Pension-Fund Investment in Forestry

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Note: Unless otherwise stated, all currency amounts are given in US Dollars.
Executive Summary and Recommendations

A forestry investment\(^1\) can include land suitable for growing trees, the trees themselves, or both. The trees can be part of a natural forest or one that has been established artificially by seeding or planting. Natural forest management typically has lower operating costs than plantation forests, but also a lower growth rate. Plantation forests are typically, but not always monocultures.

Forestry has long provided opportunities for institutional investors – but the scope for this investment remains limited. The first institutional investment in timberland apparently took place in 1288 when King Magnus III of Sweden granted the Bishop of Västerås a 12.5 percent interest in a mine and the surrounding land that become the foundational assets for StoraEnso centuries later. The Church of Sweden remains a major forestland owner. In the modern era, forestry investment began about 50 years ago. Interest in this asset class started with pension plans, and then spread among different kinds of investors and across geographies. Institutional forestry investors now include pension plans, banks, insurance companies, endowments, foundations, and large family offices.\(^2\) Forestry investment started in the Southern United States (US) and has expanded to all regions of the US, and to Oceania, Europe, Latin America, Asia, and a few parts of Africa. This class of investment is still surprisingly limited in scope: despite this long history, total institutional investment globally likely does not exceed $100 billion, a tiny figure in comparison with, for example, the $4 trillion invested in private equity (McKinsey, 2020). Equally surprising is that almost all of this investment has come from institutions in OECD countries.

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1. This report uses the terms “forestry” and “timberland” synonymously although some practitioners might see “timberland” as representing only the commercial harvesting of trees with “forestry” including a broader array of values.
2. This paper focuses on pension plan investment in forestry, but most of the discussion and recommendations can also be applied to other institutional investors, including endowments, sovereign wealth funds or insurance companies.
BOX 1 - History of Institutional Investment in Forestry

The modern era of timberland investment began in the 1970s, with structural changes in the integrated forest products industry (Binkley, Raper, and Washburn, 1996). Securities analysts calculated the value of the timberland held on the balance sheets of integrated companies, and were astonished at the low returns it was generating. This was partly due to the nature of generally accepted accounting practices (GAAP) at the time, according to which securities regulations required publicly traded companies to report their financials. Under these rules, forests were written down as timber was harvested, but not written up as trees grew back. In part, poor returns were due to inefficient manufacturing facilities propped up by low-cost timber purchased years before.

Integrated forest products companies found great comfort in owning timberland. Owning land and trees simplified their wood procurement, and provided a solid asset for loan security. Despite this, the investment community forced companies to disinvest. Private equity investors successfully launched hostile takeovers and dismembered integrated companies, selling the manufacturing facilities and the timberland separately.

Pension plans were logical owners for the timberland. High inflation demonstrated the benefits of portfolio diversification out of bonds, and legislation recognized the benefits of diversification. Unlike integrated companies that valued forests under GAAP, pension plans recognized value in terms of total returns—cash flow plus change in asset value. Unlike GAAP net income measures, cash flow was not diminished by depletion, and increases in asset values as forest grew could be recognized on pension plan balance sheets. These differences in valuation metrics made for a natural arbitrage between integrated companies and institutions. The integrated companies that escaped the direct attention of the take-over artists saw the writing on the wall and sold their timberland. This started in the United States but has spread to the rest of the world where, for example, StoraEnso spun out its timberland in Finland and Sweden.

By 2006 the process, at least in developed countries, was more or less complete. The signal event was the sale of International Paper (IP), once the largest timberland owner in the world, of nearly all its timberland. That company’s ownership of timberland started in the late 19th century. By the time IP exited timberland, virtually all timberland owned by publicly-traded forest products companies had moved into institutional ownership. The only exceptions were companies that had converted to tax-efficient investment structures.

Once this industrial restructuring was complete, the valuation arbitrage disappeared. Because there is virtually no development as there is in commercial real estate, timberland now trades among forestry investors who use the same valuation metrics and have access to the same information. Timberland asset markets have thus become more efficient.

Improved market efficiency has led to new developments in forestry investment. Governments in both Australia and New Zealand have privatized exotic planation estates, selling them to institutional investors. Forestry investors have pursued acquisitions in new geographies with fewer established players. First among these was Latin America, where the integrated forest sector model is beginning to crack; institutions now have small allocations in a wide range of countries, including those in Eastern Europe, developing Asia and Africa.

A key benefit of improved market efficiency is that timberland asset markets have become more liquid. It is not uncommon to see timberland properties valued at tens or hundreds of million dollars sold in a period of a few months. Currently, more than 20 forest investment managers and many direct institutional investors are seeking acquisitions. Sellers understand that buyers need up-to-date inventory information, and frequently provide this as part of the sales packages. Properties are marked-to-market at least annually, so both buyers and sellers have a good sense of market valuations. And exit liquidity is no longer a concern as it was in the early years of timberland investment.
Forestry investment can offer financial and environmental, social, and governance (ESG) benefits. Historically, risk-adjusted returns have been favorable (though the lack of data outside the US should be noted), although they have declined over time. Forestry investment provides both diversification within a portfolio and an inflation hedge. Forestry is a truly long-term investment, able to provide both cashflow and duration matching. The sector is governed by internationally accepted, longstanding third-party certification standards, which have largely been effective at mitigating negative social and environmental impacts of projects (Cashore, et. al., 2004). As payments for ecosystem services markets develop, particularly for carbon, they offer the potential for new income streams for forestry investments.

However, challenges to investing in forestry are significant – particularly in emerging markets, which is also where reforestation, afforestation, and sustainable forest management is most needed. Forestry is a complex, specialist asset class which requires expert management to navigate. The lack of data, stemming partly from valuation uncertainty, deepens investors' concerns around natural disasters such as fires, and reputations risks resulting from negative social and environmental impacts. Despite the potential opportunities, foundational challenges remain to investing in emerging markets where enabling conditions, (including land rights and infrastructure allowing access to markets, are frequently lacking.

Currently, there is a lack of both knowledge about and interest in the forestry asset class. This report addresses this by detailing the nature of forestry investments, explores the case for investing in forestry, explains the mechanics of forestry investments, and highlights some of the challenges. Pension fund trustees, managers, and regulators should find it particularly useful.

Various measures are available to policy makers and the pension-fund industry to enhance the opportunities for pension plan investment in forestry. The report recommends steps which can be taken to encourage more investment in forestry. Some of these (e.g. infrastructure and supply chain investments) can be seen as ‘foundational’ issues or enabling conditions, which are beyond the specific scope of the forestry sector, but need be addressed for any timber market—or markets for rural products in general—to develop. Others fall within the purview of the pension sector, as a supportive regulatory framework and capacity is needed for pension plans to take advantage of forest investment opportunities.
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<th><strong>TABLE 1 - Summary of Challenges and Recommendations</strong></th>
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<td><strong>PENSION MARKET CHALLENGES AND RECOMMENDATIONS</strong></td>
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<tr>
<td><strong>Regulatory hurdles</strong></td>
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<tr>
<td>Pension plan regulators can ensure that regulations do not unduly restrict investments in forestry.</td>
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<td><strong>Lack of knowledge – particularly by domestic EM investors</strong></td>
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<tr>
<td>Pension plans in emerging and frontier market countries that have no experience in forestry investment can partner with pension plans from OECD countries that do. These partnerships can help to mitigate risk for both institutions.</td>
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<tr>
<td><strong>FOREST SECTOR CHALLENGES AND RECOMMENDATIONS</strong></td>
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<tr>
<td><strong>Lack of historical data</strong></td>
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<tr>
<td>National governments, international research agencies, and local universities can provide basic forestry information—suitable species, management regimes, growth rates, and market information.</td>
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<tr>
<td><strong>Complex asset class</strong></td>
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<tr>
<td>National and local governments can ensure that forestry regulations do not unduly restrict forest management and harvest activities, especially in circumstances where managers subscribe to internationally recognized third-party ESG certification. Forest regulations should be well defined, enforced transparently and applied equally to domestic and international owners.</td>
</tr>
<tr>
<td><strong>Fear of natural disasters &amp; reputational risk</strong></td>
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<tr>
<td>Industry associations and international forestry organizations can provide data on the risks of natural disasters and promote and explain E&amp;S certifications and standards.</td>
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<tr>
<td><strong>Lack of investment opportunities</strong></td>
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<tr>
<td>Bonn Challenge pledges provide an enabling environment for pension plan investments in forestry. National governments and international development organizations can provide direct planting subsidies. Such subsidies might be directed towards specific regions or land types, and could be provided for a specified, limited period of time. Development organizations and program-related investments from foundations can provide low-cost debt to targeted reforestation, afforestation, or forest management improvement projects. Governments, with assistance from development organizations, can develop payments for ecosystem services (PES) markets for carbon, water, and biodiversity benefits, using international standards and tapping into global programs.</td>
</tr>
<tr>
<td><strong>EMERGING MARKET FOUNDATIONAL/ENABLING CONDITION CHALLENGES AND RECOMMENDATIONS</strong></td>
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<tr>
<td><strong>Land rights</strong></td>
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<tr>
<td>Governments can ensure that land-tenure arrangements are favorable to pension-plan investments, while protecting the rights of local peoples.</td>
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<tr>
<td><strong>Lack of infrastructure/access to markets</strong></td>
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<tr>
<td>Development organizations can support, and governments can build forestry-specific infrastructure investments (including roads, bridges, and ports), with due environmental and social considerations. Much of such infrastructure would benefit rural development more generally. Development organizations and governments can support supply-chain investments that ensure trees can be harvested, transported, and processed.</td>
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<tr>
<td><strong>Country/foreign exchange risk</strong></td>
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<tr>
<td>Banks and development organizations can provide financial mechanisms to reduce country and currency risk.</td>
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The development of PES markets is particularly important for the scaling up of forest-based natural climate solutions. Several global and national studies suggest that forestry investments on a large scale could play an important role in keeping global warming to less than 2°C. Both theoretical and empirical evidence suggest that payments for carbon sequestration in the range of USD 10/tonne CO2-e to USD 100/t (the estimated social cost of emissions) would dramatically improve the economics of forestry investments, and the resulting management practices of forestry investors. Such investments could offer the triple benefits of attractive returns for pension plans; climate change mitigation; and positive outcomes for rural development and local environmental quality enhancement.

The report concludes that the time is right to support broader involvement by pension plans in forestry investments globally. This results from a combination of factors, including national forest restoration pledges, the potential for carbon market growth, and growing interest in ESG and impact investing from pension plans. While challenges remain to the expansion of forestry as an investible asset class, shortcomings could be addressed through capacity building and partnerships between experienced, international pension plans and their domestic counterparts in emerging markets. Based on sufficiently supportive country and market enabling conditions, forest restoration pledges, and the size of domestic pension assets, several countries are suggested as offering potential investment opportunities for international and domestic investors to explore (Figure 1.)

The structure of the report is as follows: Section 1 introduces the topic. Section 2 looks at why pension plans invest in the forestry sector; Section 3 explores the reasons they do not. Section 4 addresses what makes emerging markets attractive; this is followed by an examination of potential hurdles in Section 5. Section 6 concludes with recommendations for how to support further pension plan investment in the asset class. Appendix I to the report provides step-by-step guidance on how a pension plan can develop a forestry investment program.

Heatmap based on an average of scores in the following areas: size of Bonn Challenge Pledge (forest landscape restoration pledge), domestic pension assets as a percentage of GDP, Doing Business 2020 score, and Worldwide Governance Indicators scores (of political stability, government effectiveness, regulatory quality, rule of law, and control of corruption).
### Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AIG</td>
<td>American International Group</td>
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<tr>
<td>APM</td>
<td>Arbitrage Pricing Model</td>
</tr>
<tr>
<td>AUS</td>
<td>Australia</td>
</tr>
<tr>
<td>BNDES</td>
<td>The Brazilian National Bank for Economic and Social Development</td>
</tr>
<tr>
<td>bps</td>
<td>Basis points (one one-hundredth of a percent)</td>
</tr>
<tr>
<td>BRL</td>
<td>Brazilian real</td>
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<tr>
<td>CAPM</td>
<td>Capital Asset Pricing Model</td>
</tr>
<tr>
<td>CDM</td>
<td>Clean Development Mechanism</td>
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<tr>
<td>CFL</td>
<td>Crown forest license</td>
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<tr>
<td>CLT</td>
<td>Cross-laminated timber</td>
</tr>
<tr>
<td>CO2</td>
<td>Carbon Dioxide</td>
</tr>
<tr>
<td>E&amp;S</td>
<td>Environmental and Social</td>
</tr>
<tr>
<td>EBITDDA</td>
<td>Earnings Before Interest, Taxes, Depreciation, Depletion and Amortization</td>
</tr>
<tr>
<td>EIB</td>
<td>European Investment Bank</td>
</tr>
<tr>
<td>EM</td>
<td>Emerging Market</td>
</tr>
<tr>
<td>ESG</td>
<td>Environmental, social, and governance</td>
</tr>
<tr>
<td>EUR</td>
<td>Euro</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign direct investment</td>
</tr>
<tr>
<td>FM</td>
<td>Frontier Market</td>
</tr>
<tr>
<td>FNCS</td>
<td>Forest-based natural climate solutions</td>
</tr>
<tr>
<td>FSC</td>
<td>Forest Stewardship Council</td>
</tr>
<tr>
<td>FX</td>
<td>Foreign exchange</td>
</tr>
<tr>
<td>GAAP</td>
<td>Generally Accepted Accounting Practices</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>GPIF</td>
<td>Government Pension Investment Fund</td>
</tr>
<tr>
<td>GSFF</td>
<td>Global Solidarity Forestry Fund</td>
</tr>
<tr>
<td>GSIA</td>
<td>Global Strategic Investment Alliance</td>
</tr>
<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
</tr>
<tr>
<td>IFRS</td>
<td>International Financial Reporting Standards</td>
</tr>
<tr>
<td>IOPS</td>
<td>International Organization of Pension Supervisors</td>
</tr>
<tr>
<td>IRR</td>
<td>Internal rate of return</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for the Conservation of Nature</td>
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<tr>
<td>IVS</td>
<td>International Valuation Standards</td>
</tr>
<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>KEPFIC</td>
<td>Kenya Pension Fund Investment Consortium</td>
</tr>
<tr>
<td>MiDA</td>
<td>Mobilizing Institutional Investors to Develop Africa’s Infrastructure</td>
</tr>
<tr>
<td>MIGA</td>
<td>Multilateral Investment Guarantee Agency</td>
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<tr>
<td>NCREIF</td>
<td>National Council of Real Estate Investment Fiduciaries</td>
</tr>
<tr>
<td>NCREIF</td>
<td>National Council of Real Estate Investment Fiduciaries</td>
</tr>
<tr>
<td>NDC</td>
<td>Nationally Determined Contribution</td>
</tr>
<tr>
<td>NPV</td>
<td>Net present value</td>
</tr>
<tr>
<td>NZ</td>
<td>New Zealand</td>
</tr>
<tr>
<td>NZSF</td>
<td>New Zealand Superannuation Fund</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Cooperation and Development</td>
</tr>
<tr>
<td>PEFC</td>
<td>Program for Endorsement of Forest Certification</td>
</tr>
<tr>
<td>PES</td>
<td>Payments for ecosystem services</td>
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<tr>
<td>PRI</td>
<td>Program related investment</td>
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<tr>
<td>PV</td>
<td>Photo voltaic</td>
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<tr>
<td>REIT</td>
<td>Real Estate Investment Trust</td>
</tr>
<tr>
<td>SPV</td>
<td>Special Purpose Vehicle</td>
</tr>
<tr>
<td>TIMOs</td>
<td>Timberland investment management organizations</td>
</tr>
<tr>
<td>TPI</td>
<td>Timberland Property Index</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>USD</td>
<td>US Dollars</td>
</tr>
<tr>
<td>USDA</td>
<td>US Department of Agriculture</td>
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<tr>
<td>USPAP</td>
<td>Uniform Standards for Professional Appraisal Practice</td>
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</tbody>
</table>
Introduction

Investments in sustainably managed forests can support rural economic livelihoods, produce multiple environmental benefits, and create attractive risk-adjusted returns for investors. Most forests have relatively long production periods, which can provide for investments of long financial duration. As a result, forestry investments can be attractive to pension plans, which have long-dated liabilities and social and environmental objectives, along with their financial obligations. Despite these generally favorable characteristics, pension plan investment in forestry has mostly been limited to OECD countries. These include the United States, Canada, Australia, New Zealand, and several countries in Europe.

This report seeks to explain forestry investments. What are they? Why are they attractive to pension plans? What limits forestry investment? These questions are addressed in the report with specific reference to emerging and frontier markets, highlighting the opportunities for forests to serve as forest-based natural climate solutions (FNCS).

A forestry investment can include land suitable for growing trees, the trees themselves, or both. The trees can be part of a natural forest, or one that has been established artificially by seeding or planting. Within the category of natural forests, a distinction is usually drawn between primary forests and secondary forests. Primary forests have never been logged. Virtually no pension-fund investment occurs in primary forests due to their ecological value, distance from markets, and the often difficult operating conditions they present. Secondary forests, which have been logged, typically develop characteristics of primary forests as they age. If secondary forests become old enough to reflect deep similarities to primary forests, pension plans once again do not typically invest in them, or if they do, these forests are usually designated as conservation areas. Management of natural forests typically has lower operating costs than management of plantations, but natural forests also generally have lower growth rates. Similarly, the potential positive and negative social and environmental impacts vary according to the type of forest.

4. Sustainable forest management aims to maintain and enhance the economic, social, and environmental value of all types of forests, for the benefit of present and future generations. It is characterized by seven elements: (i) extent of forest resources; (ii) forest biological diversity; (iii) forest health and vitality; (iv) productive functions of forest resources; (v) protective functions of forest resources; (vi) socio-economic functions of forests; and (vii) legal, policy and institutional framework (UN 2008, Resolution 62/98).

5. This report uses the terms ‘forestry’ and ‘timberland’ synonymously although some practitioners might see ‘timberland’ as representing only the commercial harvesting of trees with ‘forestry’ including a broader array of values.
Historically, most pension plan investment has been in plantation forests. Plantation forests are typically, but not always monocultures. The species they comprise might be native to the area (e.g. Douglas-fir plantations in the US Pacific Northwest) or exotic, such as Douglas-fir in New Zealand and eucalyptus in Brazil. Plantation forests might be managed for a single product going to a single end-user (e.g. eucalyptus pulpwood plantations in Brazil grown on a six-year rotation) or multiple products going to multiple users. For example, pine plantations in the US South may produce pulpwood for several pulp, pellet or oriented strand board facilities; small sawlogs may go to specialized high-throughput sawmills; large sawlogs to plywood mills; and large and straight logs for use as transmission poles. The risks and returns from plantation and natural forests may differ, and few generalizations can be made as so much depends on local circumstances. The potential for social and environmental impact is highly dependent on the baseline when a project begins or when an investment is made. Such impacts are more likely to be positive in instances where degraded forests or agricultural land are the investment targets, but negative where primary forests are.

