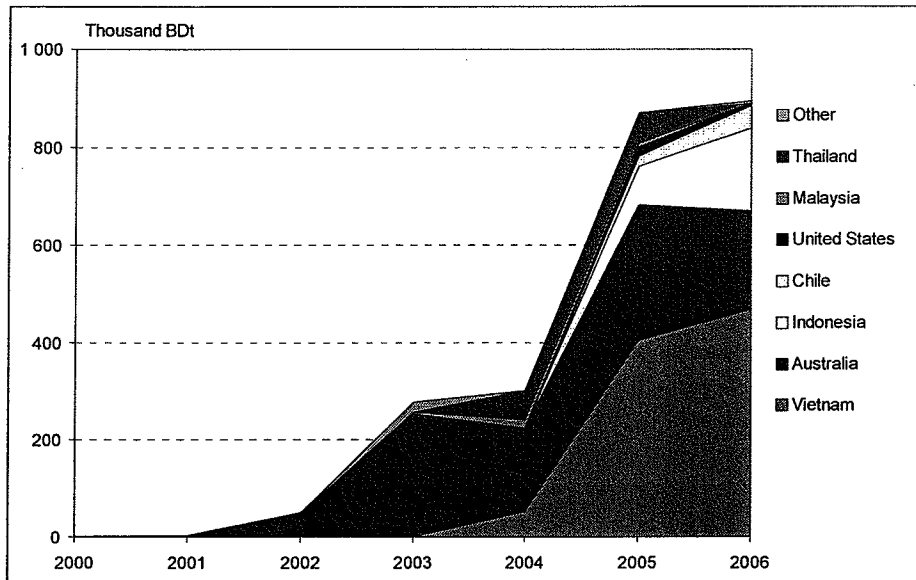
1.4.3   Other Wood Products

The development of China's other major wood products imports, excluding logs and woodchips, are illustrated and summarised as follows:

- China imported 5.1 million tonnes of paper and paperboard products in 2006. Imports started declining from the late 1990s because of increased domestic production.

- China's wood pulp imports on the other hand have continued to increase, meeting the growing demand from newly installed paper machines. China imported 7.5 million tonnes of pulp in 2006.

- China's lumber imports totalled 6.1 million m^3 in 2006, having increased considerably at 21%/a over the last decade. The proportion of hardwood was 65% in 2006, down from 82% in 1995.

- China's reconstituted panel imports peaked in 2003 and have been declining since. This is a direct reflection of the country's rapidly and significantly increasing wood-based panel production.

- China has recently become a notable plywood exporter primarily targeting the US and the Japanese markets. Consequently, the import volume has been insignificant and declining in the latest years.

Figure 1-7:
China Selected Wood Products Import
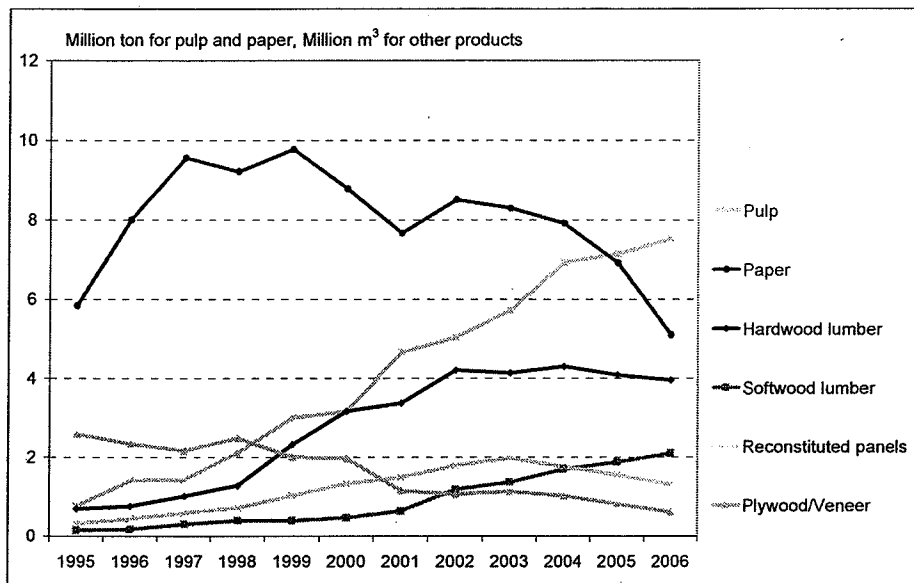
2 **OVERVIEW OF FOREST PRODUCT INDUSTRIES**

2.1 **Pulp and Paper**

In parallel to the strong economic growth, it is forecast that paper demand in China will increase from 59 million tonnes in 2005 to 107 million tonnes by 2020 and that paper production in China will increase from 56 million tonnes in 2005 to 101 million tonnes by 2020.

