Forestry as a sustainable asset class for turbulent times?

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Abstract: There is good reason to anticipate increased demand for sustainable and responsible investments from both retail and large institutional investors. Increasing interest in forestry may come from both a financial and general sustainability standpoint, and from a carbon perspective, because trees are a critical part of any successful climate change strategy.

We develop the true sustainable financial return (TSFR) concept for forestry investment screening which provides a good indication of long-run, sustainable return levels without leverage. Depending on investment horizon and illiquidity level, forestry investments tied to biological growth drivers seem the most attractive. Forestry then qualifies as a sustainable and responsible investment even during periods of financial crisis. In addition, we provide evidence that forestry investments can offer significant value to investors by adding a low correlation with other assets. Ultimately, the business model is proven and successful.

Keywords: natural resources; sustainability; forestry; timber investments; asset management; alternative investments; quantitative analytics; risk management; carbon.

Reference to this paper should be made as follows: Röckemann, C. and Schiereck, D. (2010) 'Forestry as a sustainable asset class for turbulent times?', *Interdisciplinary Environmental Review*, Vol. 11, Nos. 2/3, pp.191–210.

Biographical notes: Christian Röckemann is an Economist and has been working in the international financial services sector for nearly 20 years with a focus on asset management. His management experience comprises Citigroup in various roles within the Global Capital Markets Group, for many years he was a Consultant with A.T. Kearney. In 2005, he founded First Forest GmbH, a Germany-based forestry advisory and investment firm to offer prime access to forestry for long term institutional and private investors. Combining forestry and asset management experience, the organisation is an innovator in forestry risk and portfolio analytics.

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Dirk Schiereck studied Economics at the University in Kiel. After his graduation, he became a Research and Teaching Assistant at Mannheim University, where he also finalised his doctoral thesis and his habilitation. After two years at the Institute for Mergers and Acquisitions of the University Witten/Herdecke, he got an appointment at the European Business School for the Endowed Chair of Banking and Finance in 2002. After six years at EBS, he moved to Tech University Darmstadt in August 2008, but is still closely related to EBS by his honorary position as a Research Fellow at the Real Estate Management Institute.

1 Introduction

Investing in forestry assets has a very long tradition, with a track record of several hundred years. The term 'sustainability', a key dimension of today's ethically responsible investments, was first used in a forestry context. In the early 18th century, von Carlowitz (1713) introduced the sustainable management concept, based on the principle that growing timber volume should be balanced with harvest volume in order to ensure a perpetual supply of timber. Sustainable forestry management was discussed and further refined over the following decades and centuries, and has been widely studied in the literature.[1]

Building on this forestry-related definition of sustainability, one of the most widely accepted descriptions was established in 1987, when the Brundtland and Commission of the United Nations stated: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".[2] Responsible investing is usually defined in a similar way, in connection with investment processes that consider the social and environmental consequences of investment – both positive and negative – within the context of rigorous financial analysis (Social Investment Forum, 2003).[3]

However, although most forestry investments would qualify as 'sustainable' according to the above definitions, there are some that clearly do not match these criteria, especially those that exploit existing forestry resources solely for short-term profitability.[4] To offer investors guidance, forestry entrepreneurs can use 'chain of custody' controls such as third-party 'certification'. Such controls act as a signal to investors of the avoidance of such activities. The most widely known certifications for forestry come from the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC) schemes.[5]

In recent years, the importance of forestry in a sustainable and responsible context has increased. Forests are the main terrestrial carbon sink, and are thus critical to the climate change debate, as Stern (2008, p.25) notes: "any climate change deal that does not fully integrate forestry will fail to meet the necessary targets". Forestry also made its way to the top of the political agenda at the COP 15 conference (the UN Climate Change Conference) in Copenhagen in December 2009. It has strong advocates, including the United Nations environmental programme, whose Head, Achim Steiner, was quoted on forestry as a carbon sink, as follows: "maybe the international community of states is overlooking a proven and tested method which is operating since millennia, the biosphere" (Steiner, 2009).[6]

Following this political trend, institutional investors have begun to show increased interest in forestry as an asset class. From a financial investment perspective, forestry is expected to become a common asset class in many regions and for various groups of investors worldwide. Early financial value measures for forestry assets date back to Germany in the middle of the 19th century.[7] However, from an institutional and professional investment standpoint, this asset class has about a 20-year track record, and today is subject to the principles of Modern Portfolio Theory.[8] However, detailed knowledge of return characteristics is still limited, and return components have not been widely analysed.

