Traditionally forestry has been perceived as being a low to moderate risk investment. While historically it has provided robust returns, new investment opportunities require careful selection between alternatives by means of risk factor discount rates for:

- Country (sovereign risk and operational/execution risk)
- Timber price volatility
- Timber market depth and diversity
- Timber market concentration
- Timber volume risk (physical hazards and technical)
- Investment liquidity.

In 2013 investment conditions are changing so there is now more emphasis on fundamental return drivers such as biological in-growth, timber prices and for BRIC countries, land prices. Assessing riskiness remains a challenging task often characterized by incomplete information. Well-understood risk components can be accounted for with direct adjustments of the projected cash flows in the valuation model.

To date, physical hazard risk is rarely quantified by investing institutions! Yet of all listed risks, climatic events are almost completely outside the control of the timberland owners. Natural hazard risk can be catastrophic for the investment in any given location, particularly near the end of the rotation or the term of an investment product when there is no time for recovery. Natural hazard risks have a frequency and severity that can be used to generate a discount rate for the investor that differs significantly between forest type and location.

Irrespective of climate change trends, catastrophic events should be on the agenda of all forest owners and investors; major losses due to fire, ice storms and hurricane can be fatal to the business or significantly reduce returns through lost timber assets or reduced subsequent growth. Long term forestland owners considering the use of forests for ‘carbonland’ will need to take particular notice of risk trends due to their long term carbon liabilities and the need to maximize carbon permanence so important in REDD+ and AF/RF projects.

**Considerations for natural hazard discount rates**

While by definition catastrophic events are generally rare, their potential impact cannot be ignored. Timberland investment publications often refer to average annual losses of c.1% of values from all loss events. But this 1% tells managers nothing about the volatility of their exposures, just the proportion of planted areas at risk across the entire portfolio. Such averages also say nothing about the cost to the business of fire protection, the increased costs of harvesting damaged timber, impacts on timber quality and future cash flows. In the table below there are some

<table>
<thead>
<tr>
<th>Region</th>
<th>Fire</th>
<th>Wind/ Tornado</th>
<th>Frost</th>
<th>Ice/Snow</th>
<th>Peril causing largest loss</th>
<th>Largest annual, corporate or single event gross loss</th>
<th>Year of loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil (SE)</td>
<td>0.05</td>
<td>0.28</td>
<td>-</td>
<td>-</td>
<td>Wind $1,161,556</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Brazil (NE)</td>
<td>-</td>
<td>0.39</td>
<td>-</td>
<td>-</td>
<td>Wind $10,847,730</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
<td>-</td>
<td>0.031</td>
<td>-</td>
<td>6.39</td>
<td>Frost $1,000,000</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
<td>0.07</td>
<td>0.33</td>
<td>0.02</td>
<td>0.17</td>
<td>Fire $31,000,000</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>Argentina (NE)</td>
<td>0.35</td>
<td>0.68</td>
<td>-</td>
<td>-</td>
<td>Fire $20,000,000</td>
<td>2012</td>
<td></td>
</tr>
</tbody>
</table>

Phil Cottle, Founder and Managing Director of ForestRe, gives an insight into quantifying climate risk in relation to alternative investment opportunities.
examples of average loss rates over a 6 to 30 year time series, and the biggest individual or annual loss in US$. Note that very low average rates of loss hide extraordinary peak losses.

Thus the key questions are actually, ‘how often?’ and ‘how severe?’ And then, what is the sensitivity of the business to such events in reaching projected investment returns, or the costs in prevention or mitigation?

Is climate change affecting forests?
Yes. Recent scientific studies show that what was once thought of a 1 in 100 year event (1%) for extreme temperatures, is now nearer 1 year in 12 (8%). This is an 8 times increase in frequency. Extreme temperatures drive the strength of hurricanes, typhoons and windstorms, extreme rainfall, floods, droughts and forest fires (chart source; www.pewclimate.org). Similar charts can be shown for fires losses in forestry. Fires are growing in frequency, severity and cost. Frequency is a function of increased human activity creating ignition sources, while severity is responding to fuel moisture, wind and temperatures. US data illustrates this well, and is typical of the pattern worldwide.

What is a catastrophic loss?
It is an infrequent and severe event, and may be caused by fire, and in some parts of the world, hurricane, typhoon or ice & snow. Typically a single catastrophe event can be in the order of US$35 million for forestry. But they can be much bigger up to 10% of the value of a major investment.

To determine losses that might occur due to fire, ForestRe use the best data available on commercial timberland to generate a modelled loss profile. This helps to estimate for any state or for the entire portfolio, the potential value of the catastrophic loss and its frequency.