The Chinese pulp and paper industry has historically suffered from a lack of wood resource. The utilisation of wood in the production of pulp has remained low and non-wood pulps have played a sizable role in the industry. For the past decade, however, a sharp increase in wood pulp demand has been observed. The share of wood pulp within the total consumption of papermaking fibres in China has grown from 16% in 1990 to over 20% in 2005.

By type of furnish composition in papermaking, as illustrated in Figure 2-1, the highest growth is expected to occur in bleached hardwood kraft pulp (BHKP) demand over the next fifteen years at 6.6%/a.

To date, the growing demand for wood pulp has been largely met through imports. The contribution of imports in China's wood pulp supply has risen from 25% in 1990 to 67% in 2005. China's domestic pulp industry manufactured 4.2 million tonnes of wood pulp in 2005, including 1.6 million tonnes of BHKP and 1.0 million tonnes of mechanical pulp that partly consumed hardwood pulpwood.

As illustrated in Figure 2-2, by 2020 the domestic pulp industry is expected to be contributing about 12 million tonnes of wood pulp, including 6 million tonnes of BHKP and 4 million tonnes of mechanical pulp. This expansion in domestic pulp capacity will largely be based on hardwood fibre.

⊝ PÖYRY

Figure 2-1:
Outlook for Papermaking Pulp Consumption in China
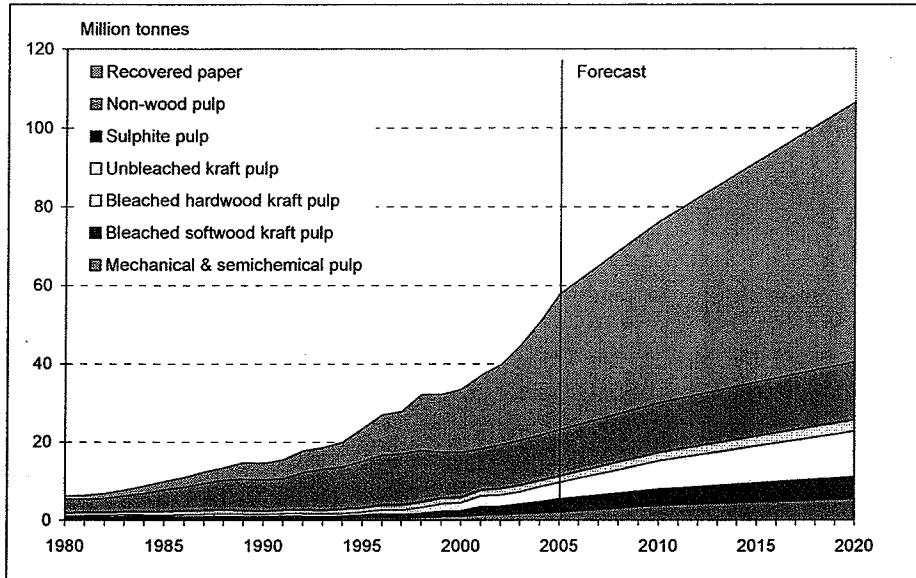
Figure 2-2:
China Wood Pulp Production Development
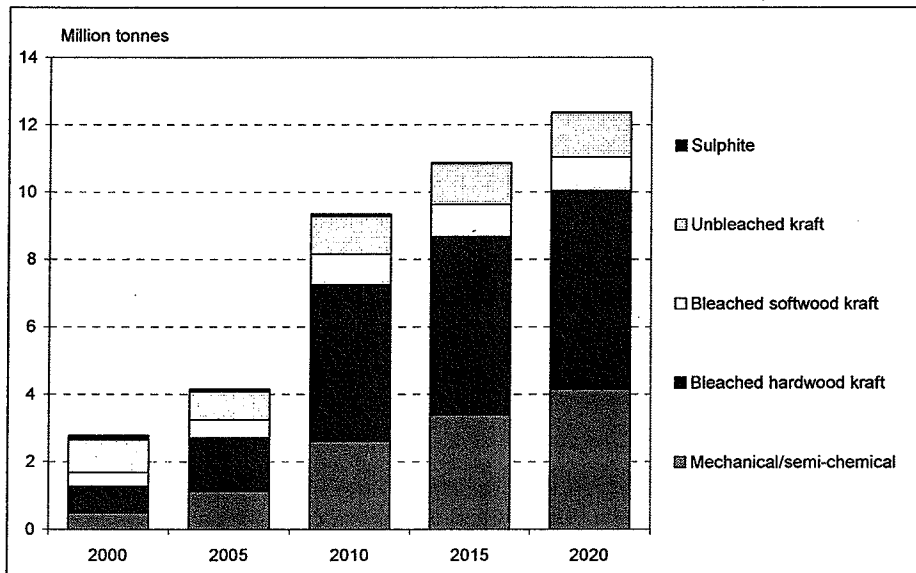
Given that China is short of wood resources and that domestic pulping capacity is planned to grow significantly during the next decade, the Government launched a special programme called the Integration Project of Forest and Paper for the period 2001-2010. The project aims to provide incentives for paper companies to make new plantation and pulpmill investments.