This lack of knowledge is the starting point of our examination. Forestry returns show remarkably low correlations with traditional asset classes.[9] It has thus become increasingly accepted as a portfolio diversifier for insurance companies, pensions and endowments, and long-term-oriented private investors. Investment volume in this sector in the USA alone is estimated at US $25 billion to $30 billion, and typical asset allocations are 1% to 3% of total portfolio volume.

Until recently, professional for profit forestry investments have centred around the USA and US investors, with a focus on afforestation/reforestation (A/R) in a plantation setup. We use the common segmentation in the forestry and climate change context, and generally observe two main strategies in forestry investing: A/R, and avoided deforestation (often referred to as REDD).[10] In this article, we concentrate on A/R activities ('new forest') that include plantations, because they constitute the majority of for profit investments today and for the foreseeable future.

Tropical forestry has not enjoyed major financial investment thus far, especially with regard to sustainable forest management (SFM). In fact, as the Rainforest Alliance (2007) reports, as many as 50% of the tropical operations in countries such as Indonesia, Cameroon, and Brazil are guilty of unsustainable management practices.[11] But investments in avoided deforestation have become more popular from a carbon standpoint. However, expected financial returns are centred around payments as 'carbon credits'. Our methodology and analytics remain relevant for this segment.

Note that we do not cover activities for 'SFM' or strategies that are primarily philanthropic. While we consider these to be important and highly relevant, philanthropic investments typically do not follow measurable and replicable patterns across a broader class of investors, and are not as well-represented in the professional investment arena. Our examination and discussion of forestry investments centres around three main research questions:

- Are forestry investments suitable as portfolio diversifiers during turbulent times, and if so, why?
- Are certain types of investments better positioned as diversifiers than others? How homogeneous is this asset class?
- Can the lessons learned from forestry be transferred to other asset classes?

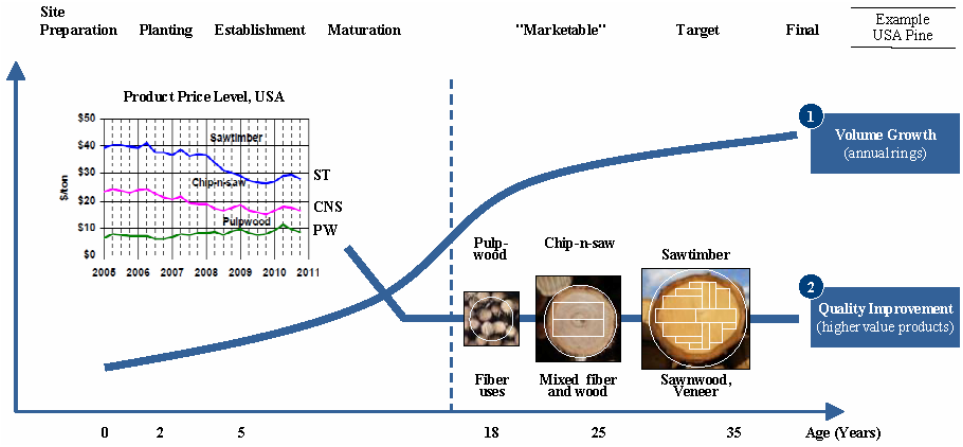
For this analysis, we use forestry investment to refer primarily to investing in the biological growth of trees. We believe this qualifies as responsible and sustainable investment and should thus be a natural part of responsible investing during times of turmoil. This article examines the asset class mechanics, profitability, and correlation measures of forestry investment from the perspective of a long-term-oriented institutional

investor. We analyse why this asset class has held up so well during the financial crisis, and illustrate potential lessons that can be transferred to other asset classes.

2 Investment logic of forestry investments

The basic concept of forestry as a 'natural investment product' is simple: trees grow, thereby producing timber, storing carbon, and supporting diversity. With respect to the timber component, the investment story encompasses both growth in volume and value. Figure 1 illustrates this concept. Tree growth is slightly S-shaped in value generation, and differs according to species (e.g., pine, fir, eucalyptus, teak, beech) and location (soil quality, climate, etc.).

Figure 1 The biological return to forestry investments (see online version for colours)



Source: Data provided by Timber Mart-South and First Forest

A typical example of afforestation illustrates the basics of the intrinsic value generation of forestry investing. Value generation is shown for the US South (the 'wood basket of the USA'), with pine at a typical rotation length of about 35 years (planting to harvesting). After 35 years, the trees are eligible to be harvested as saw timber (used, e.g., in construction and for veneers). Saw timber has recently been valued at approximately US $30 to $40/ton. Smaller stems (those harvested at 16 to 20 years) are used as pulpwood, and have lower price levels of about US $10/ton. A typical 'in-between' quality is chip-n-saw (saw timber component, used for woodchips), which is harvested at about 25 years.