The ‘four quadrants’ of real estate investments – public and private, debt and equity – may also be applied to forestry investment. Pension plans do invest in publicly traded forestry securities, in various ways. These investments might come out of the private placement of assets, such as the ownership of Suzano by Brazilian pension plans, and of StoraEn-so – and its spinoff companies Tornator and Bergsvikskog – by Swedish and Finnish pension plans. They might be incidental to a larger securities portfolio. There are also index funds covering the forestry sector, such as the S&P500 Global Timber and Forestry Index exchange-traded fund trading under the symbol WOOD, or the actively managed timber fund offered by the Swiss private bank Pictet. While all of these securities involve the processing of wood products, some may not have any exposure to forestry assets at all. The number of ‘pure play’ forestry publicly-traded companies is very small, numbering less than ten and perhaps fewer. These pure-play companies tend to have small market capitalizations and little market liquidity.

In principle it is also possible to invest in forests via debt interests. The corporate debt of publicly traded forest products companies is available, but such debt is generally an obligation of the company as a whole, and is not directly linked to the timberland the company may have. The number of publicly traded forestry asset-backed debt securities is extremely limited. The private debt market is dominated by insurance companies and specialized national agricultural lender, like the Farm Credit system in the US, and BNDES in Brazil. Forest bonds – with returns linked to forest projects rather than corporate debt – have also been issued, including by the IFC7, though the market remains limited (see Box 2).

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6. One of the authors of this report serves on Pictet’s Timber Advisory Board.
7. The forest bond issued by the IFC channels funding to a private sector, REDD project that creates viable alternatives to deforestation. Investors are offered a choice between a cash or carbon-credit coupon. [https://www.ifc.org/wps/wcm/connect/corp_ext_content/ifc_external_corporate_site/about+ifc_new/investor+relations/ir-products/forest_bonds](https://www.ifc.org/wps/wcm/connect/corp_ext_content/ifc_external_corporate_site/about+ifc_new/investor+relations/ir-products/forest_bonds)
Although the green and climate bonds market has been growing rapidly in recent years, the share of agriculture and forestry investments supported by bonds is marginal, amounting to less than 3 percent of all such bonds. This can be explained by several factors. (i) The specific needs of forestry investments do not align well with the financing characteristics of bonds, including green bonds. For example, the time between investment and revenue flow that is characteristic of forestry is regarded as a critical bottleneck — though structures such as zero-coupon bonds could provide a solution, albeit niche. (ii) Forest Bonds have a lower credit rating on average than most green bonds — most are in fact issued with no rating by small issuing entities. (iii) Lower investment volumes, investment scope, spatial and stakeholder heterogeneity, and the lack of secured and immediate income streams are secondary, but equally important, differences that hamper the forest sector from using bonds as a financing tool. (iv) Carbon finance is still an emerging player in forest bond issuances and market prices for carbon credits are still low. Finally, (v) compared with other green bonds, the social returns on forest projects tend to be lower, less immediate and less visible compared with other green projects, particularly in renewable energy.

The stigmatization of productive forest management as a driver of deforestation disadvantages bond investments, due to the perceived reputational risks for the investor. Many countries where the forest sector is important in meeting NDC commitments also have substantial political and economic risks. As a result, these countries have lower credit ratings and higher costs of public debt. These lower credit ratings makes it more difficult to raise resources for public investments, and create a less favorable environment for private investment because private investors prefer low political risk and stable economic performance. This preference is especially relevant for investments in forestry because they are long term and necessarily firmly rooted in the countries where they are made.

To achieve a true breakthrough in bond-based forest finance, it will be necessary for countries and investors to identify and design concrete and bankable solutions that integrate international support into bond structures that achieve both scale and efficiency. Demand-side interventions may be even more promising as an indirect measure to stimulate investments in forestry than an a priori focus on the supply of finance. For example, reforming public procurement favoring sustainably managed forest products, including the use of wood for energy, could increase the demand for wood and attract investors to the sector.

8. Large multinational pulp and paper or wood product companies issue bonds, but do not promote them as green due to labeling and monitoring costs — the latter being particularly cumbersome for the sector.
9. Taken from World Bank (2017), ‘Demystifying Forest Bonds: Assessing the Suitability of Bonds as a Finance Instrument to meet forest-based NDC Targets’
This report focuses on private equity investments in forestry – both direct and via Timberland Investment Management Organizations (TIMOs). Forestry investments involve the direct or indirect ownership of secure rights to land and/or trees, along with the right to sell and harvest trees for monetary gain. 'Direct' ownership means that the pension plan owns a real property interest; 'indirect' refers to the ownership of a security interest in an entity that holds the real property interest. The security interest could be either an exclusive interest in the real property, or a commingled interest in a fund or special-purpose vehicle (SPV) with other investors. Some institutional investors, including pension plans, insurance companies, and university endowments, favor investing either exclusively or with a small 'club' of like-minded investors. This approach requires considerable in-house expertise for effective execution and a reasonable level of diversification, and is thus limited to investors large enough to put $1 billion or more into the asset class. Smaller investors favor working through an investment advisor with specific expertise in timberland. Such managers are commonly called Timberland Investment Management Organizations (TIMOs). There are more than 20 such managers providing services in the US, Europe, Latin America and Australia; only a few serve Africa and Asia. The relationship between a TIMO and an investor might take the form of a separate account, where a portfolio is developed for a single investor, or a commingled fund where the investor's funds are pooled with several others. Appendix 1 discusses the advantages and disadvantages of these approaches.

Sometimes a forestry investment includes both land and trees. This is frequently the case in market economies with strong traditions of private property rights, like the United States and the United Kingdom. However, even in cases where land ownership is possible, a forestry investment might include just the trees (a timber deed) or just the land (a timber lease). And even where the land is bundled with the trees, some land rights may have been alienated, as is commonly the case with mineral rights and sometimes development rights, via conservation easements. Moreover, ownership of the timber does not necessarily imply the right to harvest the trees and sell them. China, for example, requires an investor to obtain separate rights to harvest timber and to transport it. In addition, many governments regulate how, when and where timber can be harvested.

Most countries restrict or altogether prohibit private ownership of forest land. For example, most of the forest land in Canada, Russia, Indonesia, and Malaysia is held by governments. To enable a forestry sector, these governments provide concessions or leases to private entities for the growing and harvesting of trees. New Zealand's Crown Forest Licenses, for example, retain public, and now Maori, ownership of land, while allowing the private ownership of the trees. Brazil prohibits foreign ownership of land, although a multitude of complex investment structures has emerged to provide foreign investors some exposure to the economics of investments in land. A forestry investment via a timber lease could provide the landowner with a fixed annual rent and/or an interest in the financial returns from the timber crop.
BOX 3 - Case Study – The New Zealand Experience

Starting in the 1930s the Government of New Zealand commenced a large afforestation program, with the objective of putting abandoned farmland into productive but less environmentally damaging land use, in this case by establishing plantations of the exotic Pinus radiata. Government ownership and management of these lands continued until the Crown Forest Assets Act of 1989 which established crown forest licenses (CFLs) (https://www.linz.govt.nz/crown-property/types-crown-property/crown-forest-land.) A CFL granted access to the land for a period of 35 years, or the date the trees were harvested, whichever was sooner. The CFLs were auctioned on the basis of a one-time bonus bid along with an annual land rent set at 7 percent of the bare land value. The CFLs permitted the government to achieve three objectives: to sustain progress towards meeting indigenous land claims under the Treaty of Waitangi; to obtain an infusion of cash to help national finances; and to off-load the ongoing management costs to private entities. The CFL program was successful in all these respects: today, New Zealand has a vibrant, world-class forest sector.

One particular CFL is of interest in this discussion, that covering the central North Island (CNI). The CNI estate is among the best plantation estates in the world. It is highly productive, mostly flat and very close to an efficient export facility. A consortium including Fletcher Challenge (then a leading New Zealand forest products company) won the initial auction; their management led to excessive debt and bankruptcy. The receiver ended up selling the CNI asset, trees and CFL, to the Harvard University endowment. Harvard gradually wound down its ownership, and the CNI is now owned by a consortium led by the New Zealand Superannuation Fund, which includes a collection of Canadian pension plans.

The New Zealand Superannuation Fund (NZSF) is a government savings vehicle established to help pre-fund the future cost of the country’s pension system. The fund currently has approximately $25 billion in assets, including an allocation of around 5 percent to timber assets. As a result, it is one of the leading pension plans investing in this asset class globally. Direct investments are made both locally in New Zealand and globally (including in Australia, Asia and Latin America) and are sometimes made along with other investors, such as the Canadian pension plans. Exposure to emerging markets is limited, due partly to political and other country risks (e.g. land titling, and reputation risks around environmental and social factors) and partly to currency exposures. In interviews for this report, the fund indicated that it would see benefits to investing alongside domestic investors with local market knowledge.
While ‘markets’ for ecosystem services are developing, ownership of the land and the trees does not necessarily imply ownership of the multiple ecosystem services provided by sustainably managed forests. The value of water arising from forested watersheds—including the quantity, quality, and timing of delivery—was recognized as being so great that the United States established its extensive system of publicly held national forests to protect that value. Slowly some markets for forest-based ecosystem services are emerging; of particular note are markets for the CO2 that forests sequester. The Kyoto Protocol created the Clean Development Mechanism (CDM) that allowed the sale of credits for carbon sequestered in emerging market countries to offset emissions from developed countries. In the United States, the California emissions trading scheme permits forestry credits to offset industrial emissions outside of the CDM. In contrast, the European Trading System (ETS) only allows forestry offsets certified through the CDM. If the full benefits of forests in sequestering carbon dioxide are to be realized, the market for forest-based carbon credits will have to be developed.10

Some countries have developed significant markets for land conservation. These markets can involve the outright sale of forest land to conservation entities (either public or private), or the sale of conservation easements. Depending on domestic land laws, easement documents can be quite flexible, ranging from simply extinguishing development rights to more elaborate requirements for public access and restrictions on forest management practices. As forest-based ecosystem services become more valuable, private property rights over these services may evolve. If such property rights are appropriately structured, they could provide additional returns for forestry investors.

To date, nearly all the pension-fund investment in forestry comes from OECD countries. Pension plans from the following countries are known to invest in forestry: the United States, Canada, Sweden, Germany, Denmark, Finland, Germany, France, Spain, Australia, New Zealand, Korea, the UK, Brazil, and Uruguay,11 there may be others. The authors of this paper conducted a thorough polling of national pension plan regulators and found no public pension plan investments in forestry from funds in Asia (except South Korea), Africa, or Latin America including Mexico (except for Brazil and Uruguay). The best available data is from TimberLink’s annual survey of timberland investment managers. As of year-end 2019, the survey reported total institutional investment in forestry investments of $48 billion, of which public pension plans held USD 23 billion (and sovereign wealth funds another $3 billion) (TimberLink, 2020). This data likely underestimates the total pension plan investment in forestry, as some of the larger plans invest directly without the assistance of one of the groups surveyed. Nor were the larger Brazilian managers surveyed. Despite the limitations of the data, it is unlikely that total institutional investment in forestry exceeds $100 billion globally and is probably less. This is a tiny percentage of global pension assets, which amounted to $32 trillion in 201912.

10. Current initiatives working on carbon market development include the Taskforce for Scaling Voluntary Carbon Markets – see https://www.iif.com/tsvcm
11. Based on TimberLink data and the personal experience of the authors.
Why Do Pension Plans Invest In Forestry?

i. Historic returns

As forestry is a small and specialized asset class, it has to earn its way into an investment portfolio—unlike large capitalization stocks or government debt. The argument for taking it on relies on expectations of favorable risk-adjusted returns. These expectations in turn rely, in part, on historical evidence about returns, return volatility, correlation of returns with those of other assets, other parameters of the return distribution, and the idiosyncratic risks of the timberland asset class.

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13. The answers to this question, provided in this section, are based on published research and the author’s own experience with pension-plan investors. Binkley et al. (2006) provide an overview of the asset class. This literature review has relied exclusively on publications appearing in peer-reviewed journals. Such publications are the “gold standard” of reliability, and, as such, their findings comprise the best source of information as pension funds consider forestry investments. The vast “grey literature” on the subject contains some excellent analysis, but the choice of topic and emphasis on specific findings may be influenced by the commercial interests of those publishing it. This literature can be quite valuable but needs to be read with those concerns in mind. Some of the best of this literature can be found at: Forest Research Group (Jack Lutz) www.forestresearchgroup.com/newsletter.html Forisk Consulting: www.forisk.com GreenWood Resources: https://greenwoodresources.com/research-and-education/ Hancock Natural Resource Group: https://htrg.com/research/
BOX 4 - Measuring Forestry Returns

As measures of forestry returns require information on historical returns, it is important to understand exactly how historical timberland returns are calculated. By definition, private equity timberland is not traded daily in transparent public markets, as are many financial assets.

The best available return data is assembled and published by the National Council of Real Estate Investment Fiduciaries (NCREIF) for the US. NCREIF commenced publishing a quarterly Timberland Property Index (TPI) in 1994, with data going back to 1987. The TPI is based on property-level information for institutional holdings as reported by investment managers. The return measure is nominal, pre-fee unlevered total returns, with the total return broken into two components: Earnings Before Interest, Taxes, Depreciation, Depletion and Amortization (EBITDDA) for the period, and change in asset value. The returns are reported for four regions: South, Northeast, Lake States and the Pacific North West.

Although these are actual returns as reported by pension plans and other institutional investors, the TPI has some serious limitations:

- The data refers to US properties alone - there is no comparable index for global timberland.
- The index represents 74 percent of the $31.6 billion of US institutional timberland investments as reported by TimberLink (2020) - returns from the remaining 26 percent are unknown.
- The mix of properties changes from quarter to quarter as properties are sold out of the index or managers decide, for whatever reason, to stop reporting data.
- Only annual appraisals are done by third parties, and even these are notoriously difficult. Most markets are thinly traded, so there is a dearth of ‘comparable sales’; the income approach is necessarily based on numerous assumptions over long time period; and the reconciliation of the two approaches to valuations usually has to bridge a material difference.
- Reporting regulations require quarterly reporting, which is based on simple accounting exercises where the value of trees harvested and land sold is subtracted from the prior quarter’s value, with or without an adjustment to account for tree growth or changes in timber prices. This leads to a number of statistical issues when comparing timberland returns with returns from such daily-traded assets as stocks and bonds.
- Considerable differences exist both between & within regions – reported average returns include errors.
- Only properties owned fee-simple with both land and trees are included - some important forms of forestry investment—timber deeds and some timber leases—are excluded.
- Returns are gross of investment management fees and other fund-level expenses – the NCREIF Timberland Fund and Separate Account Index (TFI) takes these factors into account and has around a 100bp difference from TPI (Chung-Hong Fu, 2013). This is significant for an asset class that generated a 4.2 percent total return at the property level in 2019.

To the best of our knowledge, there is no historical data on timberland returns outside the US (with the exception of exotic plantations in the northern UK). Because of this, analysts rely on changes in timber prices to model timberland returns. Although volatility in timber prices is typically the single largest source of volatility in timberland returns, this approach excludes such factors as changes in discount rates or land values.

Annual historical returns for the US as a whole for the entire NCREIF time series broken out into cash flow and capital appreciation along with a useful benchmark, 10-year US treasuries (Figure 2). Two features are notable in this figure. The first is the spike in returns in the early 1990s; the second is the secular decline since then. Abrupt restrictions on timber supplied from US national forests caused the spike. The reductions in harvest levels were great enough to be seen in price spikes throughout the world. The reasons for the secular trend are discussed later in this report.

International Woodland Company: www.iwc.dk/publications/
Target Timberland Investment Resources; https://tirllc.com/investing-asset-class/timberland-primer/
University of George Center for Forest Business: www.ugacfb.com (contact for access to past conference presentations).
Prior to the development of the NCREIF index, and subsequently, analysts relied on movements in timber prices to model the volatility (and higher levels) of timberland returns. This makes sense because price volatility is the single greatest contributor to timberland return volatility (Busby and Binkley, 2019). As a result of this correlation, and the lack of historical return information for regions outside the US, most analysis of non-US returns has relied on timber prices to measure return volatility (and higher moments of the return distribution), and assumed average rates of return based on investor surveys and perhaps other considerations. The discussion below highlights the instances in which this methodology is employed.

ii. Favorable market fundamentals

Timberland investments may benefit from favorable long-term market fundamentals. Population growth, economic development, and increasing urbanization continue to drive demand growth for wood products. Healy, Carriero, and Rozenov, (2005) predicted that U.S. consumption of wood would increase more rapidly than harvest volumes through 2050. This, they said, should produce upward price pressure. The key input to wood products—timber—has a low ratio of value to weight, so it cannot be transported long distances on land (however, it can be by sea). This means that timber supply can be constrained locally even if abundant globally. Any large-scale analysis necessarily misses such key domestic economic conditions. However, the recent FAO (2018) assessment found global supply and demand of roundwood roughly in balance now and for the next decade: supply and demand are roughly in balance in Africa, Latin America and North America, with some surpluses in Europe and deficits in Asia. While this analysis misses more local—and, for forestry investors—more important supply surpluses and shortages, it does not appear that timber is in short supply in any absolute global sense, absent any material changes in supply and demand dynamics. This is consistent with Binkley (1993) which outlined six reasons why ‘timber scarcity’ was unlikely to persist over the periods of time relevant for forestry investments. A balance of supply and demand does not suggest that forestry investments are unprofitable. Rather, it means that investment underwriting should take an informed and prudent view of anticipated future prices.

The emerging interest in forest-related activities to mitigate climate change, including ‘mass timber,’ could accelerate growth in demand for timber. Mass timber (or cross-laminated timber) has a two-decade track record in Europe. The approach is increasingly being used for taller commercial buildings, and has spread to the US and Canada. The world’s

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14. One of the first of these was the John Hancock Timber Index (JHTI) (Hancock Timber Resource Group, 1992 and 2003). John Wilson of John Hancock economics department developed it in the 1980s (C. Washburn, pers. comm.) just as the asset class was getting launched, and before there was really any reportable track record. The JHTI used contemporary timber prices to index cash flows, and a trailing average of timber prices to index asset values. Using these two components the index produces an index of capital returns and cashflow returns. Subsequent analyses (Lutz, 2018; HTRG, 2003) have highlighted the general similarities of the JHTI and the NCREIF TPI.
tallest mass timber structure, 18 stories and over 280 feet high, was recently built in Norway, and an 80-story high-rise is proposed for Chicago. Mass timber offers a variety of benefits, including potential cost savings compared with concrete and steel, depending on where it is sourced. It may also reduce construction time (Robbins, 2019). The key benefit that is attracting widespread attention, however, is its potential for reducing CO2 emissions from construction, by sequestering carbon in buildings and avoiding the emissions associated with concrete and steel production. Hines and Busby (2020) found that constructing buildings out of mass timber products instead of concrete and steel emits nearly 80 percent less CO2 during the construction phase alone. While the potential emissions reduction of a move to mass timber is also dependent on the CO2 expelled in the logging, manufacturing, and transport of mass timber products, the evidence indicates that if it is harvested through sustainable forestry practices, the potential benefits are significant (Robbins, 2019). The Nature Conservancy, the US Forest Service, and a number of universities and other research institutions are launching a new analysis of mass timber to better determine its potential benefits, and establish approaches to mitigating the environmental risks associated with scaling up timber production.