According to the plantation scheme, over 3.6 million ha of pulpwood plantations are expected to be established by 2010. However, while the central government has set ambitious targets for increasing the area and quality of fast growing plantations (including the promise to financially assist approved schemes), bureaucratic,

financial and practical issues have to date stalled many of these initiatives. In addition, it is possible that the pulp makers may make strategic decisions to develop plantation forests and chipping facilities in other countries, and import woodchips into their pulpmills in China, should it be considered more convenient and economical.

The Chinese paper industry will strike a balance between wood, non-wood and recycled materials on the one hand, and domestic and imported fibre on the other. The plans for establishing domestic, world-scale pulpmills have attracted considerable interest, despite the uncertainties relating to the availability and cost of domestic wood for the planned new capacity. The development of pulpmills in Southern China will certainly accelerate plantation development in the country, but part of this new pulping capacity may need to be based on imported wood.

2.2   Wood-based Panels

Only a few years after becoming the largest producer and consumer of wood-based panels in the Asia-Pacific region in the late 1990s, China is now the largest wood-based panel producer and the second largest consumer in the world. The Chinese wood-based panel sector has developed rapidly following a similar trend to the paper industry. The period of strongest growth occurred during the early 2000s and the industry is forecast to continue growing steadily.

Figure 2-3:
Wood-based Panel Production in China
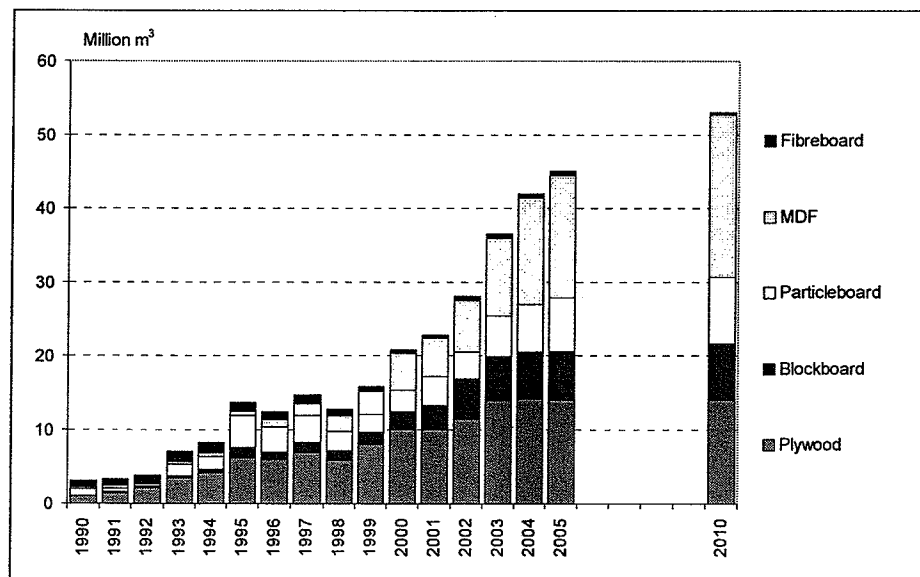
During the 1990s, the Government's investment in the forestry industry was mainly focused in the panel industry. Foreign capital, advanced technology and modern equipment have also contributed to the increased production capacity and new products, such as MDF. As the technology and materials for surfacing improved, panel end-uses increased dramatically in the 1990s.

Wood-based panel production in China has increased substantially at an average growth rate of 13%/a over the last decade. Production exceeded 45 million m^3 in 2005 and is forecast to reach 53 million m^3 by 2010. The future increase is primarily generated from growth in reconstituted panel products, including MDF at 5.8%/a and particleboard at 4.6%/a during the rest of this decade.

MDF has indeed been the most significant contributor to the growth in China's wood-based panel production and represented 37% of the total in 2005, while particleboard, another expanding sector, accounted for 16%.

Plywood has traditionally been the most consumed wood-based panel type in Asia in a variety of end-use applications. Production of plywood in China has however been relatively static in recent years due to product substitution threats from reconstituted panels, as well as shortages of quality peeler logs.