Hurricane risk profiles
ForestRe have produced the first map of hurricane impact on timberland for southern and eastern US states. We did this to a 5 X 5 mile grid for the critical 100 miles inland from the coast. For individual clients we are able to generate annual average gross losses for any forest or portfolio of forests on an ‘as-if’ basis over the last 157 years of tropical storms. We can overlay any institutional portfolio and determine the total losses in any one year, all years and the mean loss as US$. Our results show us that the danger is rarely from a single storm event but from multiple storms in any one year, or multiple threats (ice and fire).

Transferring risk by insurance
Insurers have to take the long view and that is why our risk profiling is done to protect the capital of all stakeholders in forestry. Our risk profiling results can alert investors and their forest managers to the true nature of their risk, and this includes the improbable co-incidence of extreme events (rainfall and wind storm for example).

Plan to mitigate risk: prevention, suppression and insurance
A range of management responses to risk threats are required, but it is important to cost and plan each of these to cover appropriately both the ‘regular small loss events’, and ‘large, catastrophic events’ in the most cost-effective way, whether for a small stand or for a large portfolio. The larger the portfolio, the more specific or tailored the provision of each strategy can be (eg. site-specific layout/prevention measures, in-house response by fire teams and tailored insurance products or packages for the major loss event).
In terms of insurance, small owners should find insurance that protects them from losses that they could not afford to have - perhaps in excess of US$10,000 per year as an excess. For larger enterprises, they have a history of retaining all losses, as risk transfer (insurance) products had not been designed for many countries. They should be looking at insurance for losses greater than about US$500,000 (ie. most losses), up to a sensible loss limit ie. a loss that is the 1:50 or 1:100 event that would impact on their investor returns. Such a limit may be about US$10 million.

**Model the future – don’t average the past**

Risk mitigation approaches can too often be guided by partial understanding of what has happened in the past. Forest landowners, in the face of increasingly uncertain weather patterns, more than ever need to understand the climatic risk facing their own properties, whether individual sites, or across larger portfolios. The cost-effective transfer of these risks by a combination of prevention, fire response or insurance needs to be an integral part of the forestry business plan.

**Investment managers’ responsibilities**

ForestRe have seen a strong trend in enquiries from traditional corporate pulp and paper businesses towards investment companies now utilising timber, biomass and bio-fuel crops as an important alternative asset class.

Traditionally the main risks assessed for investments have been political, social and economic. Today investors are now looking for the added security of a comprehensive risk management profile of natural events such as fire, storm, ice and flood. Many of these are catastrophic risks.

Investment managers have an obligation to their investors to understand and quantify these threats before they commit to an investment.

With mega fires, storm and floods filling our news, investment managers want to demonstrate they have rigorously assessed these risks in their marketing material as their unique selling point. However, few investment managers have the in-house capability to carry out such an assessment. Once assessed managers may decide to transfer this risk to insurers where this is appropriate.

This is where ForestRe can help. With over 25 years forestry risk assessment experience we provide an excellent risk management service at a sensible cost compared to other non-specialist providers.

ForestRe only deals with forests, standing timber and plantations on a truly global basis so we know what we are talking about. Our clients have included the World Bank, forestry management organisations, institutional investors, eminent universities and government bodies as well as TIMO’s, REIT’s and pension fund managers across the world.

The exclusive and independent services we provide are tailor-made for each individual client. Services can be an on-ground forest risk survey to establish the risk environment - condition of the asset, meeting local communities, reviewing fire management systems and assessing any other onsite causes of loss. Usually we access our extensive and unique data base, coupled with risk modelling to quantify your exposure to climate-related events. Such events may be infrequent and severe so we put a dollar value on the risk due to fire, wind and other events with a frequency of the catastrophic natural event to help you make investment and risk transfer decisions.

Whatever your requirements ForestRe, through our data modelling, can produce a comprehensive and independent report for you and your clients. Furthermore should you decide to offset the risk by way of insurance/reinsurance we have the facility to access A+ rated insurance within our network of Lloyds syndicates and other international providers.

**ForestRe specialises in assessing climate-related risk to investors.**

Generating natural hazard discount rates ForestRe then design bespoke insurance products for forestry and tree crops worldwide. Consultancy services by ForestRe enable clients to profile their alternative investments for climate risk without the insurance product.

Please feel free to visit our website www.forestre.com to find out more about what we can offer you and your investment clients. Alternatively give our team a call on +44 (0)207 347 5736 and we would be delighted to provide you with the benefit of our experience in this very specialized field of forestry and investment risk management.