Climate change mitigation efforts are leading to an increase in demand for biofuels, which could also increase demand for timber. One report that models a path to limiting warming to 1.5°C (Favero, Daigneault, and Sohngen, 2020) concludes that there would be significant growth in demand for biofuels, tripling timber prices above a 'business as usual' scenario, and involving more than a million hectares of new plantations. For this growth in biofuel demand to manifest, fossil fuel prices would need to be significantly higher, or a comparable CO2 tax would be required, as biofuel plantations are not profitable under current and expected oil prices (Chudy et al., 2019). Again, sustainable forest management practices and the assessment of emissions from logging, manufacturing, and transport will be critical to determining the potential environmental benefits from forest-based biofuels.

### iii. Diversification

Timberland returns appear to be relatively uncorrelated with the returns from those of other asset classes. This lack of correlation provides institutional investors with diversification benefits in a mixed-asset portfolio. Diversification reduces overall risk as measured by return volatility, and increases risk-adjusted returns as reflected in such measures as a portfolio’s Sharpe Ratio.

**Academic research spanning over 30 years has confirmed diversification benefits in several ways.** Simple calculations of the raw correlation coefficients between timberland returns and returns from typical holdings in large, mixed-asset portfolios confirm the low correlations. Asset-pricing models for timberland (both CAPM and APM) show a low or negative beta, positive alpha, and a low cost of capital for timberland. Including timberland in a risk-efficient portfolio demonstrates improved portfolio returns, reduced portfolio volatility, or both. Some studies are based on more than one of these analyses, since they are all logically related. Table 2 shows a recent calculation of return correlations for various asset classes.

**TABLE 2 - Correlations of real assets, commodities and REITs (1992-2019)**

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</tbody>
</table>

Source: Nuveen (2020)

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15. See footnote 3.
16. The Sharpe ratio is a measure of volatility-adjusted performance and is calculated by dividing excess return by the standard deviation of excess return. Excess return is defined as the return in excess of the risk-free rate of return (CFA Institute).
17. Measure of the volatility—or systematic risk—of a security or portfolio compared to the market as a whole
18. Excess or abnormal rate of return
19. The following provides an account of the more notable publications with data largely taken from the US, but with some global analyses. The grey literature includes an even more extensive set of work in these areas. Readers are encouraged to consult those sources as well; their findings are largely consistent with the published research: Conroy and Miles (1989), Newell and Eves (2009), Mills (1988), Redmond and Cubbage (1988).
Not only have timberland returns been poorly correlated with major financial assets, they have been poorly correlated with the returns from other real assets. The estimated correlation of timberland returns with commercial real estate is negative, and low with farmland. However, the literature contains absolutely no structural arguments for negative correlations. No matter the source—NCREIF or price-surrogate series—the return data for forestry investments is measured with error. However, when variables are measured with error, correlation or regression coefficients are biased toward zero. As a result, the findings of negative correlations between the returns from forestry investment and those of other asset classes could be just a statistical artefact.

Demand for wood products rises and falls with the broad economy. These products are used widely through the economy, in housing, industrial production and consumer goods. Timber supply is largely a function of the standing inventory of trees, which inevitably moves slowly and without correlation to the larger economy. As a consequence, one might expect timber prices and therefore forestry investment returns to be correlated with broader economic developments. However, there have been idiosyncratic events in timberland markets that may account for at least some of the negative correlation. For example, in the early 1990s, harvests on the western US national forests fell sharply in response to regulations designed to protect the threatened Northern Spotted Owl. This abrupt supply shock spiked timber prices in the region. Markets transmitted that spike into the US South, New Zealand and elsewhere, and timberland returns soared.20

Finally, on a trend basis, timberland returns have been broadly correlated with returns from other asset classes, falling since the 2008 global financial crisis (see Figure 2). Some argue that forestry investments trade at a relative level with other investments, and the data certainly suggest that this is the case (perhaps 200 bps above commercial real estate and 400 bps above real 10-year US Treasuries). But a relative-return argument is hard to square with an uncorrelated-returns argument.

iv. Inflation hedge

Timberland investments are an effective hedge against inflation. Returns from the asset class have a positive correlation with inflation, largely due to biological growth and how timber prices and land values track prices in the overall economy. Healy, Carriero, and Rozenov, (2005) compared CPI data with NCREIF index return data and show that timberland tends to perform better in times of higher inflation. Washburn and Binkley (1993) examined the historical relationship between timberland returns and inflation, separating historical inflation into two components: anticipated and unanticipated. They define an ‘inflation hedge’ as an asset that performs particularly well in times of unanticipated inflation, and find that forests in the U.S. West and South have been superior inflation hedges while forests in the Northeast have been less effective in this respect.

The value of forests as inflation hedges has declined over time. Historical analysis of timberland returns and inflation reflect, in part, the fact that timber prices increased faster than inflation from the early 1900s through around 1975 (Binkley and Vincent, 1988). However, the trend weakened and has more recently disappeared altogether. There are good structural reasons to expect this pattern of real price changes (Sedjo and Lyons, 1990; Binkley and Vincent, 1992). A forest sector’s early stages resemble those of a mine. Found old-growth timber is not growing much in volume if at all, so the only return for its owner comes from real price increases. As it is harvested and manufactured into wood products, timber inventories are depleted. However, as old growth is depleted and replaced by second growth forests or plantations, returns can arise from the growth of the trees themselves. The increased abundance of timber stabilizes prices, and they may even fall in real terms.

20. Another example is the recent chronic stagnation of timber prices in the US South since the global financial crisis. Demand for wood products was already falling off its 2005 peak when the crisis hit and drove demand dramatically downward. Roughly half of sawmill capacity in the US South shuttered. The consequent reduction in timber harvests caused timber inventory to grow and with it timber supply. As lumber demand returned, new sawmill capacity was built in the region, and that new capacity was far more efficient than that which it replaced. This rebuilding of the industry in that region reduced the amount of timber needed to produce a unit of lumber. The combination of increased timber supply and reduced unit demand for timber kept timber prices from rebounding along with the rest of the economy.
Attractive risk-adjusted total returns

As measured by the Sharpe ratio and security market line\(^{21}\), timberland investments generally offer higher returns for the assumed level of risk than other traditional asset classes. This higher rate of risk-adjusted total returns is key to both the advantages standalone timberland investments, and the benefits of adding the asset class to a diversified mixed asset portfolio. For example, using a portfolio optimization model, Healy, Carriero, and Rozenov (2005) found that adding an allocation of just 10 percent to a non-timber portfolio results in significantly higher returns with lower standard deviation. Mei (2019) summarized the findings of 68 peer-reviewed journal articles in timberland investments in the United States published after 1980, concluding that (i) timberland is a risk diversifier in a portfolio whether standard deviation or value-at-risk is used as the risk metric; (ii) classic asset pricing models for private-equity timberland find significant alpha (i.e. excess returns above what would be expected given their risk), and (iii) timber Real Estate Investment Trusts (REITs) have some ability to reduce portfolio risks via diversification, but show no excess returns. Zhang (2020), on the other hand, found that timber REITs did produce both diversification benefits and excess returns.\(^{22}\) Table 3 shows a recent calculation of returns and Sharpe Ratios for a range of assets. By this measure, risk-adjusted returns for timberland have been higher than those for stocks, and comparable with those from US bonds and commercial real estate.

\(\text{TABLE 3 - Performance of financial and real assets}\)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.11</td>
<td>0.08</td>
<td>0.06</td>
<td>0.05</td>
<td>0.08</td>
<td>0.11</td>
<td>0.10</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>Std. Dev.</strong></td>
<td>0.17</td>
<td>0.19</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.07</td>
<td>0.10</td>
<td>0.20</td>
</tr>
<tr>
<td><strong>Sharpe Ratio</strong></td>
<td>0.51</td>
<td>0.27</td>
<td>0.68</td>
<td>0.46</td>
<td>0.72</td>
<td>1.27</td>
<td>0.70</td>
<td>0.49</td>
</tr>
</tbody>
</table>

Source: Nuveen (2020)

Mean variance optimization is another way to examine the risk-adjusted returns from timberland. Starting with a traditional portfolio comprised of stock and bonds, an analyst can ask how much overall portfolio returns would increase with the addition of timberland investments. To reflect the practical difficulties of developing a large timberland investment portfolio, the analysis constrains timberland at a 5 percent allocation. Figure 3 shows the results. Adding just 5 percent of timberland to the portfolio would have increased returns from 6.55 percent over the period to 7.35 percent. More significantly, the Sharpe Ratio would have increased by 16.1 percent.

\(\text{FIGURE 3 - Efficient investment frontier with and without timberland}\)

Source: Busby, Macpherson, and Breheny. 2020

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21. The security market line (SML) is a line drawn on a chart that serves as a graphical representation of the capital asset pricing model (CAPM)—which shows different levels of systematic, or market risk, of various marketable securities, plotted against the expected return of the entire market at any given time. https://www.investopedia.com/terms/s/sml.asp

22. See also: Caulfield (1998); Newell and Eves (2009); Binkley, Raper, and Washburn (1996); Thomson (1997); Mei and Clutter (2010); Zhang and Hall (2020); Sun and Zhang (2001).
vi. Favorable tax treatment and subsidies

Although income taxes differ widely between countries and localities within countries, forestry investments frequently receive favorable tax treatment and subsidies. Common incentives include the deferral of income taxation until trees are harvested; favorable tax rates; the ability to deduct ongoing operating costs for forestry investments from other sources of income; planting subsidies; and low-cost loans with favorable terms and conditions, inter alia.

The US provides an illustrative example of the tax treatment of forestry investments. Corriero (2005) describes three specific tax benefits US Investors receive. Firstly, timber sales revenues qualify for treatment as long-term capital gains, taxed at a lower rate than ordinary income. Secondly, forestry investors are permitted to deduct the purchase price of timber as it is harvested (‘timber depletion’) from timber harvest income for tax purposes. Finally, the operating costs of a forestry investment may be deducted from ordinary (non-timber) income. These factors taken together can lead to after-tax returns actually being higher than pre-tax returns. Ironically, this could ‘crowd out’ non-tax paying investors, such as public pension plans, as it may allow tax paying investors to pay more for forestry assets.

vii. Reliable cash yield: ‘bond-like returns’

A forest well-stocked with mature timber can theoretically provide steady income as the trees are harvested. While the peer-reviewed literature does not appear to make this claim, it is frequently seen in the ‘grey’ literature. As an empirical matter, Figure 1 shows that timberland has historically delivered meaningful cash returns. Naturally, while gross revenues equal the product of harvest volumes and log prices, the latter fluctuate, meaning that even with consistent harvest levels, revenues will fluctuate. Proponents of the ‘bond-like-returns’ position counter this by arguing that if prices are low, more timber may be cut to even out the income stream. While true, this approach vitiates the embedded real option in a forestry investment to harvest more timber when prices are high (more on this in Section I. ix., below.)

Most forests do not have an age-class structure that naturally permits an even flow of timber. By definition, the harvest pattern for a forest that maximizes the net present value of the asset is the one that arises from harvesting each tree—or, realistically each group of similar trees, or forest ‘stand’—at the optimal time for that stand. This generally leads to harvests that fluctuate over time. This fluctuating harvest level can still be described as sustainable because it can be repeated, all things being equal, indefinitely into the future. Evening out the fluctuations requires harvesting stands at suboptimal ages—either harvesting trees before they are fully mature or holding mature trees past their ‘sell-by’ date. Such suboptimal harvest plans may lead to a material loss of asset value. At the same time, for a forest that provides a large proportion of the timber in its region, large fluctuations in harvest levels may be impractical. Loggers need steady work for their livelihoods to remain viable; manufacturing facilities need a steady supply of timber to stay in business.

In some instances, forestry investments come with an off-take agreement which can mitigate market risk. Volume-based agreements provide for a range of annual off-take, with the precise quantity negotiated annually. Such agreements generally price to the domestic market, offering little protection against price risk. Some agreements set price by a formula, and require the buyer to take a set volume (and the seller to deliver it). Such agreements mitigate both price and volume risk, and can deliver bond-like yields. The certainty of the cash flows makes hedging possible, although doing so might not be financially attractive. Despite these benefits to timberland investors, such supply agreements can create difficulties for the counterparty. IFRS accounting rules sometimes require companies to value fixed price/quantity agreement, and oblige them to put the value of these agreements on their balance sheets as liabilities.

Finally, some forests produce stable income from non-timber activities. Sources of non-timber income may include the harvest of such non-timber forest products as pine straw, mushrooms, and greenery; recreational leases; land leases for such facilities as photo-voltaic farms, wind-turbine installations, and cell towers; and the sale of gravel or crushed rock. These sources of income generally do not fluctuate as much as timber revenues, but are seldom great enough to provide a natural ‘bond-like’ yield. In short, the stability of cash yields from a forest depends heavily on the nature of the forest, and must be assessed in the context of each individual case.

23. Although a full review of this topic is beyond the scope of this report.
24. For public pension plans, these tax benefits may have little impact on their investments and may in fact be adverse to them. In many (but not all) countries, pension plans are tax-exempt if they invest passively. With the appropriate investment structuring, the US exempts foreign public pension plans from its general tax on taxation of foreign income derived from real property. Other countries provide a similar benefit to pension plans. And, even in countries that do not provide such tax relief, lawyers and accountants specializing in investment structuring usually
viii. Long Macaulay Duration matching long-term pension plan liabilities

Pension plans have long-dated liabilities and therefore need assets with long-dated revenues to immunize the plan against changes in interest rates. Macaulay Duration refers to the sensitivity of the value of an asset to changes in interest rates. If the Macaulay Duration of the plan’s assets and liabilities are the same, then changes in interest rates result in no change in the plan’s net liabilities. The peer-reviewed literature does not appear to discuss this issue, but it is sometimes mentioned in the ‘grey’ literature.

Two considerations are important in considering this claim. The first is a common argument from financial economists, in which a pension plan should select assets that maximize the value of the portfolio, and should not apply constraints that reduce that value as asset/liability matching likely would. This argument does not necessarily reflect the real world of pension-fund portfolio management. The second is that, just as with the ‘bond-like-yield’ argument, the facts depend on the individual circumstances associated with a specific forestry investment. Consider two extremes. Investment A is a one-year timber deed, where all the timber has to be harvested within one year. Investment B is a forest that has just been established, with pines that have a projected 30-year rotation. Investment A has a very low Macaulay duration and provides virtually no support for long-term liabilities - although, depending on the cost of the asset, it could add a lot to the present value of the portfolio. Investment B would be expected to support the liabilities associated with a young worker, but might not end up doing so because of low prices 30-years out, or a natural disaster that destroys the forest.

ix. Biological growth

One unique advantage offered by timberland investments is that the biological growth of trees is predictable, and independent of all other macroeconomic factors. In well-developed forest regions, researchers have ample data for creating statistically valid mathematical models of forest growth. As industry lore has it, “trees may fear becoming part of the Wall Street Journal, but they don’t read it every morning before they decide how much to grow.” Steady growth, it is argued, allows investors to accurately forecast returns while also providing the option to manage harvest timing based on market factors. When harvest is deferred, timber continues to grow, and to increase in value.

Forest stand modeling shows that natural tree growth over time generates both increased volume and value. Because higher-value products can be made from larger diameter trees, growth in volume over time results in steeper rates of increasing harvest value. (Healy, Carriero, and Rozenov, 2005). Using mean-variance analysis, Conroy and Miles (1989) find that there is a 10- to 11-year window for optimal harvest. The opportunity-to-time and harvest-to-market conditions across such a long time-window makes the asset class unique. While these arguments are true, they may overstate the benefits as is explained below.

Once trees have been established and are ‘free to grow’, additional growth is generated at little cash cost. The growth rates of forests are relatively steady, while influenced by the age of the trees, the productivity of the site, and rainfall and temperature. Weather factors have tended to fluctuate around long-term means - although climate change may well change that long-term pattern. And while a car factory can produce a steady supply of cars just as a forest can produce a steady supply of trees, the growth of the trees, once established, carries little cash cost comparatively—the main cost of holding a tree for another year is the opportunity cost of the land and timber which could be sold and redirected to another investment.

Proponents of forestry investment have placed significant emphasis on the real option embedded in a forestry investment associated with the opportunity to time harvest levels. The argument can be summarized as follows: when prices are high, harvest more trees; when prices are low, let the trees ‘grow on the stump’ (or free of cost) and accumulate value until prices rebound (Brazee and Mendelsohn, 1988). In the 50 years of modern institutional investment in forestry, some practical difficulties with this strategy have been identified:

- Considerations of logging and manufacturing capacity may proscribe significant fluctuations in annual harvest levels.
- An investor may not know if prices are ‘high’ or ‘low’. While many forest investment managers believe that prices are mean reverting, the evidence for this is weak and some studies have found they follow a random walk (Washburn and Binkley; 1990).
- If prices are high, other forestry investors will harvest more, and the option value would be quickly priced away.
If trees are at their economically optimal rotation age, then ‘storing them on the stump’ results in an opportunity cost, which must be weighed against the expected benefit, and risk, of higher future prices.

In the US South after the global financial crisis, many forest investors felt prices were ‘low’ and refrained from harvesting timber, particularly more valuable sawtimber. As a result of low harvest levels for many years, timber inventory has grown. Higher inventory levels imply higher potential supply, so timber prices have been depressed in that region for more than a decade.

These considerations do not imply a lack of real options associated with forestry investments. However, as with other arguments for forestry investment, the value of the real option may be limited and is highly dependent on local context. In some areas, for example, wet conditions reduce timber supply because logging equipment cannot be operated on soggy ground. Regional prices usually rise in such circumstances. Owning a forest with edaphic or topological features that permit wet-weather logging can pay handsome dividends at those times. Similarly, if the forestry investment includes forest land, then there may be a real option associated with conversion of the land to other uses, whether they be farming, housing development, cell phone towers, wind farms, or conservation sales.

x. Well-developed third party ESG certification and potential positive environmental and social impacts

Negative social and environmental impacts resulting from forestry operations have led to the development of globally agreed-upon, third-party certification schemes for forestry projects. Many countries with highly forestry-dependent economies have implemented policies and regulations to help address the potential negative social and environmental impacts of forestry. ‘Non-state, market-driven’ governance has emerged in the form of third-party forest certification (Cashore et al., 2004) to supplement these policies and regulations. Two widely recognized certification schemes are used globally. The first, the Forest Stewardship Council (FSC) was developed in 1993 by a group of environmental NGOs, indigenous groups, human rights organizations, and timber users and traders, with the World Wildlife Fund (WWF) playing a leading role. The second, organized by the forest products industry, operates under the broad banner of ‘Program for Endorsement of Forest Certification’ (PEFC). The FSC is the faster-growing initiative in terms of certified area added annually, and the more widely used. Between 2012 and 2017, nearly 50 million hectares of forest was newly certified by the FSC, resulting in an estimated total of 198 million hectares of forests managed according to FSC standards across 84 countries, as of September 2017 (Dasgupta, 2017). Certification in forestry is widely used compared with other natural resource sectors. While fishing and palm-oil plantations have developed their own certification schemes, they have had less success in implementation; still others—notably agriculture—are lagging far behind.