End-users of MDF in China are mainly manufacturers of furniture/interior-decoration and laminated flooring. The main demand drivers include strong economic growth, improving living standards and lifestyle changes, expansion of the furniture and interior decoration industries and developments in the construction industry.

Particleboard is primarily used in the production of furniture, particularly kitchen and office furniture. To date, particleboard applications in construction end-uses have been limited because of the current dominance of plywood. However, some particleboard is used in partitions and sheathing applications where it provides a cost effective solution.

2.3   Sawmilling

China's sawmilling industry has undergone transitions since 1998 caused by efforts to protect national forests and an increased awareness of environmental problems in the country. The impact of the Natural Forest Protection Program's logging ban has been realised. China faces significant shortages in domestically produced sawlogs, and relies heavily on imported sawlogs for the production of domestic sawn timber.

Small to medium sized producers continue to dominate the sawn timber industry. There are a vast number of non-industrialised workshop operations across China. More recently, as log importing has increased, many individuals operating simple saw and carriage sawnwood businesses have located around major log import ports or cities such as Suifenhe in Heilongjiang, Zhangjiagang in Jiangsu, and Jiaxing in Zhejiang.

Given the very fragmented nature of China's sawmilling industry, the assessment of national production and consumption is challenging. Pöyry estimates that China produced some 30-31 million m^3 and consumed 35-36 million m^3 of sawn timber in 2005, having increased at an annual average of 2.4%/a and 3.9%/a respectively. The sharp and steady growth from 2000 till now has been significant.

⟲ PÖYRY

It is forecast that demand will continue to grow at a more modest rate but production will remain relatively static during the rest of this decade. Thus, an increase in the quantity of imported lumber products is expected.

Figure 2-4:
Lumber Production and Consumption in China
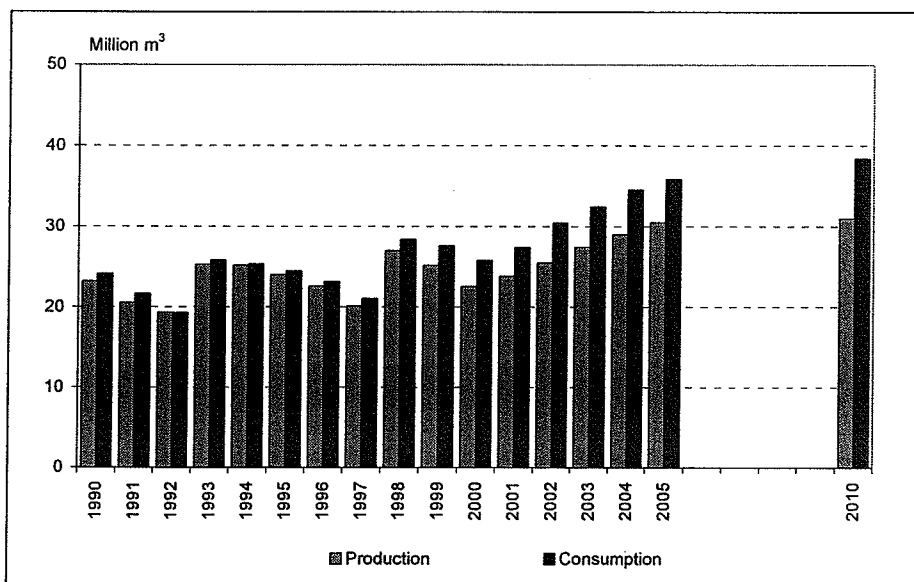
China's main use for sawnwood is in the packaging and temporary construction segments. The Chinese government is currently undertaking initiatives that will result in housing and building increases of around 200 million m²/a. Temporary construction mainly uses local softwood lumber for concrete formwork, scaffolding, floor underlay and other urban construction activities. In rural areas, lumber is often used as beams and rafters for buildings. Although China's use of timber in construction has been declining because of substitution for concrete and steel, it is still a major consumer of solid wood-based products.

The interior decoration, flooring and furniture segments account for around 47% of the total lumber consumed in China. Interior decoration includes products such as solid wood and 3-ply parquet flooring, doors, window frames and mouldings.

2.4   Woodchip Export

China has traditionally been a major hardwood woodchip exporter supplying into neighbouring countries such as Japan, South Korea and Taiwan. However, the export quantity has declined notably in recent years, due to increased domestic demand. In contrast, woodchip imports into China have increased sharply.

As the domestic wood pulp making capacity is expected to grow at a substantial rate over the next decade, China's woodchip exports are forecast to continue declining. The net result will be the country becoming a more significant net importer of woodchips in the short to medium term.