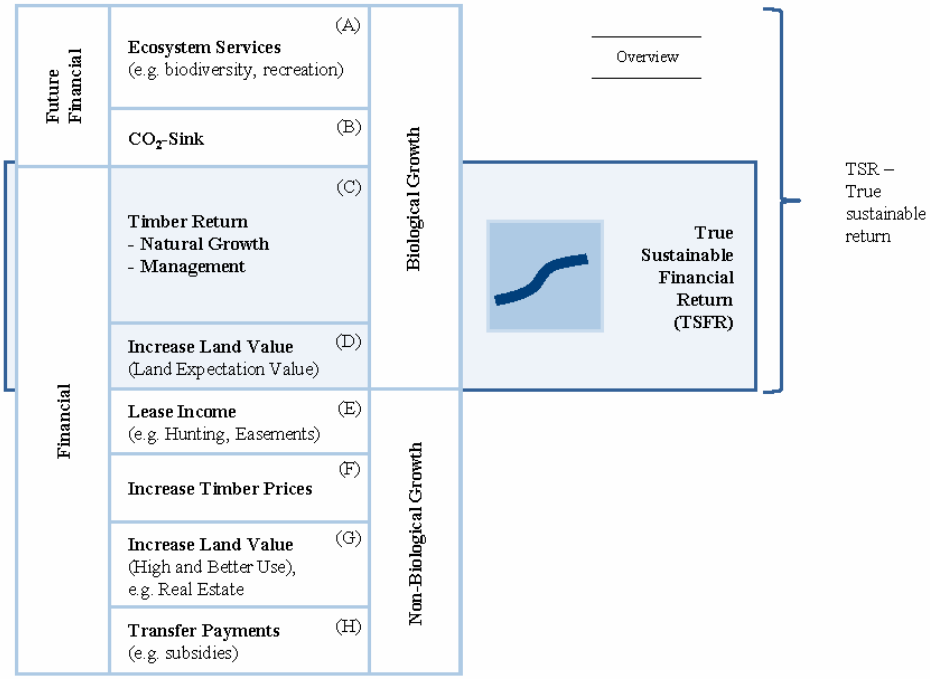
Forest investors, therefore, grow trees and sell the timber at different ages and quality levels. Biological growth is naturally supported, and investment decisions include the species and location selection as well as the product segment – all part of a typical portfolio management mandate.[12] This type of investment has more than one investment phase per definition (unlike, e.g., wind power or photovoltaic technology), but it can be repeated in various cycles. This allows for a 'perpetual' investment many decades into the future.

Given the investment logic and the value growth path we have described, we next analyse the typical risk-return characteristics of forestry investments and discuss the critical aspects investors should look for. We also continue to emphasise the performance stability of these investments during the financial crisis.

3 Biologically driven returns: the true sustainable financial return (TSFR) concept

Note the following comments of forest owners and investment managers regarding forestry investments: "US timber investments made 12% to 15% internal rate of return (IRR) over the last decades", "teak plantations can offer 15% returns", "we target 10% p.a. IRR for a forestry investment plan in Romania", "my forest in Germany hardly gives me any positive financial return", "one US timber REIT investment lost 30% of its value in the recent crisis", "forestry was the only asset class that held value during the crisis – I face an over allocation now", and "US investments allow a stable return of about 7% to 8% p.a. nominally". These quotes underline the heterogeneity of recently realised or expected annual investment returns in forestry assets, and indicate the importance of a structural analysis of return components.

Figure 2 Return components of forestry investments and the TSFR concept (see online version for colours)



We introduce a new return component analysis here, the TSFR, to allow for a structured and coherent comparison of forestry investments. Figure 2 gives an overview of eight typical return components in forestry investments worldwide.[13] We believe using these

components in a TSFR context allows the examples above to be well understood and aligned. We explain these eight components [referred to as (A) through (H)] further next.

With respect to the return components of forestry, we distinguish between biological growth-driven and non-biological factors on the one hand, and financial and future financial elements on the other. We begin with the core financially relevant component, timber return (C). This component builds on biological growth managed more or less actively, in the form of natural stands or plantations. Because wood is the main product of trees, ongoing managed biological growth and timber sales result in the generation of 'typical returns'. Their extent depends on species, location, product segment, and management quality. This is a naturally given window with hardly any out performance opportunities. However, performance can be improved by, e.g., species selection, superior day-to-day management, and an optimised harvesting schedule.