Virtually all institutional investment in forestry is in certified projects. FSC and PEFC differ in approach, governance structure and, to some degree, actual forest practice standards. However, both lay down a series of standards that guide logging companies and require that certified entities have an environmental management system in place. Such a system includes a statement of policy adopted at the highest level of the organization, a set of management practices that (if followed) are intended to meet the standards, regular internal monitoring against those practices, and regular third-party reviews of performance against the standards. Much has been written on which standard is best; both require attention to such environmental factors as water quality and biodiversity; social factors such as the treatment of workers and community support; and economic factors such as sustainable timber supply. Both certifications can be viewed as toolboxes with multiple tools for reducing environmental degradation, most notably Reduced Impact Logging (RIL). There is evidence that certification has led to positive environmental outcomes, while the evidence for social and economic outcomes compared to non-certified forests is mixed (Dasgupta, 2017). For pension-fund investors, the key conclusion is this: there are robust, globally accepted certification schemes available to certify that their forestry investments meet ESG criteria.
Sustainably managed forests28 can provide a range of environmental benefits, in addition to good financial returns. Forested watersheds can provide a reliable supply of clean water. With a diversity of age classes and attention to high-conservation value areas, forests can support biodiversity. Mongabay (2017) reviewed 40 studies comparing tropical forest managed under FSC and conventional management and found that forests managed under FSC certification, or using reduced impact logging (RIL), generally had better environmental outcomes than conventionally managed ones. FSC-certified forests and those using RIL tended to have “fewer roads and trails, have lower damage to non-target trees, and store more carbon in their tree biomass (because of careful logging and fewer damaged trees).” They also tend to have more animal and plant species (Dasgupta, 2017). Beyond certification, several TIMOS consider land use planning and ecosystem services in their management approaches.29

Sustainably managed forests can also provide social and economic benefits. Forestry is necessarily an activity conducted in rural areas, often areas with few other economic opportunities. Forestry activities range from plantation establishment (site preparation, fertilization, pest control, planting, suppressing competing vegetation), intermediate stand management (thinning, pruning), final harvesting, to regular monitoring of forest conditions. An increase in local timber supply might provide the opportunity for primary wood processing facilities. These activities provide for stable, year-round, and possibly well-paying jobs. These stable “export-oriented jobs” can support secondary economic activities in the area, as well, and may form the basis for important public services such as schools and health clinics.

xi. Possibly material capability to sequester atmospheric CO2

Stabilizing the Earth’s climate requires emissions reductions in the energy, transportation, and building sectors, but natural climate solutions can make significant contributions as well (Griscom et al., 2017). Through photo-synthesis, plants offer a proven technology for removing CO2 from the atmosphere. Because trees not only remove CO2 from the atmosphere but also store the carbon for many years, forests have significant potential to contribute to climate change mitigation.

Forest-based natural climate solutions (FNCS) include reforestation, afforestation, sustainable forest management, and avoided deforestation.30 Ending tropical deforestation and letting damaged forests recover could reduce current annual global greenhouse gas emissions by as much as 24 to 30 percent (Seymour and Busch, 2016). Recent peer-reviewed studies (Bastin et al., 2019; Busch et al., 2019; Fargione et al., 2018; Griscom et al., 2017) suggest that these approaches could make material contributions to reducing the amount of CO2 in the atmosphere. The US ‘Midcentury Strategy for Deep Decarbonization’, produced in the final years of the Obama administration, suggested that FNCS would provide about 30 percent of the reductions required for the US to meet its nationally determined contributions (NDC) to the Paris Agreement (White House, 2016). Bastin et al. (2019) found that FNCS could achieve 37 percent of the global total of NDCs to the Paris Agreement. Forestry can potentially further contribute to mitigation through growing trees that can be processed into long-lived buildings and products that continue to sequester a large proportion of the CO2 over their lifetimes and substitute for such carbon-intensive alternatives as concrete and steel.

Despite the low unit cost of removing CO2 from the atmosphere with forests, the total cost of the necessary investments globally could amount to hundreds of billions of dollars. The unit cost of such carbon sequestration is low, in the range of $10 to $100/tCO2e (Griscom et al., 2017), equivalent to a gasoline tax of around $0.10 to $1.00/gallon. However, the capital for these investments is unlikely to come entirely from public sources; as a consequence, it will be necessary to attract private capital to scale and implement forest carbon strategies.

Pension plans could provide capital to reduce CO2 through forestry investments while attaining acceptable risk-adjusted returns. There are well-developed and ac-
cepted initiatives for measuring and certifying the amount of carbon stored in forests. These generate carbon credits that may be sold into both voluntary (Donofrio et al., 2020) and regulatory markets. One regulatory initiative is the California cap-and-trade program. Approximately three quarters of carbon offsets registered in the California Air Resources Board regulatory market arise from forestry projects.

Selling carbon credits can provide a substantial boost for forestry investment returns. The additional returns may not be correlated with timber returns, adding another source of improved risk-adjusted returns. Credits could come from additional carbon sequestered in standing forests, or from carbon sequestered in long-lived building products, like mass timber. The majority of existing forestry offsets traded in the California market are derived from activities on (i) largely non-commercial lands controlled by Native American groups and (ii) forests controlled by timberland investment management organizations (TIMOs), representing pension plans and other institutional investors. The California rules credit offsets if a forest property holds more carbon than the average in the USDA Forest Service ‘Forest Inventory and Analysis’ region where the property is located. TIMOs typical purchase such carbon-rich properties and then register the excess carbon but generally do not actually produce much ‘additional’ carbon.

**Globally, efforts to scale up carbon markets are gaining momentum, most notably through the Taskforce on Scaling Voluntary Carbon Markets (TSVCM).** The taskforce is a private sector initiative backed by more than 40 companies and organizations and is working on a blueprint for the new market for voluntary carbon offsets (TSVCM, 2020). Mark Carney (UN Special Envoy for Climate Action and Finance Advisor to UK Prime Minister Boris Johnson for COP26) launched the initiative in late 2020 and has said, “This needs to be a $50-100 billion per annum market” (Hook and West, 2020). The taskforce published a consultation document in November 2020 laying out what the new market may look like. A pilot trading program is expected ahead of the UNFCCC CoP in November 2021. Demand for carbon offsets is expected to grow significantly as more companies and countries work towards their net zero emissions targets, which may require the use of offsets to compensate for difficult to eliminate emissions.33

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32. See Paragraph 25
33. See Paragraph 25

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EQUITABLE GROWTH, FINANCE & INSTITUTIONS INSIGHT | Pension-Fund Investment in Forestry
Why Don’t Pension Plans Invest in Forestry?

Despite the appeal of forestry investments, the majority of pension plans do not invest in the sector. This section explores some of the reasons for this, based on the scant information available in peer-reviewed and ‘grey’ literature, and on the experience and research of the authors.34

i. A complicated asset class

Forestry investments typically comprise no more than 1 to 3 percent of a pension plan’s portfolio at most. The benefits of including forestry investments have to exceed the transaction costs of making these investments. For a specialized asset class such as forestry, these transactions costs may be high relative to the gain in risk-adjusted returns from such a small allocation.

Forestry investments are complicated to understand. Few investment personnel on a pension plan’s staff will have a specific, personal education in the field, which is characterized by specialized and often impenetrable terminology. General investment consultants typically have no knowledge of the field, so it is expensive for them to get up to a speed adequate to provide informed advice. Plan leadership and Boards are justifiably uncomfortable investing in an asset class they do not fully understand. By using different metrics than most of the rest of the investment business, the forestry investment industry does not make it easy for investors to understand: for example, anticipated forestry returns are typically reported on a real, unlevered basis, while the practice in the broader private equity field is to report anticipated returns on a higher nominal and levered basis.

34. One example of another type of institutional investor which is expanding exposure to the sector is the Irish Strategic Fund, which is investing in both domestic and regional forestry assets. See: https://www.pionline.com/article/20170203/ONLINE/170209941/ireland-sovereign-wealth-fund-helps-seed-forestry-fund
BOX 5 - Case Study – The Harvard Endowment Experience

The Harvard Endowment Fund’s experience with forest investments illustrates the difficulty in directly investing in such real asset classes, even for sophisticated investors. In October 2020, the endowment fund announced that its natural resources team would be spin out into an independent investment firm – Solum Partners – which would take over $200 million worth of the fund’s portfolio of orchards, farms, and soya bean plantations. The US insurance company AIG is also expected to contribute a similar amount to the new venture, which is aiming to raise $1 billion for investments in agriculture and food production.

Harvard Endowment was an early investor in natural resources, including in New Zealand timberland. However, a large write down in assets was taken in 2019, partly due to its exposure to emerging market assets which are difficult to price and sell. Local environmental and social disputes – for example, in Brazil, Argentina, and Chile – were also proving disruptive. The experience demonstrates the need for institutional investors to work with managers who are specialized in this asset class.

The first question most investors ask when discussion forestry investments is “won’t my trees burn up?” This is especially the case when each summer sees devastating news coverage of massive forest fires. In fact, as a matter of historical record, fires damage only a small fraction of managed forest land. In the US, a large portion of the fires is on public lands, including National Parks, National Forests, and lands managed by the Bureau of Land Management, which may lack resources to manage these assets well. These lands are subject to extensive fires due to a history of fire exclusion combined with inadequate fuel-reduction activities. In addition, poor road infrastructure makes initial attack difficult and costly. Having public land as a neighbor poses a serious fire risk to private investors. Similar circumstances may exist in other countries.

Well-managed forests are relatively more immune to fires from natural causes. Not only is there less fuel in the forest, but road infrastructure for ordinary management activities eases fire control activities. Forest management personnel and loggers are regularly working in the forest and can be diverted to fire control if and when needed. Well-managed forests also have well-developed fire management plans that are tested prior to each fire season. Such plans include a system for initial detection (e.g. manned fire towers; lightening detection systems), approach to initial attack, support personnel, and standby aircraft to assist in firefighting efforts. Climate change is making some places hotter and dryer (and others hotter and wetter). As a caveat, historical evidence may no longer be as reliable a guide to fire risk. Higher temperatures and prolonged drought have extended the fire season in the Western US by several months, and this likely has occurred in other arid parts of the world. However, underwriting can assess these risks on a case-by-case basis.

Forestry investments may be vulnerable to natural disasters other than fire. These include ice storms, hurricanes, tornadoes, high winds, and attacks by insects, animals and diseases. One ‘grey’ literature study examined the casualty losses for a $9 billion internationally diversified timberland portfolio over a 14-year period. Losses from all natural disasters averaged 0.1 percent, with a standard deviation of 0.14 percent, and with an obviously positive skew (HTRG, 2011). This study did not consider any of the offsetting benefits, such as the capacity of local forestry enterprises to salvage some of the damaged timber, or realize the higher timber prices in regions where natural disasters reduce timber supply.

Some insurance companies provide capacity for protection against casualty losses, especially from fire. Whether or not these insurance policies make sense depends on their cost and structure, the investor’s tolerance for losses, and the nature of the fire control programs the forest manager has in place. As with other matters in forestry investment, the appropriate level of protection depends on the specific circumstances.

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36. 2015 is the worst fire year on record in the US through 2019. In that year, 10.1 mm acres burned. Over half of that area (5.1mm acres) was non-commercial forest land in Alaska. 73.1 percent of the total was on Federal land. Based on these figures 0.7 percent of non-federal forest land burned in that year. [https://fas.org/sgp/crs/misc/IF10244.pdf](https://fas.org/sgp/crs/misc/IF10244.pdf) 2020 may set a new record.
iii. Fear of reputational risk

Ownership of rural land may give rise complex social, political, and environmental conflicts that may impact negatively on the underlying investor. Land concessions, even those properly granted by governments, may be disputed by local people. Changes in land use from, for example, pastoral agriculture to plantations may empower some local people more than others, giving rise to political tensions in well-established communities. Tree plantations carry more leaf area than do grasslands, so evapotranspiration is likely to be higher, with possible negative impact on local water supplies. Any one of these conflicts can obviate all the other positive benefits of forestry investments. Rural land markets are often murky. Land may, for example, be a store of value for money gained from illegal activities, and institutional forestry investors have faced problems like kick-backs to brokers and even outright bribery.

A good pension plan manager can protect investors from these risks in several ways. Third-party certification can help avoid conflicts by identifying them early, and by convening outside stakeholders to help develop acceptable solutions. Ordinary commercial attention and due diligence can avoid corrupt financial practices. And, having a manager as the face for a pension fund’s investment insulates the pension plan from direct involvement.

iv. Limited opportunity set

There is no one agreed definition of the ‘investable universe’ for forestry. To a large degree the measure depends on what countries one includes and what kinds of investments are permissible. For example, concerning the latter, are concessions in Canada, Malaysia, Indonesia, or Russia considered acceptable investments? Would an investor take on an ‘avoided deforestation’ investment that involved payment for not harvesting trees? What about an investment that generated a material portion of its return from carbon sales?

Estimates of the investable universe for traditional timberland investments in countries where institutions currently invest appear to range in the USD 100 billion to USD 300 billion.\(^\text{37}\) Including such investments as forest grown for carbon alone would increase this number to perhaps $1 to 1.5 trillion. Given that total global pension industry assets today amount to $32 trillion,\(^\text{38}\) even with the broadest definition of a ‘forestry investment’, the opportunity set for forestry investments is relatively small. It could however amount to 3 percent of pension plan assets, about the level of forestry investment held by those pension plans that currently do invest in the asset class.

An almost complete lack of development limits the opportunity set for traditional forestry investments. Fifty years of institutional investment in forestry has financed virtually no greenfield development; the only major exceptions are eucalyptus pulpwood plantations in Brazil. In contrast, development plays a major role in commercial real-estate investment, providing pension plans a continuous source of new investment opportunities. Forestry properties, on the other hand, are mostly ‘recycled’ from one investor to another. The consequences of this are discussed in the next two sections.

v. Returns have fallen

Due to a combination of market efficiency and broad changes in capital markets, timberland returns have fallen. Where investors once expected US timberland returns in the range of 8 to 10 percent (on a real, unlevered pre-management fee basis), expectations have fallen to around 5 percent on the same basis (Figure 1). Management fees, averaging around 100 bps as mentioned above, have not fallen at the same rate, so post-fee returns have fallen even more. Portfolio optimization models still suggest timberland contributes positively to risk-adjusted returns even at these lower return levels. However, to achieve this requires diversification out of the United States into riskier countries. And the transaction costs of forestry investment remain high so the net benefits of investing in forestry have fallen.

Increasingly timberland is seen as a component of a real-assets portfolio. Such a portfolio might include real estate, infrastructure and farmland among other investments, with which it is difficult for forests to ‘compete’. Since the global financial crisis, returns from these other assets, especially when they come highly leveraged, have been higher than those from timberland; these lower relative returns have cooled interest in timberland. For example, the California Public Employee Pension Retirement System (CalPERS) is the largest public

\(^{37}\) According mainly to the ‘grey’ literature; once again, the peer-reviewed literature has little to say on the subject.

\(^{38}\) See OECD ‘Pension Markets in Focus’ http://www.oecd.org/finance/private-pensions/pensionmarketsinfocus.htm
pension plan in the US and one of the earliest pension plans to invest in forestry. As a result of the general factors given above, and some portfolio-specific ones, CalPERS recently closed down its timberland investment program. Similarly, the Harvard University Endowment recently spun out its timberland investment group, indicating declining interest in the asset class (see Box 5).

Despite the lower returns, investors still see opportunities in forestry investment. The modern world of pension plan investment in forestry started in the United States. Diversification out of that country provides both higher and less correlated return expectations. Local supply shortages and regulatory shocks can create price shocks lasting for several years as markets adjust to the new realities. Payments for ecosystem services—including the sale of conservation easements, fee interests, and carbon credits—can boost returns. A focus on cash flow has increased the value of natural forests where the re-investment costs are lower than with plantations.

vi. Valuation uncertainty

Valuation uncertainties have reduced the faith of some investors in historical timberland returns and deterred them from making new investments. As seen in Figure 2, a considerable fraction of the reported returns from timberland arise from the change in asset value. Asset values may be the transaction price of an actual sale, or may be estimated internally by managers themselves. If internally valued, the manager generally obtains a third-party appraisal every year to comply with institutional reporting standards. The appraiser seeks to determine the market value of the property at a specific point in time. These appraisers generally operate under the guidelines of the Uniform Standards for Professional Appraisal Practice (USPAP) – which are generally consistent with International Financial Reporting Standards (IFRS) and International Valuation Standards (IVS).

**BOX 6 - Asset valuations**

Uniform Standards for Professional Appraisal Practice (USPAP) outlines three measures of value: cost, income and comparable sales.

- **The cost approach** asks: “what would it cost to replicate the asset?” Because of the long time periods involved in creating a forest asset, forestry appraisers rarely use this approach unless the forest is quite young.

- **The income approach** forecasts net revenues arising from the timberland asset, and discounts them at an appropriate rate to determine the present value of the asset. Forestry underwriting generally uses this method, so appraisers are replicating the calculations of a well-informed buyer. This method requires numerous assumptions about anticipated harvest levels, prices, costs and the discount rate.

- **The sales comparison approach** considers the actual transaction prices of ‘comparable’ assets in the recent past. Because actual transactions are the best indication of actual asset values, this latter method is, in theory, preferred. The difficulty arises in practice. There are typically few large forestry transactions in a given region and year, and forestry properties generally differ widely in terms of the factors that influence value, including timber stocking, age class, and location with respect to mills. As a result, appraisers are forced to make often considerable adjustments to the transaction prices of the sales deemed comparable. And transaction prices are necessarily backward looking because past sales reflect investors’ expectations about market conditions at the time of the sale. Those expectations may have changed in the intervening years, making historical sales less relevant to current values.

Sometimes appraisers infer an ‘implied discount rate’ from the comparable sales. This is the discount rate that makes the NPV of the appraiser’s estimated cash flows equal to the sales price. If that discount rate is used in an appraisal, the income and sales comparison approaches may lead to similar conclusions of value. If not, the appraiser will need to reconcile to two estimates. The reconciliation of values is an art rather than a science.

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39. [https://www.appraisalfoundation.org/](https://www.appraisalfoundation.org/)
What Factors Make Emerging and Frontier Markets Attractive?

The history of institutional investment has been characterized by a gradual expansion of the investable universe. The modern era of institutional investment in forestry began in the US South, partly as a result of the abundance of investment-grade timberland, and partly in response to obscure provisions in the US tax code. It expanded from there into the US Pacific Northwest and US Northeast. At that time New Zealand was considered ‘too risky’ despite its excellent climatic and edaphic conditions for forestry, a stable legal system, excellent plantation management practices, and highly trained and competent forestry personnel. Now of course institutional investment has swept across New Zealand and Australia, and moved into Brazil and Columbia, with small amounts invested in more frontier geographies such as Malaysia and Laos. This expansion has been driven by several factors, detailed below.

i. Higher absolute expected returns

Just as with sovereign debt, investors expect higher returns for forestry investment in riskier places. The following chapter details some of the specific risk factors associated with forestry investments in emerging and frontier markets. There is a larger literature on estimating expected returns from foreign direct investment (FDI) in emerging markets but no one widely agreed-upon approach.\(^{40}\) Perhaps the best way to quantify these risks is to understand investor expectations of returns in different countries. Timberland appraisers have to use a discount rate in their income approach to valuation. As a consequence, several of them survey investors as to their return expectations. The Sewall Company is one of the leading appraisal firms, and Table 4 shows the results from their 2019 survey.