⊙ PŐYRY

Chipping operations in China have been small to medium scale and run by Forest Bureau offshoots and private companies. With the decline in volumes many are now operating at well below capacity. Hardwood woodchips almost entirely represents the country's total woodchip exports. Figure 2-5 presents the Chinese hardwood woodchip exports volume by dispatch port.

Figure 2-5:
China Hardwood Woodchip Export by Port
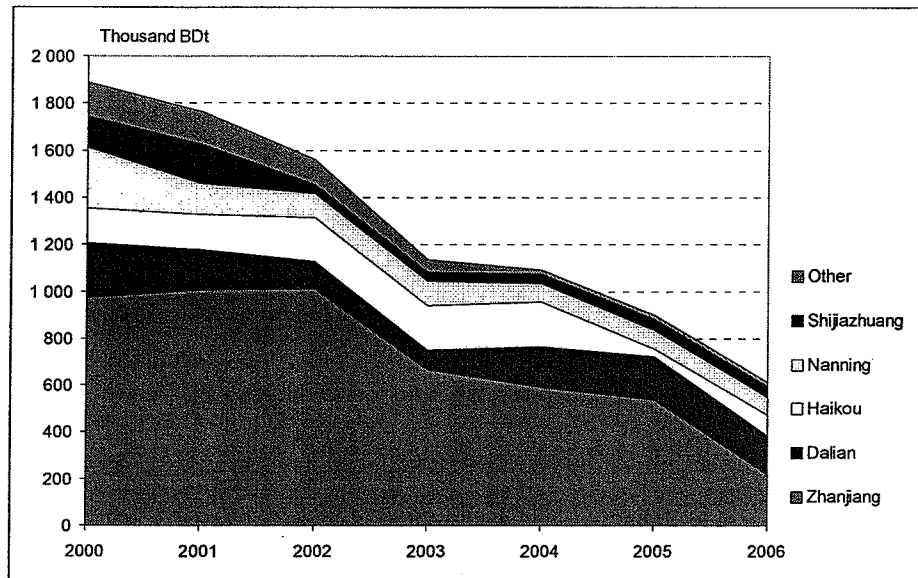
3   OVERVIEW OF FOREST PRODUCT PRICES

3.1   Roundwood Logs

Log prices in China differ greatly depending on regions, species and size. Log sales are either conducted by direct negotiation between seller and buyer or through large central log wholesale markets.

Average log prices for wholesale markets in Shanghai, Guangzhou and Fuzhou for red pine, larch, Chinese fir and Masson pine are shown in Figure 3-1. In 2006, prices for red pine and radiata pine have increased significantly.

Domestic log prices are broadly in line with the imported sawlog prices trend.

Since 2003, prices of larch and pine logs imported from Russia have increased at an average rate of 14.6%/a and 9.8%/a respectively, while prices of radiata pine from New Zealand have also increased dramatically over the same period at 16.7%/a. The main reason for the increase is increased freight and transportation costs with rising oil prices over this time. Also, deforestation of the economically accessible forest locations in Russia has forced logging operations to move to more remote locations, resulting in higher production costs.

Imported softwood log prices have increased over the past four years.