A second, closely-related, return component is the increased land value (D), due to biological productivity. Specific biological income is attainable, and an investment is expected to be profitable in the future. The present value of the (expected) future income payments increases the land value, e.g., pasture land that has been successfully afforested.[14] Higher expected future revenues from forestry will increase the land expectation value.[15] This component is linked to biological growth and is part of our TSFR definition. However, in contrast to the timber returns, this is a 'one time only' component.

The two components timber return (C) and increased land value (land expectation value) (D) based on biological returns represent what we define as the TSFR. The TSFR indicates the 'typically' and 'perpetually' feasible return on forestry an investor can expect based on biological growth. This definition is helpful when investors look for a forestry asset with financially attractive, long-term returns that provides low correlations with traditional asset classes. The return decomposition is particularly important during financial crises or times of inflation. In the following sections, we discuss typical return levels, lessons learned from the recent crisis, and future outlook.

Two further components driven by biological tree growth are ecosystem services (A) and CO_2-sink (carbon sink services) (B). We classify both as 'future financial' components. The carbon sink function of trees has become the most widely known element of ecosystem services. The others include biodiversity, clean water, air filtration, recreational values, and such socially demanded factors as job creation in remote and rural areas, and social stability that can lead to long-term income streams.

Woody biomass is also frequently included in this component. However, recent market experience indicates it was already included in the financial component. We thus include biomass (e.g., for pellet production) as one of the timber return (C) products.[16]

For many foresters, environmentalists, and the public, the other ecosystem services are important value components; for some (non-forest owners), they are the most important. From a responsible investing stand point, these services have a significant value. However, we note they are mostly not market priced as of today. Forest owners remain unable to generate significant financial returns from this source, thus the use of the term 'future financial'.

We theorise that the carbon sink (B) function should be evaluated as a separate component, but it is often summarised under ecosystem services (A). As we noted earlier, the carbon sink potential is critical from a climate change perspective, and it has already gained broader financial acceptance. Carbon credits from forests are traded in voluntary

markets, and are accepted under the Kyoto Protocol.[17] In that sense, it has become more financial than the other ecosystem service components.

Trees are a known and major terrestrial carbon sink. As trees grow, they store carbon as cellulose in wood fibre, where it will remain virtually indefinitely until released by burning, decomposition, or by the manufacture of products that end the carbon storage cycle. Forests are of strategic importance to global climate change abatement. As noted in IPCC (2007), "In the long-term, SFM strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual yield of timber, fiber, or energy from the forest, will generate the largest sustained mitigation benefit".

Voluntary carbon credits have been the major focus of recent financial carbon-related transactions so far. But this may change after the COP 15 conference, where, as mentioned earlier, afforestation, reforestation, and REDD have been at the top of the agenda for post-2012 agreements.

Compared to total forestry activity, carbon sink-related transactions are still in their infancy, and remain restricted by a number of man-made eligibility and measurement rules. And, because most forests store carbon naturally, without being subject to any financial profits, we feel it is appropriate to exclude this component from the TSFR at this point.

Note that other components of financial returns from forestry investments do not have a biological growth focus, but contribute significant value. It is questionable, however, whether they offer the same low correlation characteristics to investment portfolios. In this segment, we distinguish among lease income (E), increased timber prices (F), increased land value (high and better use) (G), and transfer payments (H).

Lease income is typically generated from hunting rights, and may include rights of way (e.g., power and gas pipelines, railroads), easements (payments from environmental groups not to execute real estate developments), and/or payments for mineral rights.[18]

Returns from increased timber and land prices are based on market dynamics and are 'non-perpetual'. They can be materialised only once, and are at risk of becoming negative. Increased timber prices (F) can influence performance, although the effect is often overestimated. For example, in the US South, timber prices increased on average (in real terms) by more than 3% per year from 1910 through 2007.[19] In the current recession, however, prices for many timber qualities softened by about 20% from their former levels.

In Europe (e.g., in Germany), a slight decline in real timber price levels was realised over the last 30 years. And the recent recession led to a 10% price decline, well above 2003/2004 levels.[20] However, while timber prices are important for short-term and tactical decisions, they are far less relevant to long-term-oriented strategic investors. For a more detailed discussion, see Section 4.

The returns from increased land value (high and better use) (G) can be substantial. Real estate developments on former forest land are common in many parts of the world. Although almost negligible in Germany, this has been a strong income component for US forest owners, contributing 3% to 5% to rates of return. However, note that this return component has almost no link to biological growth, its sustainability is questionable, and it is a one-time profit pool. For sustainable, responsible, and long-term investors, this component would not be of primary interest.