\(^{40}\) For example: Damodaran; http://pages.stern.nyu.edu/~adamodar/
**TABLE 4 - Required Spreads (bps) over US Timberland Discount Rates, 2019**

<table>
<thead>
<tr>
<th>EUROPE</th>
<th>SOUTH AMERICA</th>
<th>CENTRAL AMERICA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltics</td>
<td>Chile</td>
<td>Panama</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
<td>350</td>
</tr>
<tr>
<td>Poland/Hungary</td>
<td>S. Braôil</td>
<td>Costa Rico</td>
</tr>
<tr>
<td>300</td>
<td>350</td>
<td>400</td>
</tr>
<tr>
<td>Romania</td>
<td>W. Braôil Eucalypts</td>
<td>Nicaragua</td>
</tr>
<tr>
<td>250</td>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td>Russia</td>
<td>W. Braôil Teak</td>
<td>Mexico</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>OCEANIA</td>
<td>Uruguay</td>
<td>AFRICA</td>
</tr>
<tr>
<td>NZ Pine</td>
<td>Argentina</td>
<td>Angola</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>AUS Pine</td>
<td>Ecuador</td>
<td>Mozambique</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>ASIA</td>
<td>Peru</td>
<td>S. Africa</td>
</tr>
<tr>
<td>Cambodia</td>
<td>550</td>
<td>700</td>
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<td>Malaysia</td>
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<td></td>
</tr>
<tr>
<td>Indonesia</td>
<td>575</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>750</td>
<td></td>
</tr>
</tbody>
</table>

Source: Sewall Forestry & Natural Resource Consulting, Annual Investor Survey

The divergence between the return that investors need and those that timberland can provide is one reason little institutional investment takes place in many emerging and frontier countries. The data in Table 4 refers to the median spreads over the base US timberland discount rate (in the same survey found to be 5 percent on a real, pre-tax, pre-management fee basis). The survey included responses from 31 active timberland investors from a range of countries. Not all respondents invest in the countries they reported on. For emerging and frontier markets, the number of respondents was small — in the single digits — and the range in the responses large. Some of the results are anomalous—is South Africa really a riskier place than Russia or Mozambique, for example? Are teak plantations in West Central Brazil really as risky as concessions in Peru or Ecuador? This data also refers to the returns that investors would demand from investments made in each country. There may or may not be investment opportunities in these places that generate those expected returns with prudent underwriting.

The cost of land acquisition has a negative impact on returns. Following a similar methodology to Sedjo (1983), Cubbage et al. (2020) estimate the returns available from timberland investments in several combinations of tree species and management approaches in 22 countries, including several emerging and frontier ones. Their analysis includes careful assessments of costs, prices, and yields. In some cases, they find returns, as measured by IRR, that exceed the thresholds in Table 4 if the land is already in hand. They find that returns are negative if land-acquisition costs are included. Of course, their analysis refers to generalized investments in these countries, and specific investment opportunities could well differ.

Only careful underwriting of individual investment opportunities can assure investors that their required returns might be met. It can be argued that the analysis by Cubbage et al. estimates the maximum that investors would be willing to pay for the opportunity to acquire land and afforest it. While this is useful information, its utility is limited by how actual land markets work in some parts of the world. For example, sellers in Latin America often want to double count the value of the potential investment by adding to the NPV of cash flows from the investment their perceived value of the bare land, neglecting to take into account the fact that the NPVs are contingent on having the land. In some countries, rural land is desired as an opaque way to store the value of gains for illegal activities.

**ii. Additional diversification benefits**

The returns from different regions and countries are generally not highly correlated. This lack of correlation arises from the structure of forest products markets. For example, global demand for paper products and the value of the Brazilian Real (BRL) drive the returns from an investment in eucalyptus pulpwood plantations in Brazil. There is no a priori reason, absent an international economic crisis like the global financial crisis, to expect those markets to be connected to US housing markets that drive the returns from forestry investments in the US South. In addition, events that disrupt timber supply or demand—a windstorm, fires, an industrial accident at a timber-processing facility—may be highly localized, giving rise to a local price shock that is not felt in other regions. As a result of this lack of correlation, investments in emerging and frontier countries offer the possibility of greater diversification and reduced risk at the portfolio level. Indeed the ‘risk min’ timberland investment portfolio discussed above has investments in five countries. (Busby et al., 2020).
iii. Higher biological growth rates/shorter rotations

Some emerging and frontier market countries possess land suitable for tree plantations that is highly productive yet unsuitable or unneeded for agriculture for some reason. Such land may be profitably converted to fast-growing forest plantations. Degraded pastoral lands in Uruguay and Brazil are good examples where quite successful plantation-based industries have developed; the radiata pine plantations in New Zealand were developed on such land starting in the 1930s (Box 3). Land in sub-Saharan Africa, sometimes abandoned due to conflict or urbanization, may be suitable for plantation development, and may provide for high growth rates. For example, good-quality pulpwood plantations in Brazil can yield 60 m³/ha/yr. In contrast, good-quality plantations in the US Pacific Northwest might yield only 8m³, and in the US South or New Zealand 20 m³. Acacia mangium plantations in Vietnam established on former hill-side farms have grown exceptionally well.

Higher growth rates do not necessarily lead to higher returns. Returns from timberland depend entirely on the cost of acquiring the land, the cost of production (usually high), growth rates, and log prices. But the higher growth rates do mean that the economically optimal rotations are shorter. Shorter rotation ages may bring greenfield developments within the reach of institutional investors. While few investors would be willing to wait 25 years for initial cash flow from a greenfield development in the US South, they might be willing to wait six years in a greenfield development in Brazil. High growth rates and short rotations are have pros and cons. Short rotations mean that silvicultural interventions have to be made on a very timely basis, and that the costs of extending rotation (in light of the discussion above on option values) are high. In such regimes, forest management planning is done on the basis of months, rather than years.

iv. Import substitution/higher growth rates in domestic demand

Emerging and frontier market countries may have poorly developed forest sectors. As a consequence, meeting domestic demand relies on imports rather than domestic production. Where growth in domestic demand is high, these factors offer opportunities to forestry investors. Because most forest products have high transportation costs relative to value, substituting domestic production for imports can transfer those transportation costs into margin for domestic producers. To greatly simplify the matter, timber prices will rise if the growth rate in demand exceeds the growth rate of trees available to meet that demand (Kallio et al., 1988). High growth rates in domestic demand put pressure on local timber markets, opening the door for the development of domestic timber resources. Pension plans can play an important role in supporting such development, and reap the benefits of rising timber prices that may not be available in developed economies.

v. Compression of exit discount rate

As a country’s economy grows and diversifies, the risks of FDI usually fall. As the risks fall, the discount rate used to evaluate investment opportunities usually falls. All else being equal, the present value of the cashflows a forestry investment provide will rise as the discount rate used to calculate falls in NPV. The increasing present value of the cash flows should provide higher sales value on exit than otherwise. Reduction in discount rates have been a major factor in the increased value of US timberland since the 1990s, leading to high returns in the early years of the asset class.

Investor activities can contribute to a discount-rate reduction by reducing the risk in the timberland investment. Risk-reduction activities include improved inventory information, an accurate geographic information system, and sophisticated stand-record and forest management planning systems. They include improvements to the road system and to fire control measures. Improved transportation from the forest property to markets reduces both transportation costs and market risk. Well-structured offtake agreements can deepen and diversify manufacturing activities need to extract value from standing timber. All of these activities should improve the exit value of a forestry asset.
What Are the Impediments to Increased Pension Fund Investments in Forestry in Emerging and Frontier Markets?

Some impediments to investment are unique to emerging and frontier markets. Chapter III outlined some reasons that pension plans may not wish to invest in forestry. All of those factors apply equally to developed economies, and to emerging and frontier market countries; this chapter covers the particular challenges faced by the latter.

i. Pension regulations preclude, limit, or unduly penalize investments in illiquid assets

Pension plans may be prohibited from investing in certain asset classes, or the risk-adjusted capital weights on investments in such asset may be so high as to make investments impractical. Governments regulate pension plans to ensure that plan participants have a reasonable probability of receiving the payments that they expect. Pension regulators are naturally, and perhaps necessarily, concerned about asset classes that seem ‘exotic’. While prudence is warranted, a substantial body of peer-reviewed literature suggest that timberland, properly managed, is a comparatively low-risk investment. There is at least half a century of experience of institutions investing in timberland (and eight centuries going back to the Swedish Church’s investment in the entity that became StoraEnso). Pension regulators in emerging and frontier market countries might take advice from peers in Uruguay and Brazil, where there is substantial investment in forestry by domestic pension plans (see Box 7).

40. For example: Damodaran; http://pages.stern.nyu.edu/~adamodar/
When it comes to the regulatory restrictions on pension plans investing in forestry, global pension plans generally fall into two camps. First are the large, often public, pension plans from countries such as Australia, New Zealand, the US, Canada, and Europe. These funds operate either outside regulatory frameworks (being subject to their own acts) or are bound by the 'prudent person rule' and not bound by various restrictions, including those on specific asset classes. These funds invest in forestry assets both domestically and internationally, either directly or via TIMOs.

Pension plans in emerging markets are subject to more restrictive investment regulations. In many countries, pension plans cannot invest directly in real assets – including land – and therefore have to invest in forestry assets indirectly via fund vehicles and collective investment schemes, or by gaining exposure to the sector via public equity holdings in paper and other companies. Although most countries do allow investment in these vehicles, it is normally restricted to a small percentage of their portfolios – between 5 and 20 percent on average. Sometimes the asset class is termed ‘private equity’, sometimes, more broadly, as ‘alternative assets’. Most countries regulations also have an asset allocation for real estate, generally of around 10 to 20 percent, under which forestry assets could also be housed.

Pension plan regulators generally do not consider forestry separately in their regulatory frameworks, and indeed may not even be aware that this can be an asset class for pension plans. For this paper, a survey was circulated to members of the International Organization of Pension Supervisors (IOPS) which represents pension supervisors globally. Responses confirmed that in almost all cases pension plans are not restricted by regulations from investing in forestry, although one country mentioned that private equity investment is not allowed, which could restrict investment in the asset class. However, in only three countries – Australia, Austria, and South Africa – were the regulators aware that pension plans in their jurisdiction have invested in forestry. Even in those countries, the regulators did not collect specific details on these investments. Notable from the survey was the number of regulators who were not aware that forestry could be an investment asset class for pension plans. Others noted that although these investments could be attractive for pension plans in their jurisdictions, barriers to investment exit such as a lack of information, the difficulty of understanding these investments, and returns potentially being too low.

Pension funds interviewed confirmed that their investments are mostly made under their private-equity allocations. As most allocations are still small, none found the asset class ceiling to be a binding factor restricting their investments in the sector to date. However, this could become a challenge in future if allocations were to rise significantly – as has been the case with infrastructure investments in some countries. As infrastructure investments – particularly infrastructure debt – are generally more secure and offer lower returns than private equity, it is difficult for these investments to ‘compete’ for space in the same limited allocation ‘bucket’. Regulators have consequently separated infrastructure into its own asset class for allocation purposes in some countries, like Colombia. In addition to allowing more space for investment, this is also seen as an important ‘signal’ from regulators that they consider this asset class as acceptable for pension plans. If forestry investment by pension plans were to increase significantly in future, similar carving out an allocation asset class for pension plans may need to be considered.
BOX 7 - Case Study – The Experience of Uruguay and Brazil

Pension plans in two emerging market countries – Uruguay and Brazil – were found to have significant investments in forestry. These case studies are based on interviews with the countries’ pension regulators, with investors, and their legal representatives.

URUGUAY

The old-age pension system in Uruguay was reformed at the end of 1995, establishing a two-tier system consisting of a publicly managed social security system and a mandatory private pension system. The latter is a fully-funded defined contribution system, where participants’ contributions are accumulated in individual accounts, managed by private pension fund management companies (Administradoras de Fondos de Ahorro Previsionales, AFAP).

The pension plans in Uruguay offer a rare example of successful investment in forestry assets by domestic institutional investors. Although pension funds in Uruguay invest domestically mainly in government bonds (which make up over 50 percent of their portfolios), they also have relatively substantial investments in unlisted assets – around 15 percent of their total $14 billion portfolios. This is due to local historical factors, stemming from the relatively under-developed nature of the domestic capital markets. Following governance and investment challenges, the securities regulator created special purpose vehicles (SPVs), set up as financial trusts to manage investment in real assets, through which pension plans have to invest. Regulatory requirements establish what these trusts can invest in, the experience required of the manager of the trust, and reporting requirements, inter alia. The SPVs can invest in a range of direct assets, from infrastructure to private equity – including forestry.

Twenty-three SPVs now operate, with the first forestry fund established in 2011. Six forestry funds – five domestic and one international manager – now form the market, with $750 million collectively under management, and the largest fund dominating with investments of over $500 million. 90 percent of the SPV investment comes from the domestic pension plans, comprising around 5 percent of the pension fund’s portfolios. Previously, one investor could own 100 percent of an SPV, but this was reduced to 70 percent in June 2020, to allow smaller investors to be able to access investment opportunities. International pension funds have also invested in Uruguay: the New Zealand Superannuation Fund, for example, has had some investments via a global forestry fund.

The pension plans have been attracted to the asset class by the low correlation to the rest of their portfolios and the relatively attractive returns, with approximately 9 percent nominal return annually. The funds have been well managed by experienced managers with long track records, and consequently have not faced the challenges experienced by SPVs investing in other sectors, such as real estate. Managers of SPVs have to put a minimum 3 percent of their own investment into the funds they manage – several of the forestry managers invest above this floor. Fees are generally in the 1 percent range (management fee, plus 10 percent success fee over a hurdle rate). The strong management track record has also enabled the pension plans to avoid environmental and social risks experienced by institutional investors in some other global forestry investments. The domestic forestry funds do not yet invest in carbon markets, but have expressed openness to considering it. A key lesson from the Uruguay experience is that regulatory structures and investment vehicles can be created, which allow domestic pension plans to take advantage of investment opportunities that can be offered by the asset class.

BRAZIL

The Brazilian pension system consists of various schemes: (i) a mandatory public pay-as-you-go (PAYG) system known as General Social Security Regime (RGPS); (ii) the Pension Regimes for Government Workers (RPPS); and (iii) the Private Pension Regime (RPC), consisting of occupational and Individual plans consisting of closed pension funds and open pension funds, the latter run by insurance companies and not tied to particular employers. The voluntary, private pensions operate in a highly regulated environment. The National Superintendence of Complementary Pensions (Previc) oversees...
closed pension funds, which can be either defined benefit or defined contribution in nature. Open private pension entities are supervised by Superintendence of Private Insurance (Susep). Both are linked to the Ministry of Finance.

As in Uruguay, the investment regulations for closed pension funds do not allow for direct investment in real assets, including land. This must be done by investment fund (collective investment vehicle) structures. Pension plans may invest up to 20 percent in alternative investments (up to 15 percent can be in private equity) and 20 percent in real estate. Most forestry investment is via private equity style funds, and therefore falls under the 20 percent alternative investment ‘bucket’ via FIP investment participation fund structures – forestry funds make up less than 10 percent of these investments overall. Pension plans also have some exposure to the sector via public equity holdings – for example, via paper company Suzano. Total assets held by the pension plans amount to around $220 billion, or 12 percent of GDP.

Around a dozen of the larger pension plans invest in forestry funds, most on a limited scale with only a couple of funds having a meaningful investment. International pension plans (from US, Canada, Australia, and Europe) have also invested in Brazilian forestry assets, mostly via global funds – foreign ownership of land in Brazil is restricted. Domestic pension plans have been behind their leading international peers in terms of interest in the sector, but are said to be catching up, not least as interest rates have been falling and the funds are looking to new asset classes to maintain returns. Previc does not break out the alternative investments by underlying category, but overall forestry investment by domestic pension plans consists of a tiny portion of their overall portfolios at less than 1 percent. The domestic pension plan of Swedish parent company Ericsson is an outlier with a more significant allocation, due to its experience in investing in the asset class from the parent company’s pension plan. There is said to be plenty of room for the investment by domestic funds to grow.

Forestry investment funds only really started in Brazil around 10 years ago when manufacturing companies started to offload their forestry assets from their balance sheets. Around 70 percent of the forestry funds are run by international managers with the balance of 30 percent domestic. As with the investment structures in Uruguay, there were some challenges with the governance of funds from other sectors. However, regulations were tightened in 2012 (for example by requiring co-investment from managers) and the forestry funds, which were relatively new at the time, were relatively unscathed. The largest domestic fund invests mostly in greenfield assets, with plantings on degraded land – mostly old cattle ranches. Real returns have been in the range of 10 percent. Pension plans are attracted to the asset class for the diversified returns and the inflation hedge they offer, as well as their environmental, social and governance angles – regarding governance, investments are in assets certified by third parties. Many of the funds also have the added security of having an ‘off taker’ for their timber, with contracts prearranged with Suzano and other major clients: price is set on planting, with only the volume of output fluctuating. Other funds sell their pulp output into the international markets, which, while providing more volatile returns, have provided an inflation hedge. The domestic funds have not yet invested in the carbon markets – the local market is still small – but some are seeking certification to do so in future.

ii. Small investable universe – undeveloped potential

Despite favorable growing conditions, the enabling environment needed to support forestry development is lacking in many emerging markets. Developing countries by definition have developing economies. While some of these countries have vibrant forest sectors – like Vietnam and Indonesia – others do not. Absent a strong domestic forest sector to consume domestic timber production, investors have to rely on exports, perhaps the most volatile market of all. This means that some places that might be superb for growing trees may be poor bets for forest investments – unless the forestry investor is either prepared to invest in manufacturing, or partner with a company that will do so. Both approaches increase the risk associated with a timberland investment. It is inevitable that the forestry investor would take on at least some of the manufacturing risk, either by owning and operating the manufacturing facility themselves, or through the nature of timber supply agreements that would be necessary to attract a partner. The manufacturing risks could range from the simple risks of operating sophisticated equipment in remote locations, to the greater operational leverage of manufacturing vs. tree growing and the risks of development new markets.
Forest restoration pledges could provide incentives to develop local markets. Section I. xi. notes the large potential for forestry investments to be part of a solution to addressing the climate crisis. Bastin et al. (2019) have found around a billion acres of marginal land that could potentially be available for such investments. Cai et al. (2011) confirm this finding. They develop four scenarios for cellulosic biofuel plantings in Africa, China, India, South America, and the US, concluding that between 320 million and 1.107 billion hectares of marginal or abandoned land is available for plantation establishment. Some forestry investment professionals are skeptical that this much land is available on commercially attractive terms. But if even only a small fraction were, this would present pension plans with a substantial new investment opportunity.

The Bonn Challenge is a multilateral initiative launched by the Government of Germany and the International Union for the Conservation of Nature (IUCN) in 2011 to restore 150 million ha of degraded and deforested landscape worldwide by 2020, and 350 million hectare by 2030. Achieving these goals would deliver material progress towards the program of forest-based natural climate solutions discussed elsewhere in this report. It would also provide enormous opportunities for rural economic and social development, along with improved environmental outcomes. The Challenge works through national, and in some cases sub-national, pledges. In 2017, the cumulative pledges exceeded the initial 150 million hectare target, although the Challenge fell short of meeting its goal by the end of 2020. However, these pledges are a useful benchmark to measure commitments to reforestation, afforestation, and sustainable forest management.