PÖYRY

Figure 3-1:
Nominal Historical Log Prices in China

Figure 3-2:
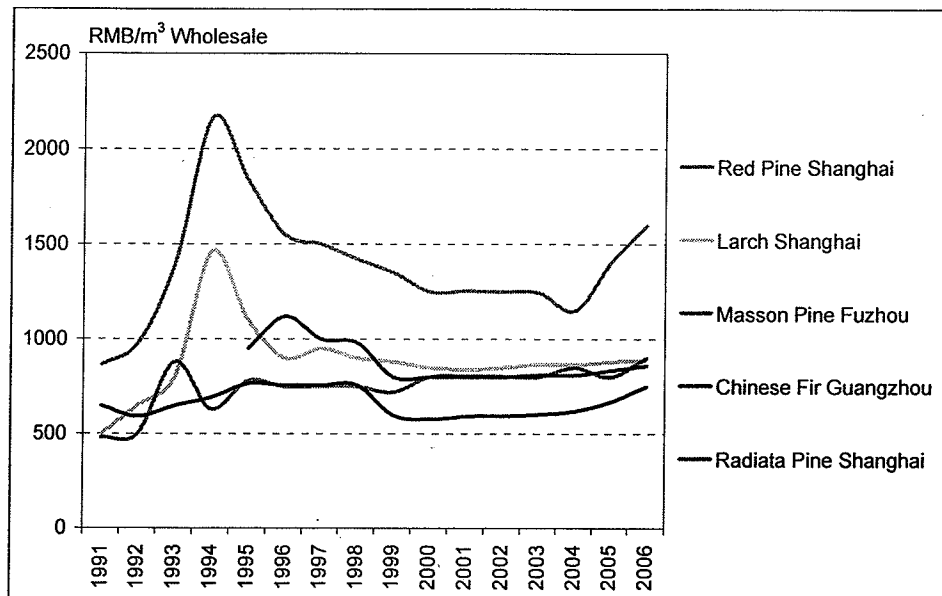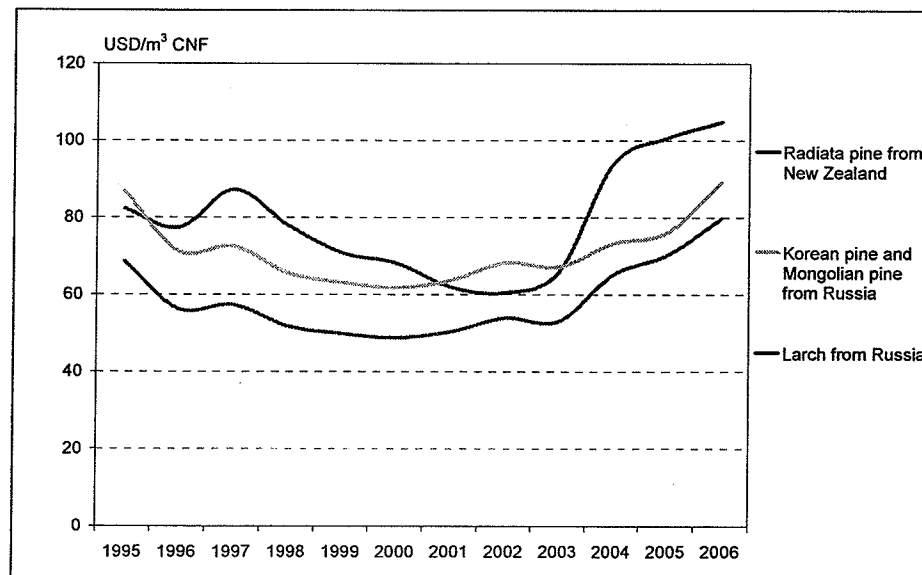**China Imported Softwood Log Prices**


3.2   **Sawn Timber**

Softwood sawn timber prices remained relatively static in China prior to 2003 but increased at an average rate of 14.3%/a. during 2003 and 2005, reflecting increases in log prices.

The greatest influences on the sawn timber prices have been rapid increases in domestic transportation costs as well as increased log prices. For example, red pine sawn timber prices in Harbin have remained relatively stable compared to the

⊜ PÖYRY

dramatic increase in Beijing prices. The same trend emerged for larch prices in Harbin and Guangdong. This implies that increased transportation costs caused the prices of sawn timber from Russian imported logs to rise more dramatically in South Eastern China than in Northern China.

Figure 3-3:
Sawn Timber Prices in China
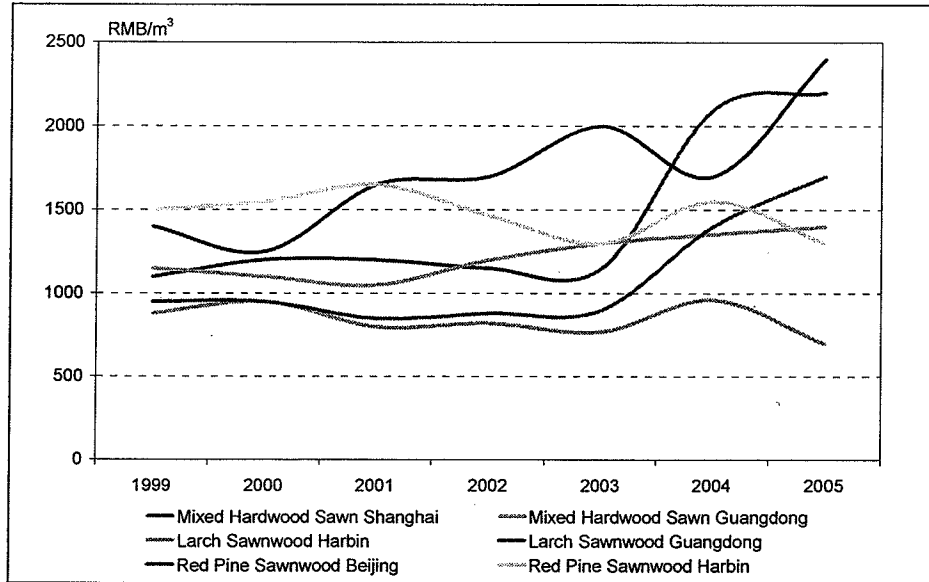
3.3   **MDF and Particleboard**

MDF prices in the region show a wide range, dependent largely on surface quality and suitability of overlay. China's average price for 12mm board is about USD170/m^3, and for 3mm is about USD336/m^3. Quality premiums of up to USD15/m^3 can apply for higher quality MDF. Even though MDF quality has increased considerably in China over the past ten years, price levels for MDF have been under pressure because of strong competition.