Finally, we must consider transfer payments (H), which include government subsidies as direct transfers or indirect contributions. Direct payments in a forestry context are typically subsidies for planting material, while indirect contributions include tax

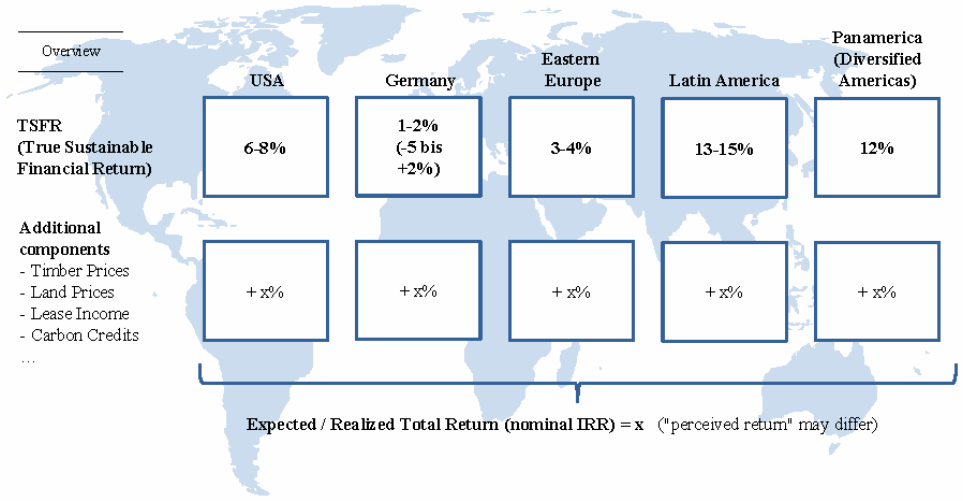
advantages. Government-guaranteed prices for timber are not typical in the forestry industry, especially not in this context. But transfer payments do play a significant role in other responsible investment asset classes.[21]

4 Sustainable investment returns of forestry

In this section, we use the TSFR concept to illustrate typical and potential long-term returns in forestry investments. The TSFR describes the financial returns the asset class is expected to offer at today's price level. Responsible investors can use this information to decide how to allocate their capital to forestry in order to generate 'perpetual' and sustainable returns over very long horizons. By definition, the 'future financial' components must still be added.

In the USA, one of the traditional forestry investment regions, TSFRs can be 6% to 8% for the typical investment in today's market (Figure 3). This rate must be evaluated as a perpetual rate, which excludes the profit potential from increases in real timber and land prices. If we compare NCREIF[22] index historical returns of about 12% to 15%, we can infer that about half the value generation comes from land value changes and timber price increases.

Figure 3 Biologically driven financial returns (TSFR) for selected regions [typical investments, nominal internal rate of return (IRR) levels] (see online version for colours)



In Europe, we would not expect to see a significantly positive TSFR in Germany because of climate conditions and the market structure. But in Eastern Europe (e.g., Romania), biological returns may reach 3% to 4%. Thus, investment projections of 10% (as noted earlier) must include additional components. For Romania, these may be infrastructure improvements, or a 'convergence play' of Eastern European to Western European land price levels.

The Latin American region is clearly gaining in importance for forestry investments, due to climate conditions and cost structures. We note that higher TSFRs are possible here: It is not uncommon to find 13% to 15% return rates for species including pine (at

the lower end), teak, and eucalyptus (upper end), typically in a plantation-type setup.[23] If we analyse diversified investment portfolios that include various species, age classes, and also natural forest (which are attractive to institutional and private investors), we find TSFR levels today of around 12% IRR, with ten- to 15-year investment horizons.

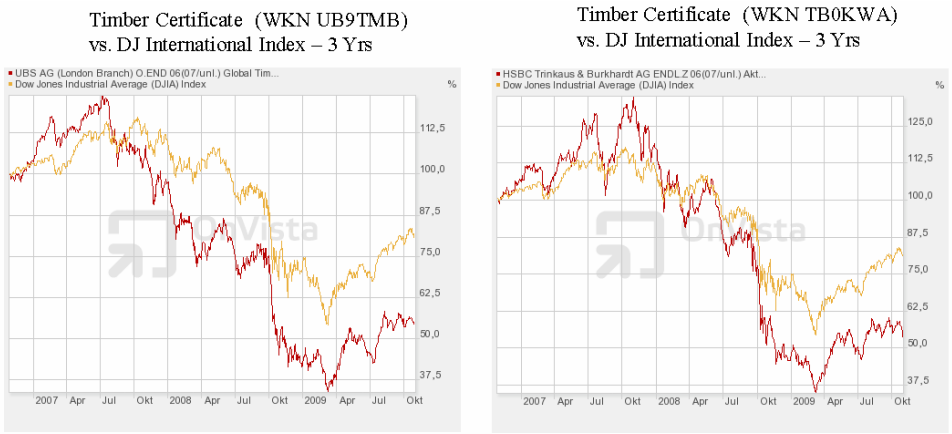
5 Value contribution and the stability of forestry investments during the financial crisis