A major impediment to achieving these pledges (or any other forest management program) is the availability of financing – which is where pension plans (domestic and international) could play a role. In many countries, forest lands (both actual and potential) are owned and managed by the government. Public budget constraints can hinder investment in good forest management. In other countries the lands are owned by the government but leased to private entities. In these situations, both incentives and policy can drive private expenditure. If, for example, reforestation post-harvest is mandated by the government, then private expenditure is only likely to reach the regulated minimum. On the other hand, if the private entity also has an economic stake in the long-term economics of expenditure on reforestation and subsequent forest management, expenditure may be greater. Weak land tenure rights in many countries serve as a barrier to investors having a long-term economic stake and hinder private investment. Pension plans, particularly domestic plans, may have a unique role to play in achieving the Bonn targets. Table 5 shows the countries that have both a significant Bonn Challenge Pledge and substantial domestic pension assets. Noting that appropriate enabling conditions are required to unlock these potential investment opportunities (see following sections), the countries' 'Doing Business' and 'World Governance Indicator' rankings are also shown.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>Bonn Challenge Pledge (million ha)</th>
<th>Domestic Pension Assets, 2019 or latest (% GDP)</th>
<th>Doing Business 2020 Ranking (Score out of 100)</th>
<th>Worldwide Governance Indicators (Ranked from -2.5 to 2.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>15.28</td>
<td>12</td>
<td>154 (59.1)</td>
<td>-0.29</td>
</tr>
<tr>
<td>Chile</td>
<td>0.5</td>
<td>81</td>
<td>59 (72.6)</td>
<td>0.93</td>
</tr>
<tr>
<td>Colombia</td>
<td>1.0</td>
<td>27</td>
<td>67 (70.1)</td>
<td>-0.22</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1.0</td>
<td>32</td>
<td>74 (69.2)</td>
<td>0.53</td>
</tr>
<tr>
<td>India</td>
<td>21</td>
<td>2</td>
<td>63 (71)</td>
<td>-0.19</td>
</tr>
<tr>
<td>Kenya</td>
<td>5.1</td>
<td>13</td>
<td>56 (73.2)</td>
<td>-0.60</td>
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<tr>
<td>Malawi</td>
<td>4.5</td>
<td>15</td>
<td>109 (60.9)</td>
<td>-0.57</td>
</tr>
<tr>
<td>Mexico</td>
<td>12.17</td>
<td>16</td>
<td>60 (72.4)</td>
<td>-0.44</td>
</tr>
<tr>
<td>Nigeria</td>
<td>4.0</td>
<td>7</td>
<td>131 (56.9)</td>
<td>-1.17</td>
</tr>
<tr>
<td>Tanzania</td>
<td>5.2</td>
<td>8</td>
<td>141 (54.5)</td>
<td>-0.58</td>
</tr>
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<td>Uganda</td>
<td>2.5</td>
<td>9</td>
<td>116 (60)</td>
<td>-0.62</td>
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<tr>
<td>Uruguay</td>
<td>0.2</td>
<td>28</td>
<td>101 (61.5)</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Sources: The Bonn Challenge. Current Pledges. bonnchallenge.org/pledges
OECD Global Pension Statistics. Pension funds’ assets as a % of GDP. stats.oecd.org/Index.aspx?DatasetCode=PNNI_NEW

42. Pledges to the Bonn Challenge represent the land a country (or jurisdiction) has pledged to restore according to the Bonn Challenge’s definition of ‘forest landscape restoration’ (FLR). FLR prioritizes both biodiversity conservation and human livelihoods. It is about using land sustainably in a variety of ways, such as new tree plantings, protected wildlife reserves, regenerated forests, ecological corridors, agroforestry, riverside plantings to protect waterways, managed plantations, and agriculture. These figures include sub-national pledges.
43. Average of scores of 5 indicators: political stability, government effectiveness, regulatory quality, rule of law, and control of corruption.
In conclusion, in some countries there are substantial pension plans, which could potentially invest in forest projects. This is particularly important in the absence of resources from government budgets to invest in forest-based natural climate solutions in general, and Bonn Challenge pledges in particular. Pension plans are (or should be) fiduciaries for their plan participants, and such investment would need to be made on their financial merits. However, as this report demonstrates, forestry investments have been, and can be, sources of strong risk-adjusted returns and portfolio diversification. One solution might be to partner with larger OECD plans that do have such experience. There could be gains on both sides: the incoming investor sees lower risks if partnered with a domestic one; the domestic one sees lower risks being partnered with one experienced in timberland investment management. Box 8, below, provides further details on this type of co-investment.

iii. Lack of understanding and experience with forestry investments by domestic pension plans

Forestry investments are, in general, a complicated asset class to understand, and especially so in emerging and frontier markets where there has been little of this kind of investment. This has been noted in more detail in Section II. i. Pension plans in these countries are understandably reluctant to move into an opaque asset class, and will need to partner with experienced managers, and potentially with other experienced investors.

Kenya, Tanzania, and Uganda are particularly interesting, as their pension regulations consider investment across the East Africa Community the same as domestic investment (Table 5). There are also large social security funds in each of these countries which could potentially act as co-investment partners.

44. Heatmap based on an average of scores in the following areas: size of Bonn NDC, domestic pension assets as a percentage of GDP, Doing Business 2020 score, and Worldwide Governance Indicators scores (of political stability, government effectiveness, regulatory quality, rule of law, and control of corruption).
The search for long-term assets that deliver non-correlated, inflation-related returns has been driving pension plans interest in infrastructure investments. As with forestry, investment in infrastructure projects has been mostly the domain of the large, public pension plans in countries such as Canada and Australia. They have built up considerable expertise and experience in investing in this asset class domestically and globally, through direct investments (in the case of the Canadian funds) and through specialized infrastructure funds (in the case of the Australian funds).45

In order to increase their investments, pension plans domestically, regionally, and globally are increasingly coming together to collaborate and coinvest in the infrastructure asset class. This allows them to pool funds to obtain the necessary scale to participate in these investments; to share and drive down costs (making sure their investments are managed in the interests of their fund members); and to share knowledge of the asset class on the one hand (on the part of the experienced international investors) and knowledge of the domestic investment environment and opportunities on the other (on the part of domestic pension plans). This united approach is helping pension plans drive the creation of a pipeline of investible projects. It also assists in dialogue with regulators to ensure that the regulatory framework is supportive of and does not impede their investment into the infrastructure asset class.

These co-investment and collaboration mechanisms can take different forms:

• **COLLABORATION PLATFORMS:** Mobilizing Institutional Investors to Develop Africa’s Infrastructure (MiDA) is an initiative which exposes US public pension plans to opportunities for co-investing with African counterparts in African infrastructure. The program has led to dialogue between the US funds which are already experienced infrastructure investors with domestic pension plans in Kenya and South Africa, and to the US pensions investing almost $1 billion into pan-African infrastructure investment funds. A Canadian G7 Initiative launched in 2018 aims to enhance expertise in infrastructure financing and development in emerging and frontier economies — including training in investment in the asset class offered by leading Canadian pension plans (Ontario Teachers, CDPQ) to domestic pension fund managers.

• **CO-INVESTMENT:** this can be structured on an ad hoc basis with large pension plans co-investing on a direct basis via syndicates and other arrangements, as the large Californian public pension plans have done. OMERS, the leading Canadian pension fund, has established a more formal Global Strategic Investment Alliance (GSIA) to co-invest with international peers such as the Government Pension Investment Fund (GPIF) of Japan.

• **CO-OWNERSHIP OF FUND MANAGER:** pension plans in the UK and Australia invest in infrastructure via specialist infrastructure funds, run by a specialist manager which is in turn owned by the pension plans themselves – IFM Investors in Australia, and the Pension Investment Platform (PIP) in the UK.

• **FUND/INVESTMENT STRUCTURES:** a group of Kenyan pension plans have formed the Kenya Pension Fund Investment Consortium (KEPFIC) which is looking to invest in domestic infrastructure products through a specialist fund to be established. In India, the Canadian pension plans such a CDPQ have been investing in infrastructure projects through specially created Infrastructure investment trusts (InvIT), which are listed instruments (along the lines of REITs). In Mexico, pension plans gain access to unlisted investments such as infrastructure, through investment vehicles known as FIBRAs.
iv. Lack of information on historic and prospective returns

The only available data on timberland returns apply to investments in the United States, and this imperfectly (see Section I. i. above). Although a variety of measures suggest that timberland returns will be higher in emerging and frontier market countries, the empirical data is scarce. In the early days of the modern era of institutional timberland investment, the lack of this sort of data stalled interest in the asset class. In 1994, the NCREIF Timberland Property Index started publication and provided reliable data on timberland returns. No index of that sort for investments in emerging and frontier markets is apparently under consideration as at this writing.

This lack of historical evidence on returns obliges analysts to rely on proxy return measures driven by better-recorded timber prices. This is similar to the situation early in the development of the asset class in the US with proxy measures such as the JHTI. As has been shown, these proxy measures gave a reasonably good approximation of returns, and particularly of return volatility.

v. Lack of liquidity

Because few institutions make forestry investments in developing economies, almost by definition the liquidity of these investments is poor. Poor liquidity is not only a risk factor, but means that investors have to count on ongoing operational cash flow over perhaps many years to generate returns with little anticipation of asset-value appreciation in the near term. This is especially problematic in developing economies, as one might expect the risk premia for these countries to fall especially rapidly as their economies grow and stabilize. A falling risk premium would lead to a lower discount rate and an increase in appraised asset value, but that increase if of little value if the asset cannot be actually sold.

vi. Complicated and insecure land-tenure arrangements for forest land

Institutional investment in forestry has been most active in countries where there are straightforward and secure legal rights to land and timber. As mentioned previously, the modern era of institutional investment in timberland started in the United States, where land rights are constitutionally guaranteed, land law is well developed, and an array of institutions, including those specialized in timberland transactions, support these rights. Only after considerable experience in the United States did institutions venture cautiously into other countries with similar British-based land law, notably Australia and New Zealand, even though, in some cases, these investments were on essentially leased lands.
BOX 9 - Canadian Land Rights

Canada offers a good case study in the impact of land tenure on the proclivity of institutions to invest in forestry. Canada has both private land and forestry concessions. The private land has, in some respects, stronger rights than in the United States – for example, a Torrens land registry system, where the government guarantees land ownership. The concession rights differ between provinces, but in some cases are area-based, so a private entity has the rights to and obligations arising from trees in a specific area. Such an area-based concession could easily be held by a pension plan.

British Columbia in an interesting case. Pension plans own virtually all the private forest land in the province, but none of the concessions, even though there is no legal impediment to them doing so. The reluctance to own forestry concession arises from the ever-changing regulatory system governing these concessions. For forestry investments that take years to pay off, a history of changing the royalties paid to the government for concession rights and the shifting and increasing financial obligations of concession ownership deter institutional investment.

Other forested countries – including Russia, Malaysia and Indonesia – have concession systems similar to the Canadian ones. Still others are developing such systems. Concession systems, rather than the outright creation of fee-simple private property rights, arise for many reasons. These include a reluctance to alienate land considered as a national patrimony; corruption, where government officials who control concessions can profit from the threat of ever changing regulations; uncertainty over what parties have actual or traditional usufruct rights to the land; and a general inability to enforce property laws.

None of this is to say that traditional rights should be overlooked, just that uncertainties in concession structure and enforcement comprise a significant impediment to institutional investment. As described in Box 3, New Zealand created a system of forestry concessions that not only respected indigenous rights but also attracted massive amounts of institutional capital.

vii. Lack of access to markets for logs and final products

A lack of supporting infrastructure is a barrier to forestry development in many emerging markets. Section IV. ii. above, noted the general problem of weak forest sectors in many emerging and frontier economies, along with the concomitant opportunity for import substitution. A related problem is poor transportation infrastructure, including both internal road systems and ports. Forestry requires considerable land per unit of economic output. That means it is conducted more or less exclusively in rural areas. Rural road systems in many emerging and frontier countries are inadequate. Poor internal road systems mean that it is difficult and costly to get forest products to the urban areas where they are mainly consumed. High transportation costs and long transportation time erode the margins that accrue to forestry production, and reduce the potential returns from forestry investments.

Port infrastructure in many of these countries is also inadequate. Poor port infrastructure provides a non-tariff barrier to imports, propping up profits for domestic manufacturers, but it also means that these same manufacturers do not have profitable access to foreign markets. This is particularly problematic for forest products manufacturing operations with significant economies of scale, such as pulp mills and, increasingly, solid-wood products facilities. The production of a single facility could overwhelm domestic demand, requiring exports to absorb the surplus. Inefficient port facilities hinder such exports, and might proscribe investment in such manufacturing altogether. Without a market for logs, no forestry investment can take place. Improved rural transportation infrastructure and port facilities support general development goals – although environmental and social safeguards need to be carefully observed. If thoughtfully designed with the forest sector in mind, they could also support forestry investment. Additionally, governments could identify areas suitable for timber plantations that leverage existing transportation links. Once clusters of producers have formed, the government could make plans to upgrade the appropriate infrastructure or offer support to lower producers’ transport costs (Gavryliuk, 2020).
viii. Country risk

‘Country risk’ is a catch-all phrase referring to political, social, cultural, and legal risks of foreign direct investments in a specific country. Measurement of these risks collectively is difficult. Such measures as Damodaran’s Equity Risk Premium,\(^\text{46}\) Transparency International’s country ratings, spreads on credit default swaps, and the World Bank’s ‘Doing Business’ rankings are useful as general measures, but do not reflect forestry-specific factors such as security of rural land tenure.

Some forms of country risk, especially absolute expropriation, can be insured. However, the process of obtaining such insurance is complicated and costly so likely is economical only for large projects where the risks are significant. Partnering with institutions like the International Finance Corporation (IFC) provides a measure of security, because most countries do not want to provoke such organizations, by, for example, simply expropriating the land or trees. A great danger in forestry investment is ‘creeping expropriation’, where regulations, fees, or social expectations ratchet up over time, sapping profits from the investment until it is less and less valuable and may become worthless. This occurs in developed countries as well as in less developed ones.

Pension plans, especially domestic ones, should in principal be immune from at least some country risk factors. As discussed in Box 10, one way for international pension plans to address country risk is to partner with domestic plans to invest.

ix. Risks associated with Foreign Currency Exchange

Two key risks arise with respect to foreign exchange. First, some countries have controls of repatriation of local currency back to USD, EUR, or other currencies. Such controls hinder foreign direct investment even if they have historically worked smoothly. Having returns trapped in a country with a currency that cannot support plan liabilities is obviously problematic. Second, fluctuations in foreign current exchange rates (FX) add to the volatility of forestry returns. This is true both for foreign investments in a country and for possibly for domestic investments as well. Laws and regulations require many pension plans to report returns on a ‘mark to market’ basis. That means that both cash flows and asset values are affected by changes in FX. Paying a plan’s cash liability requires that cash flows have to be translated back into home-country currency. But translating the asset value changes due to FX fluctuations simply adds to the reported return volatility of an asset that the owner has no intention of selling.

It is virtually impossible to purchase financial hedges against these currency fluctuations. Cash flows from forestry investments are not as predictable as, for example, bond yields. Locking cash flows in at any specified level for the purpose of an FX hedge could lead to loss of asset value as timber prices fluctuated (this is similar to the problem of debt-financing of timberland discussed in Appendix I).

It is difficult to conceive how an investor could hedge the value of a forest asset against fluctuations in FX. In forestry investments, asset values are typically large compared with annual cash flows. That means that the volatility in asset values due to changes in FX have a greater impact on the volatility in reported returns than does the volatility of cash flows. Thus, the more important factor is the one that is impossible to hedge. The only meaningful exception to this general conclusion is the use of a short-term hedge at the time a binding purchase and sales agreement is executed for the asset. At that point, since the amount and timing of the cash flow is known, it is possible and may be desirable to execute an FX hedge.

Finally, the FX risk of a forestry investment may not be apparent just from the country where the investment is being made. New Zealand offers a good example of the problem. Log exports make up a large fraction of the market there. Pacific Rim log exports are, like many commodities, priced in USD. Because forest owners have the unfettered choice of exporting logs or selling them into the domestic market, domestic log prices are, in effect, priced in USD even if they transact in NZD. As a consequence of this market structure, a forestry investor in New Zealand effectively receives revenue in USD. Because some forestry production costs, especially labor, are priced in local currency, a forestry investment in New Zealand is actually short NZD, not long. A similar situation may exist in pulpwood markets in Brazil, because most of its pulp is exported and priced in USD. In short, the FX risk of forestry investments must be considered on a case-by-case basis.

46. http://pages.stern.nyu.edu/~admodar/
**BOX 10 - Case Study - East Africa Experience**

East Africa, and indeed most of sub-Saharan Africa, offers great potential for forest-sector development based on green-field plantations. Advantages include:

- considerable land not currently used of for food production is apparently available.
- the high innate productivity of this land.
- population and economic growth driving strong growth in domestic demand.
- much of Africa’s energy needs are met by wood.
- many countries import considerable amounts of wood products.

Add to this the rural employment, biodiversity benefits, and the opportunities to store considerable amounts of carbon, and the potential is evident.

Between 1995 and 2008 three privately funded entities gained access to 355,000 ha of nominally vacant, productive and plantable land in Mozambique with the intention of establishing high-yield plantations of pines and eucalypts both for domestic consumption and export. The entities include:

- Green Resources, a Norwegian company headquartered in Tanzania and first financed primarily by Norwegian investors but with a second round financed by the Phaunos Timber Fund, an LSX-listed timber fund;
- Global Solidarity Forestry Fund, an investment entity started by the Swedish Church, Diocese of Västerås. Other investors included the large Dutch pension plan APG, the Harvard University endowment, and a Danish pension plan advised by the International Woodland Group, a well-experienced Danish timberland investment advisor;
- UPM Kymmene), one of Europe’s two largest forest products companies, and headquartered in Helsinki.

In 2014 GR acquired UPM’s plantations. Also in 2014, GR and GSFF merged as Green Resources. The combination created what is today Africa’s largest private forest plantation company outside South Africa. Green Resources not only owns plantations, but also industrial facilities located in Sao Hill, Tanzania. It also holds cutting rights in the Sao Hill *Pinus patula* plantations previously established by the Tanzanian government with World Bank support, and in Lichinga, Mozambique and Jinja, Uganda. Early plantations have matured. With its streamlined and focused management, GR is now generating positive operating cash flow.

These various entities received debt financing from bilateral development organizations, including a 6-year mezzanine loan at 14 percent interest from Norfund, Finnfund and FMO in 2012, and earlier smaller loans for industrial expansion from IFC and Norfund. African Development Bank and EIB signed term sheets for large greenfield planting projects, but these did not materialize due to a lack of equity finance from Green Resources. Table 6 below shows some key statistics about these entities.

**TABLE 6 - Summary of Plantation Forest Area in 2015**

<table>
<thead>
<tr>
<th>ENTITY</th>
<th>Year Founded</th>
<th>Area Planted (Ha)</th>
<th>Area of Plantable Land</th>
<th>Non-Us Bonds</th>
<th>Real Estate</th>
<th>Farmland</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR Group</td>
<td>1995</td>
<td>28,000</td>
<td>180,000</td>
<td>38,000</td>
<td>130</td>
<td>40</td>
</tr>
<tr>
<td>GSFF</td>
<td>2005</td>
<td>11,000</td>
<td>30,000</td>
<td></td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>UPM</td>
<td>2008</td>
<td>2,300</td>
<td>10,000</td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>GR Mozambique pre-merger</td>
<td>2007</td>
<td>4,500</td>
<td>260</td>
<td></td>
<td>260</td>
<td>40</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2007</strong></td>
<td><strong>45,800</strong></td>
<td><strong>355,000</strong></td>
<td><strong>38,000</strong></td>
<td><strong>260</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

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47. This account is drawn from the authors’ own knowledge, along with interviews with key participants in the various investment entities. No comprehensive assessment of these efforts has been made. This account largely excludes discussion of the Mozambique plantations established by Navigator (formerly Portucel) in Mozambique. These were not the result of institutional investment, but were apparently established by this integrated Portuguese pulp and paper company for either consumption in a mill to be built in Mozambique or to be exported as chips, possible to a company mill elsewhere.
The total investment, equity, and debt to date amounts to $300 million, making this by far the largest-ever private investment in emerging/frontier markets made. One can see these efforts as the prototype for afforestation activities designed to reduce atmospheric concentrations of CO2. Despite the large scale of these investments and their importance in demonstrating FNCS, no comprehensive assessment of the successes and failures has been made. The following is an account drawn from some ‘grey’ literature on these investments along with interviews with some of the key participants. While thought to be accurate, it is by no means comprehensive.