China's MDF prices have moved towards import price parity following trade deregulations in the mid 1990s.

In recent years, MDF prices in the region have increased slightly by 6%/a. on average since 2003. Recent increases in MDF prices have resulted from rising production costs, particularly increased costs of raw material, as well as from surplus demand for MDF.

Wood based panels pricing in Asia has also been greatly influenced by developments in the regional and global plywood industry. It is expected that the dynamics in the wood based panels market in Asia will change considerably over the coming years and as a result so will pricing.

The cost of MDF production has increased dramatically over the past three years. During the period from 2002 to 2005, the average market price for MDF has

⊙ **PÖYRY**

Appendix 2

increased from USD195/m³ to USD213/m³ while the cost of production has almost doubled from USD95/m³ to USD183/m³. During the past three years, the production capacity of the MDF industry has increased significantly, leading to an oversupply issue. These factors have combined to reduce the profit margin of MDF producers, resulting in intense competition.

Figure 3-4:
MDF Prices in China
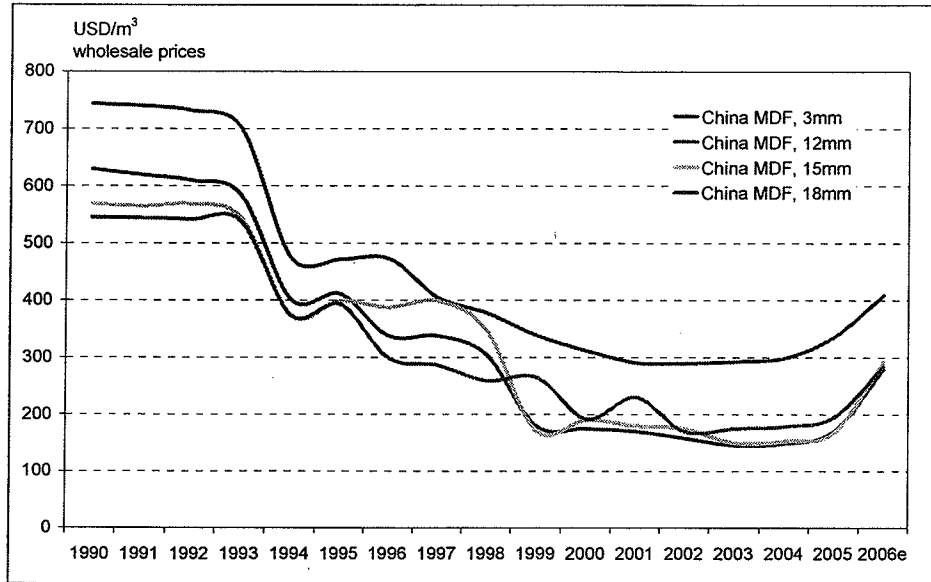
China's particleboard demand was in a negative trend from 1995 to 1999, driven primarily by substitution threats from MDF in several end-use applications. This has impacted on the level of particleboard prices during the period, declining from USD152/m³ level in 1995 to USD122/m³ level in 1999.

Demand has bounced back, however, particularly in the last four years as overall wood panel demand in China has continued to expand and the cost competitiveness of particleboard has again been recognised. Particleboard prices have recovered in the last four years at an average rate of 3.3%/a.

Due to quality differences between regions, a wide range of particleboard prices exist in China. Although the recent trend in the market is substitution of particleboard with MDF products, the market's price sensitivity supports particleboard's advantage over MDF.