On the basis of the TSFR definition, we would expect forestry investments that focus on biological returns to offer stability during turbulent times. We use the term 'pure play forestry' for these types of investments. But, in fact, there are good reasons to hypothesise that in both current crisis and in future crises, the biological growth of forests will not be correlated with economic movements. Only non-biological factors are partially related to economic cycles.

By using historic data and forward-looking simulations, we can examine the robustness of several forest investments. We use these methods because forestry is characterised by limited publicly available price and performance data, and because simulations provide complementary and unique insights into future forestry investment decisions. We first examine the performance of publicly traded forest assets, followed by the NCREIF timber land index for the USA and two types of stress tests based on a proprietary dataset for USA and US continent (North and South America) forest portfolios. We address the specific criteria in the context of sustainability and responsibility.

We distinguish between public and private forestry investments. Our logical first step is to analyse the performance of publicly traded forest assets. Longer-term price data are available, but we cannot separate out the TSFR component to allow for a consistent analysis with regard to sustainable and responsible investments.

Figure 4 Price development of forestry investments in the form of timber certificates (see online version for colours)



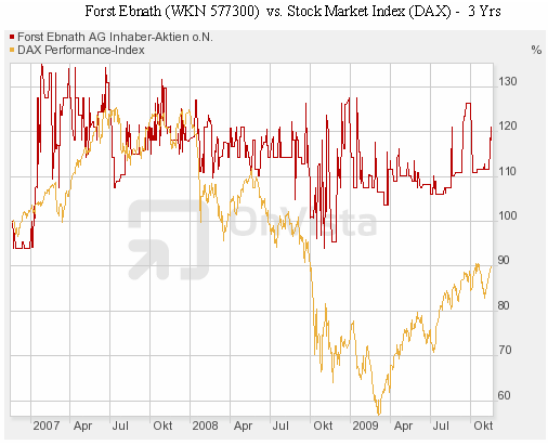
Source: Data provided by http://www.onvista.de

Figure 4 shows the total return performance examples of 'forest stocks' during the recent financial crisis. Here, diversified forestry stocks (represented by basket certificates issued by HSBC and UBS) are compared to leading market indices (the Dow Jones industrial average).[24] By looking only at the charts, it is obvious that naïve diversification by forestry stocks did not provide additional stability to investment portfolios. But a closer look at the business structure of forestry stocks illustrates why. These investments are not TSFR-focused. They represent businesses that are part of the 'forestry sector', but include significant portions of manufacturing, real estate, and other exposures as well. Even timber REITs like Rayonier or Plum Creek in the US may largely include non-'tree growth'-related exposure.

Nichols (2008) used SEC data for the two companies, and found timber contributed 28% and 17%, respectively, to total sales.[25] These percentages alone suggest that most listed forestry stocks will not be able to provide a TSFR for investors seeking a biological growth-focused investment.

We can document this further by using Forst Ebnath, a 'pure play forestry' equity investment listed on the German stock exchange, as an example. Forst Ebnath is a unique listed organisation that represents approximately 2,800 hectares of sustainably managed mixed forests in the southern part of Germany.[26] Comparing its stock price trend during the recent crisis with the overall market (DAX) index, we see it has not moved in sync with the market (Figure 5).[27]

Figure 5 Price development of 'pure play' forestry investment (Forst Ebnath, Germany) (see online version for colours)