**Initial greenfield development in emerging market countries is costly.** Based on the data in Table 6, the average cost of planted hectare was a slightly over $7,800/ha. According to one observer, the 183,000 ha of greenfield plantations established in the region have an average cost of around $6,500/ha. Poulsen et al. (2019) suggest an average cost of $6,400/ha. Portucel spent $110 million to plant 13,200 ha, or about $8,300/ha (http://en.portucelmocambique.com/). It is important to note that these costs include land acquisition, expenditures on social programs, nursery facilities, and some industrial investments. As a result, the actual cost of establishing another hectare is less than these figures suggest, perhaps considerably less. Poulsen et al. (2019) estimate that the cost of planting the ~125,000 ha of commercial plantations in East Africa since 2000 ranged from $4,000 - 6,000/ha. These figures are three to four times the cost of greenfield plantations in Brazil, and four to six times the cost of re-establishing plantations in the US South, Australia or New Zealand (Cubbage et al., 2020). Poulsen et al. (2019) suggest that, building on lessons learned and extant infrastructure, planting costs in East Africa might be reduced by half, to perhaps $2,500/ha. There is no technical reason that the marginal costs of planting an additional hectare should be higher in East Africa than for, for example, greenfield developments on degraded pastoral land in Brazil. Achieving similar costs will require well-developed and tested plantation management regimes, good operational management, adequate scale, a consistent annual program, factors which were not always evident in the entities that now comprise GR.

**Technical risk is significant.** Effective plantation management regimes underlie profitable forestry investments. All the entities which now comprise GR struggled with developing and implementing on an operational basis effective methods of land preparation, fertilization, species/plant-material selection, early competition control, and stand-density management and thinning regimes. These struggles are evidenced by the high plantation failure rate—of the area planted, only 83 percent developed into a plantation, and some of that area was planted more than once. In developed plantation economies, plantation success would lie in the range of 95 to 100 percent, with only a single planting. Governments, development organizations and local universities can reduce and spread these technical risks by developing information on effective plantation establishment and management regimes. These initial investors paid a lot in ‘school fees’ by learning as they developed plantations: it may be that new investors can learn from this experience and achieve greater success.

**Planation success requires adequate scale and consistent annual programs.** Regions with well-developed plantation-based forestry activities benefit from proven establishment practices tested over many years, along with a strong contractor base available to implement them. These conditions do not apply in East Africa. As a consequence, achieving reasonable unit costs requires larger-scale developments to amortize the considerable fixed costs over a larger area. These fixed costs include nurseries for plant material, trial plantings and considerable social and physical infrastructure. Portucel notes that their program included 1,500 km or roads, a nursery producing 11 million seedlings annually, the construction of 2000 barns, the digging of wells, and a variety of social programs. This infrastructure is affordable only if the scale of the plantations is large enough to reduce the unit costs. Similarly, because contractors are generally not available to implement plantation development, only a consistent annual program will support the stable well-trained workforce required for excellence in operational execution. And a consistent annual program requires consistent annual financial support.
Managing social risks is critical. The national governments involved granted vast concession areas through the apparently free and informed consent of the local people involved with the land. The developmental impact of plantation forestry has been substantial, and plantations appear to be generally welcome by the local communities. However, especially in Mozambique, the long civil war drove off the local people who once lived in these areas. Once the strife ended, they returned to the land and disputed its new uses. These dispute have not only stalled plantation development, but have also created excessive reputational risks for the institutional investors involved. GR is preparing to turn hundreds of thousands of concession area in Lurio province in Mozambique back to the government primarily because it lacks the funding to develop the plantations, and also over concerns about reputational risk.

ESG record of private plantations appears to exceed that of public ones. All of the GR plantations are managed under the FSC third-party certification scheme; none of the public forest lands in these countries have received FSC certification.

Low carbon prices impede greenfield development. GR can access both voluntary and Clean Development Mechanism markets, the latter linked to the European Trading System. Typical prices in both markets are low (less than $5/t CO2-e) due to excess supply or inadequate demand. Government regulations drive demand in these markets, and governments have simply been lax in regulating greenhouse gas emissions. Carbon prices at the estimated social cost of CO2 (commonly estimated to be around $100/t) would have a profound and positive effect on plantation economics.

Attracting market-rate private capital will require risk mitigants. Given the potential attractiveness and scale of the forest-sector development opportunity, the lack of investment strongly indicates that the risks exceed the rewards. Some measures—higher prices for carbon fixed in forests, as an example—will enhance returns. But a more direct approach might be to reduce risks. Poulsen et al. (2019) provide some useful thoughts on how a private equity fund might be structured with a junior tranche of 15-25 percent of total capital taking first losses (and second in line for profits). The junior tranche could be provided by philanthropic organizations, donor agencies or climate facilities. Unless structured specifically around the financial characteristics of plantation development—especially the lack of cash flow until the trees mature—debt is unlikely to be a helpful form of finance. Once plantations have matured, and especially if downstream manufacturing infrastructure is involved, ordinary debt financing might come to play a role.
This research discovered little pension-fund investment in emerging and frontier markets, either by developed-country pension plans or by those in these countries themselves. However, forestry investments offer the prospect of many benefits: solid financial returns; favorable rural development; and environmental benefits ranging from watershed protection to carbon storage. Forestry is among the most capital-intensive activities (Binkley, 1994) so pairing it with pension plans that have capital to invest makes sense. What steps should be taken to encourage more investment in forestry? This chapter seeks to answer that question with recommendations specific to forestry. Some foundational, enabling conditions which need to be in place for investment opportunities in emerging markets are addressed. It should be noted, however, that such general matters as improving institutions and ensuring the rule of law are beyond the scope of this report.
i. Pension sector recommendations

**Pension-fund regulators can ensure pension-fund regulations do not unduly restrict investments in forestry**

As discussed in Section II, pension plan regulation in most countries takes place via collective investment vehicles, including investment vehicles structured along the lines of private equity funds. In countries where private-equity investment is allowed, pension plan regulators could provide guidance that forestry funds can be considered under this asset class. Regulators could provide further guidance on the nature of forestry assets, and on how to assess and monitor investment in these funds. If forestry investment should increase, regulators may wish to consider creating a separate investment allocation allowance for the asset class to provide pension plans with room to invest in forestry and not be ‘crowded out’ by other assets such as private equity or real estate. This would also signal their recognition as regulators that forestry is a suitable asset class for pension plans.

**National and local governments may provide favorable tax treatment for forestry investments that do not deter – and hopefully enhance – pension-fund investment in forestry.**

Instead of direct cash subsidies, governments have successfully encouraged forestry sector development via favorable tax treatment of forestry, by means of tax subsidies. Most developed countries provide tax benefits for forestry investment. For example, for over 40 years the United States has granted forestry income favorable long-term capital gains treatment, generally leading to a far lower tax rate than if the income were treated as ordinary. For many years Australia had a program of ‘managed investment schemes’ for permanent agricultural crops, including plantations, that greatly reduced taxes on income from enrolled plantations when they were harvested. Some tax advantages may therefore be considered as part of an ‘infant industry’ strategy, and to ensure a level playing field with agriculture policy. This would be an alternative to providing planting subsidies. That said, due consideration for broader fiscal implications would be needed in developing economies with low tax takes.

**Pension plans – both international and domestic – can create alliances and platforms to collaborate and coinvest in global forestry opportunities**

Forestry investment is a new asset class for most pension plans – particularly those in emerging markets where most of the investment opportunities are likely to arise in future. Domestic pension funds in emerging markets could benefit from partnering with leading international pension plans which have experience in investing in the sector, to gain from their knowledge and expertise. In return, the international funds would have domestic partners who know the investment opportunities and investment conditions well, giving them the confidence to expand their investments to a broader set of markets. Networks could be formed between pensions plans to facilitate such collaboration and co-investment, as have arisen for investing in infrastructure (see Section IV. ii. above).

**National governments, with assistance from international institutions, can develop payment schemes for carbon credits and other environmental services linked to scientifically sound international standards and programs.**

As noted, forests produce a multiplicity of benefits beyond wood alone. Many of these benefits are not traded in markets. To ensure their production, governments frequently revert to regulation. If well-designed, such regulations ensure that a minimum level of these benefits is produced. However, a regulatory regime does not provide any incentive to produce more than the minimum. The regulations may also represent a burden on forest management and forest investment. While it may be justified, it is a burden nonetheless, and one that impedes investment.

An alternative approach is to establish payments for ecosystem services (PES) (Pagiola et al., 2002). Carbon credits represent a good example of where this approach could work well; the general principles were discussed in Section I. xi. Both theoretical and empirical evidence indicates that, when forest owners receive a payment for the carbon they store, they will store more of it. Van Kooten et al. (1995) show that

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49. In some countries pension plans are exempt from income taxes, particularly where they invest passively and not directly into an active trade or business. Two implications flow from this fact. First, how governments characterize income may be as important as how they tax it. US pension plans were able to invest in timberland because the income from the sale of standing timber (called “stumpage”) is treated as a capital gain, treated by the US tax code as passive income. This partly explains why institutional investment in timberland started in the US South—stumpage sales are that region’s most common form of timber sale. In the Northeast and Pacific Northwest, due to a far larger array of species and markets, most landowners sell logs. Selling logs is considered an active business and generates ordinary income. To retain passive income treatment, forestry investors in these regions learned to set up a “harvesting subsidiary” (which is an active business) and pay a small amount of tax on the income generated by harvesting standing timber and selling logs. Second, due to the structure of both the US capital gains tax and the Australian MIS program, the after-tax returns from a forestry investment can be higher than the pre-tax returns. This means that a taxable investor has an advantage in purchasing timberland over one that is not taxed. In this way, favorable tax treatment can actually deter pension-fund investments.
a modest payment of $10/tonne of CO2-e has a modest impact on forest management practices, while a price of $100/t may lead to a major forest management emphasis on storing carbon. Empirical evidence for this is the fact that most of the carbon offsets registered in the California regulatory market arise from forestry projects.

What is needed to implement PES schemes? First, the ‘environmental service’ needs to be measured. For some services this is relatively easy; for others it is so difficult that regulations may be the only resort. The measurements need to be rooted in science, and the measurement system needs to be practical and not too costly to apply. Conservation easements, where the forest owner sells development rights to the government or conservation organizations, have proved successful in the US because of their simplicity. Conservation easements transact a bundle of environmental services without having to measure each one - biodiversity, water, recreation, etc. – separately. Measuring the amount of carbon stored in a forest, or the cooling of stream water by streamside vegetation, have so far proved costly. Investment in developing better remote monitoring of these environmental outputs of forests might reduce the transactions costs of PES schemes, and open the way to more markets for these services. Second, a counter-party needs to be available to pay the forest owner. In the case of carbon, a cap-and-trade system could provide a market in carbon credits. Or, if a government imposes a carbon tax, it could use some of the proceeds to buy credits from those who actually removed CO2 from the atmosphere. There is precedent for this kind of arrangement: in the United States, the federal government uses proceeds from offshore oil drilling to purchase conservation lands and easements from private owners.

**ii. Forestry sector recommendations**

*National and local governments can streamline forestry regulations*

Governments logically regulate forestry practices to protect those values of forests that escape the attention of markets. Typical regulations include those protecting, water, fish, endangered species, and biodiversity more broadly. Sometimes they also regulate harvest levels as well. To encourage pension-plan investments, such regulations need to be transparent, efficient and obviously necessary. Governments may feel comfortable using internationally recognized third-party certification programs as part of their regulatory regimes. In this context, ‘transparency’ means the rules need to be clear and uniformly applied. Foreign investors need to be treated the same as domestic ones. The latitude for interpretation, especially without recourse to adjudication, needs to be as small as possible to meet the regulation’s objective. Fines for violations need to be clear and in proportion to the social damage incurred by the violation.

Efficient regulations are those with which forest managers can comply as easily as possible. Ideally the regulatory framework builds on activities that the forest manager already conducts—harvest planning, long-term forest management planning, and third-party certification, to name but three. Globally, there are many examples of regulations which could be more efficient. The requirement in China to have a forest right, a right to own the trees, and a right to harvest and transport the trees could easily be streamlined. Setting harvest levels in locations remote from the forest, as is done in Russia, leads to inefficient harvest plans and encourages illegal logging when unimplementable plans arrive from Moscow.

Do governments really need to set what they think are sustainable harvest levels? Such constraints may be reasonable in the case of rights granted over old-growth natural forests in the first pass of logging. But it is unclear that they are needed in cases of second-growth or plantation management, where institutional investors in particular have an incentive to maintain relatively stable cash flows. Rather than a government entity imposing harvest constraints, an alternative is to have that entity review forest management plans and any material deviations from them. Another option may be to establish third-party certification.
Bonn Challenge pledges provide an enabling environment supporting pension-fund investment in forestry

Bonn Challenge pledges could help overcome the lack of investable opportunities, especially in some emerging and frontier market countries—a key limitation of forestry investment. Historic institutional investment in timberland has not focused on the development of new forests via plantation establishment; the main source of new investment opportunities has been the expansion of the geographic scope of the investable universe. The Bonn Challenge provides material, large-scale governmental support for reforestation, afforestation, and sustainable forest management. Since the Challenge was launched, new analysis suggests that forest-based natural climate solutions may play a large role in reducing atmospheric levels of CO2 to help limit climate warming, strengthening the case for forest investment. Governments can use this opportunity to harness the trillions of dollars of pension plan capital to achieve these objectives.

Development organizations and national governments can provide direct planting subsidies

Basic forestry information supports sensible assessment of the desirability of forestry investment in a particular country, and perhaps in specific locations within that country. Once such an assessment determines positive results, governments sometimes subsidize plantation establishment for a period of time to encourage those investments. Successful programs have been developed in the United States, Chile, Brazil, Uruguay, Costa Rica, and perhaps elsewhere. Generally, these programs provide cash reimbursement once successful plantation establishment has been proved. Such a program can be effective for pension plans with capital to expand, but are problematic for smaller land-holders without adequate capital for the initial outlay. Such programs work better for well-capitalized entities, and this may give rise to justifiable political controversy. It is therefore important that the plantations provide important co-benefits in rural development and environmental services.

At least part of the value of a planting subsidy is likely to be capitalized into the value of the land. That is, an investor will include the cash flow from the subsidy in the financial model used to acquire the land. The amount that can be paid for the land will be higher with the subsidy than without it. As a result, some of the subsidy will be passed on to current landowners. This could be important for actually achieving the desired forest sector development in a particular region, by encouraging existing landowners to part with their land and allow it to be converted to forestry.

Development organizations, national governments and PRI loans from foundations can provide low-cost debt to targeted afforestation projects

Another way to encourage forestry investment is to provide low-cost debt structured in keeping with the cash-flow profile of greenfield projects. In Brazil, BNDES provides low-cost six-year loans repayable at the time pulpwood is harvested in Year 6. This eases the negative cash-flow profile of these greenfield developments. In essence, the government becomes the forestry investor’s partner in the plantation, but with a priority return when the trees are harvested. The government receives further benefits from taxes on the downstream activities. As a result, the cost to the government of low-cost debt might itself be low.

iii. Emerging Market enabling conditions

National governments can ensure that land-tenure arrangements are favorable to pension-fund investments

Secure land tenure supports forestry investment. Without secure land tenure, pension plans are unlikely to invest in timberland, as discussed in Section IV. vi. above. As a general matter, the most secure land tenure is fee simple private ownership and exclusive use of all the rights associated with real estate, including the underlying mineral estate, and the air above the property. The owners should be free to use the property within a stable regulatory scheme. Strict and known limits on expropriation should be combined with full compensation if land is appropriated. The liberal easement laws in the United States, permitting someone other than an adjacent landowner to hold an easement on a parcel of land, has enabled significant traffic in conservation easements. As the case in New Zealand shows, a well-designed forestry concession system can attract considerable institutional capital.

Many public values embedded in forest land can be achieved through markets and regulations, without reverting to public ownership. For example, Swedish forest law permits anyone to enter forests for the purpose of certain forms of recreation. Most countries and states or provinces have some form of forest practice regulation designed to protect environmental values of forests—clean water, fish, endangered species, and biodiversity more broadly.
Development organizations can fund, and national governments can build, forestry-specific infrastructure investments – with due consideration for environmental and social standards

Forestry investments are nearly always made in rural areas. In many countries, transportation infrastructure is poor where forestry activities do or might take place. The cost of a log delivered to a manufacturing facility is heavily influenced by transportation costs – the cost of transportation usually exceeds the value of the log standing on the stump. Reducing transportation costs by improving roads, railroads or barge traffic on inland waters improves the profitability of forestry investments, and likely of other rural activities.

Improvements need to be made with forestry activities in mind. Log trucks are heavy, so bridges must be sized appropriately. Utility poles, a valuable forest product, are long, so curves in roads and railroads need to be planned accordingly. Log trucks are sometimes stacked high, so underpass clearances need to be high enough to accommodate those loads. Log-export ports require large marshalling areas, ideally on an all-weather surface, to accumulate enough logs for a shipload.

A forestry investment can support valuable rural infrastructure itself in the form of biomass-fueled heat and power. The fuel could be derived from the residual biomass left over after logging (including tops, limbs, and broken trees) and from manufacturing residuals (sawdust, planer shavings, and trim blocks). In some places pulp mills share electrical power and steam they generate with the community.

Development organizations and banks can provide mechanisms to reduce country and currency risk

The additional volatility introduced by changing foreign-currency exchange rates has impeded pension-plan investment countries outside their home countries. The impediment is particularly great if the native currency of the investment is other than USD or EUR. It is costly, difficult, and sometimes impossible to purchase financial hedges to reduce or eliminate this source of volatility.

A specialized facility for forestry investments in emerging and frontier markets could greatly assist pension-plan investment. As described above, the greatest source of FX-induced volatility is not the translation of cash flows but rather the translation of changes in asset value. For entities that must mark assets to market as part of their regulatory accounting, the volatility associated with these FX-related swings in asset value are a major deterrent to investing outside their home country. A facility may be imagined, perhaps sponsored by an institution such as the World Bank, that would agree to offset these swings with cash paid in or out of a restricted account. When the swing is adverse to the investor, money would be paid in to the account; when the swing is favorable to the investor, money would be paid out of the account. The account would be trued up when the forestry asset is sold, or on a periodic basis along the way.

Country-level risk coverage could also be explored. Institutions such as the Multilateral Investment Guarantee Agency (MIGA) provide political risk insurance guarantees and credit enhancement to private sector lenders and investors against non-commercial risks. Such ‘de-risking’ instruments could be explored to encourage and support global pension plan investment in a broader set of countries.