PÖYRY

Figure 3-5:
Particleboard Prices in China
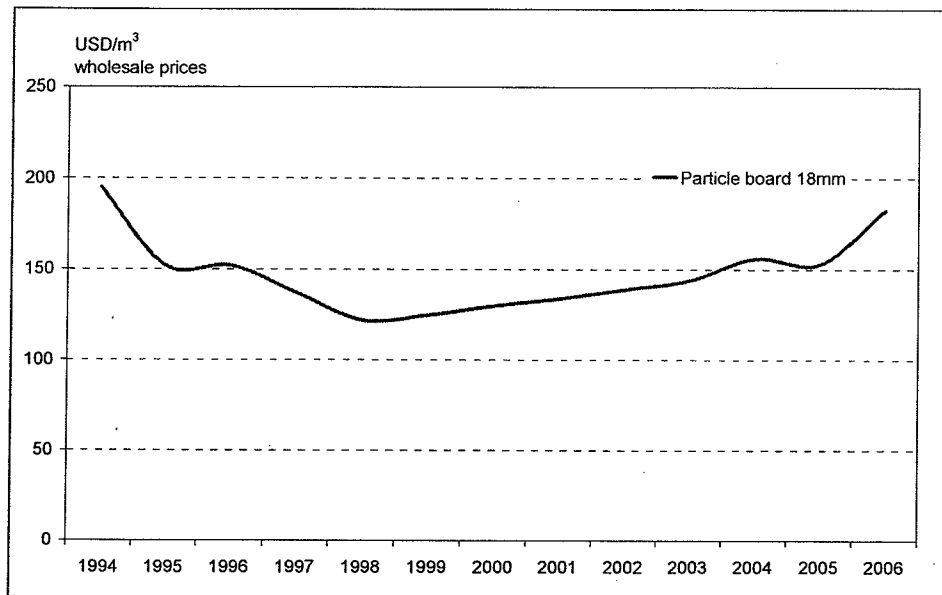
3.4   **Log Price Outlook**

Price forecasts are made using a combination of formal modelling techniques and informed judgement. Many factors affect prices, including the demand and supply balance, exchange rates, pulp prices, financial positions of buyers and sellers, price relativities between woodchips from different sources, and production costs.

China's macroeconomics and wood consuming industries growth outlook suggests that future demand for wood products in the next five years will continue to expand. The boost in wood product demand will enlarge the fibre supply and demand gap and hence is expected to have a positive impact on log price development.

Domestic roundwood removals are under a quota of 248 million m³/a from 2006 till 2010. Although this is an increase of 25 million m³/a compared to the previous five-year quota, the slight increase will not be sufficient to meet growing sawlog demand. Growth of imported industrial roundwood logs is anticipated to be positive to meet the greater need for wood fibre but at a slower rate than this decade. Regulations on harvest levels among the South East Asian suppliers will suppress the amount of the tropical logs available in the next five years.

Russian imported logs production costs are expected to increase as logging locations shift to more distant forests. Also, various measures and regulations on sustainable forestry in the tropical forest supplying countries will cause increases in costs of production in the Southeast Asia countries. These influences will likely result in sawlog price growth which will in turn put upward pressure on domestic sawlog prices.

Whereas the price outlook for sawlogs is positive, the outlook for pulplog prices looks flat or only modestly increasing.

⊙ PÖYRY

Demand for pulpwood is likely to increase in the next five years as a number of large mill development plans are implemented, putting upward pressure on pulplog prices. However, internationalised pulplog and chip prices, and low imported pulplog/woodchip prices such as from Southeast Asian suppliers, will offset the opportunity for domestic pulplog price increases.

The following table summarises factors influencing log prices over the next five years.

Table 3-1:
Log Prices Outlook

Factors	Outlook	Influence on Log Prices	+/-
Domestic Supply	Domestic fibre supply is likely to be steady over the next five years as the harvesting quota allows only 248 million m³ of log to be harvested per year.	Quota on domestic log supply will set upward pressure on log prices.	+
Domestic Demand	Demand for pulplog is likely to increase in the next five years with large mill development plans. Strong growth in construction and furniture industries will increase fibre demand.	Solid lumber and pulpwood demand will sustain log prices.	+
Cost of Production	Transport cost is likely to increase in the medium term as oil prices are expected to increase.	Increase in cost production is likely to influence log prices to rise marginally.	+
Imported Log Prices Imported Log Prices	Russian log prices are expected to increase as its governmental policy on export tax on softwood logs is likely to affect the volume and the cost of its export logs.	Increased imported Russian log prices will set upward pressure on domestic log prices as well as overall log price levels.	+
	Hardwood log prices are expected to rise in the next five years as tropical hardwood supply is declining.	Imported hardwood log price increases will influence overall log prices in China to rise over the next five years.	+
Wood Paying Capability of Wood Processing Industries	Strong competition in the wood processing industries will limit the wood paying capability of consuming industries.	Strong competition in the wood processing industries will reduce the consuming industries' profitability/margin, which will set downward pressure on log prices.	-
	Technological developments in engineered and reconstituted wood products will allow less volume of wood materials to produce end products.	Technological developments will limit significant real price growth for solid wood lumber products.	-