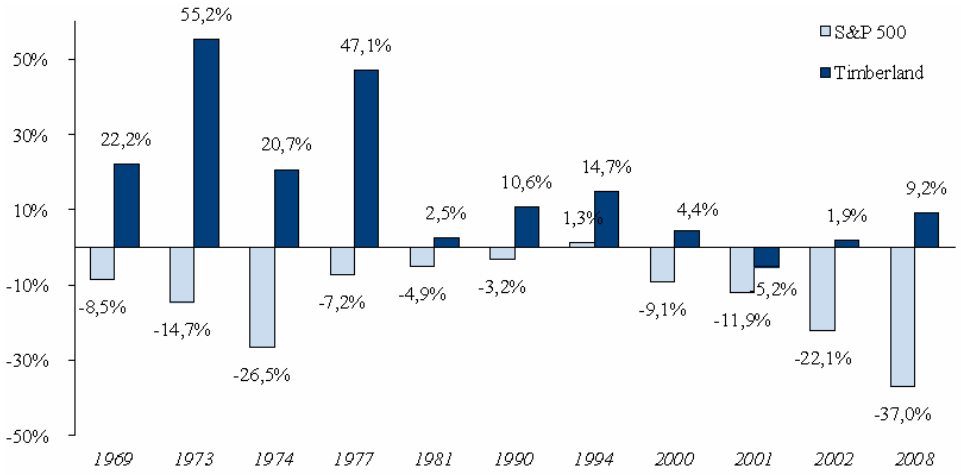


Source: Data provided by http://www.onvista.de

A broader type of forestry investment is represented by the US timberland investment index in the NCREIF.[28] This index reflects the performance of US-based specialised timber investment funds with an investment volume of $1 billion. The assets are mainly in closed-end funds that report holdings and asset valuation on a quarterly basis.[29]

In order to fully assess the diversification benefits of timber in an investment portfolio, we first examine its performance during 'bear markets', including during 2008. Figure 6 compares the performance of the NCREIF Index versus the S&P 500 index. Obviously, the NCREIF performance was positive in years when the stock market was falling.

Figure 6 Performance of timberland index NCREIF versus S&P 500 index for bear markets (annual performance in years with negative S&P 500 performance, 1969 to 2008) (see online version for colours)



Source: NCREIF annual return data and S&P 500 annual returns, Data 1969–1987 provided by HTRG (2003)

The above analysis is based on an ex-post perspective, where the historic realisations of stock and timberland returns are known. Our next step is more forward-looking. We compare the correlation coefficients of international stock, bond, and commodity market returns with those from forestry investments in NCREIF and Forst Ebnath.

The quantitative results (Table 1) support the diversification potential of NCREIF forestry investments for bond and stock investors. As expected, this potential is even higher for 'pure plays' like Forst Ebnath. We must now test the biological component of the NCREIF index performance. As we noted, the index reflects all the return components of the investments, and therefore includes non-biological factors, too. Timber prices tended to fluctuate, and the contribution of increased land value (high and better use) (G) was significant, especially during boom years. But, as Section 4 noted, about half the historical returns were generated by the non-biological component. For investors focusing (ex ante) on biological returns and sustainable and responsible investments, the NCREIF and corresponding analytics have limitations.

One way to overcome the shortage of listed forestry stocks and NCREIF analytics is to use a consistent and coherent dataset focused around TSFR. We execute analytics on two forestry investment portfolios:

1 a typical diversified US South investment with mainly pine, various age classes, and products

2 an even more diversified investment portfolio in the US continent.

The latter includes various species and age classes, as follows: pine (36%), beech (30%), eucalyptus (20%), teak, (9%), and fir (5%), in both plantation and natural forest management setups. It also has a land base of more than 17,000 hectares across the USA, Chile, Costa Rica, and Brazil. Tree growth, yields, and cost data come from experience and expert estimates for larger-scale professional forestry investments.

Table 1 Correlation coefficients of forestry assets with international stock, bond, and commodity markets