In conclusion, the time is right to support greater involvement by pension plans in forestry investments. Such investments can help achieve national restoration pledges, play a role in financing forest-based natural climate solutions, and achieve the impact investment goals increasingly being set by pension plans. While challenges remain to expanding forestry as an investible asset class globally, capacity building and partnerships between experienced, international pension plans and their domestic counterparts could significantly address these shortcomings.
References


Appendix I.
The Mechanics of Investing in Forestry

Investing in forestry involves five steps: (i) developing an investment strategy; (ii) choosing an investment approach; (iii) deciding on the role of an investment manager (if any); (iv) developing and managing the portfolio; and (v) exiting. Each of these steps is discussed below.
i. Developing the investment strategy

Just as this report starts out by asking "why invest in forestry?", this is the first question a pension plan should ask. A logical way to approach the answer is to employ a formal portfolio optimization model to estimate the change in risk-adjusted returns when different percentages of timberland are added to the existing portfolio. Any constraints on investment geographies should be considered at this step, as should the currency of liabilities (all the return information presented here is reported in USD). The analysis should reflect a realistic amount of timberland given the opportunity set in the selected regions. Other important factors such as cash-flow targets or inflation hedging should be considered at this step as well.

A key part of the investment strategy is to set a return target. This might be an absolute target (for US timberland at the moment that would be around 7 percent on a nominal basis) or a relative target (again in the US, that might be 5 percent on a real basis, or CPI inflation plus 500bps; or 10-year treasuries plus 400 bps). Specifying the components of returns—cash flow and asset appreciation—is a common practice as well.

Consultants are available to assist in this process. These include generalized investment consultants, and specialists in timberland investment strategy. The former rarely have specific timberland expertise and will have to get up to speed themselves or hire one of the latter. The latter rarely have enough knowledge of other assets that might inhabit the current portfolio and will need assistance, either internal or external, to understand how timberland fits.

One important question is the role of debt in the strategy. Debt facilities are generally available for commercial-grade timberland. Lenders usually seek only recourse to the asset, with loan-to-value ratios as high as 70 percent depending on the estimated cash flows and the nature of the asset. Fixed interest rates with terms of 10+ years and a balloon payment at the end are common. Covenants generally include an EBITDA to debt-service coverage ratio (1.25 to 1.5), limitations on land sales, requirements for an annual appraisal, and regular updates to a long-term management plan.

While the use of debt can increase equity returns, sometimes dramatically, it presents unique risks for forestry investors. In times of low timber prices, it might become necessary to increase harvest levels to meet debt-service covenants. If low prices persist, the necessarily increased harvest levels may deplete the inventory of merchantable timber. There are numerous examples of devalued assets and bankrupt companies arising from this process. It is prudent to conduct the kinds of risk assessment discussed below prior to including debt on any specific property.

ii. Selecting the investment approach

Having decided on an investment strategy, the next step is to decide how to implement it.

The first task is to determine how the program is going to be managed internally. If the allocation is large enough, it is logical to hire in-house timberland investment expertise. This is not generally the case, so the program frequently is assigned to a current staff member, typically with a real-estate or other real asset background—common backgrounds include farmland and infrastructure. Such individuals can learn about timberland by discussing the topic with other pension plans that do invest in timberland, by interviewing investment managers, and by attending some of the several conferences on the subject. In-house expertise might be supplemented by the standing engagement of a timberland specialist.

By far the easiest approach is to invest in one or more commingled funds offered by the 20 or so private equity managers who specialize in timberland. These funds may be global in scope, with specific allocations to specific regions. Or they may be regional, focused on one or two countries, or regions within a country. The advantage of a global approach is the larger opportunity set and the ability to weigh investment opportunities in one region against those in another. The advantage of a more targeted approach is the manager’s likely greater in-depth expertise in a particular region. And a global approach can be crafted out of a collection of regional funds, but at the costs of (i) greater complexity of managing several managers, and (ii) the loss of capacity to weigh investment opportunities across regions. There is at least one forestry ‘fund of funds’ manager, which eliminates the first problem, but not the second. Fund-of-funds generally add another layer of fees. Consultants can assist in manager selection.

Investing in a commingled fund is relatively simple, but forfeits most control over management of the timberland portfolio, and usually fixes a terminal date for the investment. Unless the investment plan has a strong in-house team, the forfeit of control may not be a concern, but a fixed terminal date creates sev-
eral problems. First, timber and timberland markets fluctuate so a sale forced by non-economic considerations could lose considerable economic value—the largest component of cash flow in a ten-year investment typically comes from the sale of the asset. Managers usually have some flexibility in extending the exit date, but such flexibility may create a conflict of interest between the pension-plan principal and the manager agent. Second, finding, acquiring and developing a timberland property is expensive.

An open-ended structure with no terminal date solves the exit problem associated with closed-ended funds, but introduces problems of liquidity and valuation of interests on entry and exit. There is at least one open-ended timberland investment fund.

A separate account with an investment manager obviates these problems but creates others. With a separate account the pension plan allocates a certain amount of capital to a manager. The allocation may be non-discretionary, in that the pension plan considers investment opportunities that the manager presents, or discretionary, where the manager calls capital for individual investments fitting within the pre-determined strategy. The pension plan might have the authority to approve annual budgets and capital expenditures. It would have the authority to effect a sale of some or all of the properties. It would have the authority to fire the manager. With those measures of control comes an obligation to be knowledgeable enough about timberland investment to exert that control wisely. Depending on a country’s legal system, it might extend liability to the pension plan as well.

A separate account might give rise to conflicts of interest with the manager. If the manager has other investors, either funds or separate accounts, the pension plan needs satisfactory answers to such questions as: How are investment opportunities allocated among investors? How are timber sales opportunities allocated among investors? How are management costs allocated among investors?

Direct ownership of forestry assets can eliminate the problems associated with both commingled funds and separate accounts. With direct ownership, the pension plan would source investment opportunities, conduct diligence on them, then acquire and manage them. Some of these functions could be outsourced to consultants. The pension plan might organize a forest management team dedicated to one or more assets—typically the team would be drawn from the people already managing the asset. Direct ownership obviously involves a great deal more participation and timberland investment expertise than other forms of investment. In some instances of direct ownership, pension plans have clubbed together with other like-minded investors to spread the costs and risks.

No matter what approach is taken, careful consideration must be given to the legal structuring of the investment entity. A discussion on legal structuring is beyond the scope of this report. Each jurisdiction has its own rules and regulations. Considerations include limiting risks and liabilities; minimizing tax losses both on an ongoing basis and on sale of the asset; and, in some cases, the ability to repatriate cash back to the pension-plan’s home country.

### iii. Portfolio development and management

Regardless of the investment approach, the process of portfolio development involves the following nine steps.

#### A. Acquiring properties.

The acquisition process commences with the discovery of investment opportunities (I/Os). These may arise from public or private auctions and discussions with individual forest owners. Once the I/O is identified, the customary practice is to negotiate a purchase and sale agreement providing for all the key terms of the transaction, including price (and possibly a post-diligence price-adjustment mechanism). The agreement generally provides for a period of time for the buyer to conduct diligence on the property. Property-level diligence generally covers the legal review of the seller’s legal title to whatever asset is being sold; work required to detect the presence of hazardous materials or prior illegal uses; and a thorough understanding of local regulations that might affect the management of the property. The diligence would create forest management and financial models of the property. The forest management diligence would include a forest inventory or review of the Seller’s inventory. Forest inventory is a highly technical field, and there are many consultants qualified to do this work. Deviations between the seller’s inventory and that found in diligence generally drive post-diligence price adjustment mechanisms. Other diligence findings might lead back to negotiations with the seller about terms and/or price.

The inventory would be the basis for developing a long-term harvest plan using locally-validated growth and yield information. The financial plan would take the harvest plan and incorporate price forecasts, cost information, tax considerations, and debt. A legal and tax team might join at this point in the process to identify the best legal structure for holding the asset.
B. Developing long-term management plans.
Once the acquisition is completed a formal long-term management plan is generally developed and written. This plan describes what is to be done to each stand, and when each activity is planned to take place. The description is logically more detailed for near-term activities than for those in the more distant future. The initial forest management plan should look a lot like the plan developed during the diligence period. The usual practice is to update the long-term management plan every three to five years unless some major event (for example, a windstorm, fire, or new market opportunities) requires a material change in management strategy.

Usually the forest inventory is refreshed every five years or so, depending on the growth rate of the forest and the quality of growth and yield models—faster-growing forests need more frequent re-inventory, as do forests with poor growth and yield models. Some managers support programs where one tenth the forest may be re-inventoried each year, so the average age of the data is five years. Others may conduct complete inventories of each property every five to seven years. There is no universally correct answer.

Careful measurement of harvest volumes is prerequisite to effective forest management. If the inventory has been conducted on the same geographic basis as the harvest units are organized, harvest volumes are an excellent test of the quality of the inventory information. Accurate measurements of harvest volumes are critical to short-term (quarterly or annual) inventory updates. In many instances the income from the forest is paid on the basis of these harvest volumes.

C. Managing properties.
Prior to financial close, plans for subsequent property management are needed. For commingled funds or separate accounts, the investment manager would typically make these arrangements. With direct ownership, the pension plan would need to. As mentioned above, the typical practice would be to attempt to hire the people who are currently managing the property. In some instances of institutional ownership, the same people have had six or seven different corporate logos on their business cards without moving at all. Section iii. D., below, discusses property management in more detail.

D. Creating annual budgets.
Most forests owned by pension plans operate on an annual budgeting process, with a fall back to +/-10 percent of the previous year’s budget, if for some reason a budget is not approved on time; good practice has the annual budget approved 30-45 days before the beginning of the year. Here the term ‘budget’ includes the plans for logging, marketing, road building, silviculture, and capital expenditures. Ideally the first year’s budget is identical to the first year of the financial plan developed during the acquisition.

E. Monitoring budget-to-actual variances.
Common practice is to have quarterly reviews of performance against budget by 15 days after quarter’s end. The comparisons would include quarterly performance, year-to-date and projection to year end. The Q3 review would be conducted during the period for development of the following year’s budget, and should help inform that. The Q4 review would comprise the annual review. The budget reviews are based on management accounts that are deemed to be useful guiding actual operations of the business. This might differ from the actual audited financial reports.

F. Reporting financial performance.
Each pension plan has a required set of financial reports. In countries where there are no current timberland investments, some effort may be required to develop national reporting standards. Both IFRS 41(https://www.gipsstandards.org/) and GIPS (Global Investment Performance Standards, https://www.gipsstandards.org/) have well-developed protocols for reporting the performance of forestry investments.

Recall that the usual metric for measuring timberland returns is total returns—cash flow plus change in asset value, which might be negative. Returns can be time or dollar weighted (or both) as appropriate. Cash flow is easy to measure; change in asset value is not. As noted in Section iii. F., there are well-developed methods for third-party assessment of asset value. The difficulty is not with the concepts but with the availability of data to implement them with accurate results. Conventional institutional practice is to have a full appraisal on a regular basis (but not less than every three years) and internal or third-party updates annually if full appraisals are conducted on a long-than annual basis. Quarterly valuations, if needed, can be accomplished by moving the prior year-end valuation forward on the basis of timber harvested (‘depletion’), timber growth, and asset sales as adjusted for any casualty losses.

G. Certifying and reporting on ESG standards.
As discussed in Section I. x., two forest certification schemes are available for forestry investors, and most institutions use
one or both. These provide the basis for annual ESG reporting, although the timberland investment sector does not have a single agreed-upon format for ESG reports.

A key area of active development is carbon reporting. The regulatory standards in California and New Zealand are well developed, and there are at least four voluntary carbon standards against which investors can report. That there are so many standards implies that there is no single agreed-upon standard. Institutional investors spurred the development of the NCREIF timberland return data; if investors show a similar interest in consistent and accurate ESG reporting they could play a similar catalytic role in this area as well.

H. Conducting an annual hold-sell analysis.

Just as with a portfolio of stock and bonds, regular rebalancing a timberland portfolio is a key to generating good returns. The analytical tools for rebalancing include estimating future returns and considering future risks. The first issue is treated here, and the second in the next section.

A key element of the long-term plan is a long-term harvest schedule describing the annual volumes of different wood products arising from the forest. This is the basis for a long-term financial model depicting for each property in the portfolio the annual cash flow for 20+ years. As previously noted, each property is re-valued each year, and this value is meant to indicate the price that the property would fetch if sold. With these two bits of information in hand, one can ask the question “what is the expected return if the property was purchased at the appraised value with the anticipated long-term cash flows?” A low value is an obvious sell signal, and a high one is a hold signal.

Because of the uncertainties in both the appraised value and in the forecasted cash flows, detailed attention to small differences between returns estimated this way and pre-established targets for the timberland program is not advised. Instead, other considerations come into play. In particular, timberland transactions costs are high, replacement properties are not always available, and the risks associated with holding the property may have changed.

I. Identifying and managing risks.

Stepping back from the details of a financial model, forestry investments suffer three general kinds of risk: price, volume and discount rate. Notably absent from this list is a consideration of operating costs. Based on considerable empirical experience, operating costs both are relatively stable and do not have much of an impact on financial returns. This general case may not hold in all circumstances, and if not then due attention to costs should be paid.

Two general approaches can be taken to model risk. One is a simple sensitivity chart (called a “spider chart”) showing the change in returns associated with a percentage change in each parameter of interest. This is helpful but says nothing about the probability of such a change. For that calculation, two approaches are available, one simple and the other more complex.

The first involves considering the case of price risk, estimating the historical parameters of the distribution of prices. Care must be taken to consider the nature of the distribution of prices—it might well not be a normal distribution, but the distribution of changes in prices might be. The simple analysis simply takes the price at perhaps two standard deviations below the mean (or, the lowest price in the series) and uses the financial model to calculate the return at that level.

The more complicated approach involves Monte Carlo simulations (also called stochastic simulations). The idea is to run a large number of simulations of the financial model – perhaps 1000 - and for each run draw a price realization randomly from the estimated price distribution (several generally available software packages can perform this task). This exercise would produce a measure of investment risk in the form of a distribution of returns leading to such measures of risk-adjusted returns as the Sharpe ratio for each property.

Monte Carlo simulations are also a useful way to assess the risk of debt at the property or portfolio level. Using this method, one can calculate the probability of exceeding interest coverage or other covenant thresholds at various loan-to-value and interest rate levels.

It is important to consider higher-order moments of the return distribution than the standard deviation alone. Experience suggests that returns from forests may be left- or right-skewed, and may suffer kurtosis of one form or another. Such results could have important investment implications. Finally, the usual caveat is applied: past experience may not predict future events.

50. Having such a long term for the cash flows helps deal with the always difficult question of estimating the terminal value of the property. After 20+ years the contribution of the terminal value to the return estimate is diminished by ordinary financial discounting. One common practice is to estimate the terminal value as the then present value of the cash flows coming after the 20-year period. If the cash flows have stabilized at a sustainable level, the terminal value is sometimes calculated by capitalizing the last few years of estimated cash flows. An obvious question is “what discount rate may be used in the calculation of terminal values, regardless of the method used?” Good practice uses the same discount rate as required to hold the investment, but aggressive underwriting might use a lower one, justified by such arguments as improving the property, providing better information, etc.
iv. The role (if any) of the manager

As with real estate, forestry investment distinguishes investment management and property management. Both are important whatever approach is taken to investment but there are many different ways to accomplish those functions. Property management is considered first.

Property management consists of all the activities involved with operating a forest. This includes forest management planning, annual budgeting, management accounting, conducting silvicultural activities, building roads, harvesting trees, maintaining stand records, and forest inventory. A property manager may contract out some of these activities—it is common to do so for harvesting, road building, and many silvicultural activities, with the property manager retaining planning and oversight activities.

The industry distinguishes three kinds of property management: vertically integrated with the investment manager, contracted property management, and management integrated with a specific investment.

In the vertically integrated case, the investment manager also owns or is exclusively affiliated with a property management company. In such cases, the number of employees in the property management company may far exceed the number in the investment management company. The putative advantage of this form of property management is consistency of approach, and the scaling of forest management and accounting systems etc. across properties. It is sometimes said that vertically integrated management provides the opportunity to spread best practices quickly. The disadvantages include lack of transparency in pricing of property management services, and possible conflicts of interest. Such conflicts include those among investors served by the same property management personnel, as well as those between the investment manager (who may generate profits from its property management subsidiary) and the investor.

To rectify the lack of pricing transparency and conflicts of interest, some investment managers contract property management to independent third parties, either for all of their properties or on a property-by-property basis. Although this approach resolves some of the problems of vertically integrated property management, it does so at the cost of requiring greater oversight of property management by the investment manager.

The third style of property management integrates the property management employees with the investment. A group of personnel manage one property held by one or more investors. To manage liabilities, these personnel may be organized in a separate company, but the investors directly pay—and have complete transparency into—their costs.

The best practice depends on the circumstances related to individual properties and investment strategies. Competent third-party property management companies exist in most well-developed forest regions: the major US regions, some of Brazil, all of New Zealand, and much of Australia, to name a few. In more frontier regions this option likely will not be available. Small properties cannot afford to have full-time management companies. If investing in a commingled fund, the investor likely will not have a choice, as the investment manager likely favors one style or another. If an investor dislikes, for example, the vertically integrated model, their only choice would be to invest with a manager that uses a different model.

v. Managing the exit

Usually the single largest cashflow from a forestry investment is the sale of the residual asset at the end of the holding period. This is not always the case. For example, an investor might hold a timber deed or cutting right that permits them to harvest trees for a fixed period of time, or a lease that expires. Typically, though, the investor sells a forest as an ongoing operation, even if the land is not owned outright.

Unless the pension plan has an absolute need for cash (which they sometimes do), the decision to sell will arise from the hold-sell analysis described above. If someone presents an unsolicited offer, the logic of the hold-sell analysis would be the same, with the offer price substituting for the appraised value.

Some investors handle sales by themselves. Some have their property or investment manager handle sales. Some employ specialized timberland brokers, or, if the property is large enough, investment bankers who specialize in timberland.

Forestry assets are typically sold through either a one- or two-step process. In the one-step process the seller provides a sales package, usually including a description of the forest along with a draft purchase and sales contract. Prospective buyers have an opportunity to tour the forest, and sometimes to discuss matters with the property managers most closely involved with the particular property. Offers are submitted by a deadline, and the successful proponent conducts diligence of the kind discussed above.
A two-step auction usually provides a more limited set of information, with prospective buyers asked for indicative offers including price and proposed terms. The seller (or agent) accepts a limited number of these to go to a second round. Prospective buyers are usually expected to complete their diligence so the final offer is unconditional. The offer is usually made as a mark-up of a purchase and sales contract provided by the seller. Two-round auctions are usually reserved for larger properties and more complex transactions.

An investor can create value in a forestry asset by developing comprehensive and accurate information about the forest. This would include geographic information system (GIS) information showing such information as stand boundaries, the road system, streams, and conservation areas. The GIS would also include the harvest plan, perhaps detailed for five or ten years. The GIS would be indexed to a stand-record system that maintains information on species composition and silvicultural treatments. An updated inventory would underlie all this information. This information eases the sales process however it is handled. Sometimes the diligence process can be eliminated altogether, or greatly shortened if the seller has comprehensive, accurate and up-to-date information on the property.