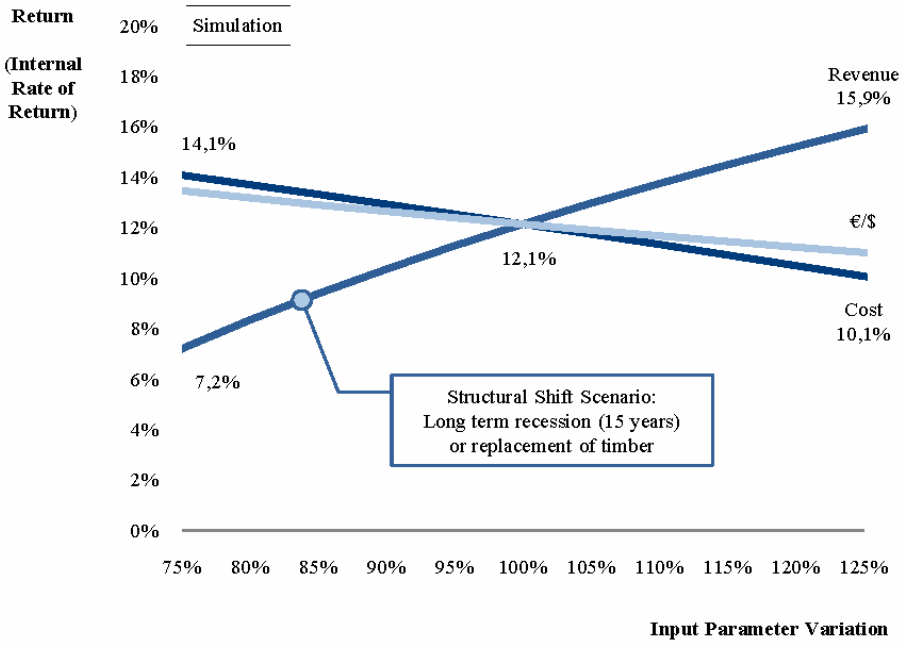
	2007	*2008*	*2009*
		NCREIF	
European stocks (MSCI Europe U$ – price index)	–0.35	0.61	0.82
Asian stocks (MSCI AC Asia U$ – price index)	–0.50	0.59	0.85
US stocks (MSCI AC US U$ – price index)	–0.23	0.70	0.82
Commodities [CRB spot index (1,967 = 100) – price index)	–0,36	0.74	0.85
Asian bonds [Barclays Asia Pacic GVT 5 – 7 Y(U$)]	–0.82	–0.76	0.64
Europe bonds [BOFA ML EMU direct GBT 5 + YX IR($)]	–0.82	0.38	0.86
US bonds (Barclays Government 5 + Y)	–0.75	–0.60	–0.72
		Forst Ebnath	
European stocks (MSCI Europe U$ – price index)	0.06	0.45	0.39
Asian stocks (MSCI AC Asia U$ – price index)	–0.03	0.47	0.33
US stocks (MSCI AC US U$ – price index)	0.02	0.43	0.37
Commodities [CRB spot index (1,967 = 100) – price index]	–0.04	0.33	0.30
Asian bonds [Barclays Asia Pacic GVT 5 – 7 Y(U$)]	0.03	–0.07	0.42
Europe bonds [BOFA ML EMU direct GBT 5 + YX IR($)]	–0.08	0.53	0.35
US bonds (Barclays Government 5 + Y)	–0.08	0.16	–0.04

We first perform an analysis of the US continent portfolio by stress-testing the asset using various cost, return, and exchange rate levels. Starting at an expected return projection of 12.1% (in euros), we adjust the cost, return, and exchange rate levels by ±25% from the basis projection. The results will help us to gauge the sensitivity of the investment to major shifts (see Figure 7). To understand how a financial crisis affects the investment, we examine the consequences of a 15% return reduction – a potential price shift in along-term recession. A negative return at this level would reflect an enduring shift in a 15-year investment horizon, and would be much more dramatic than during an average recession.

For example, a 15% drop in timber prices (or 15% lower income levels) in this investment setup would reduce expected returns (in % IRR over a 15-year investment period) by about three percentage points, from about 12% to 9%. Even lower prices reflective of a ‘disaster scenario’, e.g., a –25% structural change in timber prices (or a 25% drop in income level) would result in expected return levels of about 7%. These findings suggest the TSFR-focused US continent forestry portfolio should deliver significant stability in an investment context.

Our second step is to explore a diversified forestry investment in the US South. We base this analysis on a portfolio of typical USA South diversified forestry assets of mainly Southern yellow pine with various age classes. The portfolio includes 30,000 hectares with 60 age classes in various US states [88% softwood (pine) and 12% hardwood]. We assume market-typical timber price volatility with no real price increases; typical risk factors include fire, storms, and beetle infestations. We assume 3% p.a. inflation, and that the acquisition of the portfolio is at current market prices.

Figure 7 Return sensitivity of a forestry investment portfolio (diversified US continent) assuming ±25% of revenue and cost levels (see online version for colours)



For our calculations, we use an innovative portfolio analytics software tool, GUMP, created specifically for forestry.[30] Based on Monte Carlo simulations, GUMP allows the derivation of long-term forestry asset projections and sensitivity analyses, including risk/return and carbon profiles, for all kinds of forests. Technically, we can model a variety of risk dimensions, such as fluctuations in timber prices. For a financial crisis situation, we project a five-year drop in timber prices of –25%. This seems aggressive, but it may be an appropriate stress test given the current market environment.

We compare the return level 'no crisis' (a long-term trend of +0.6% in real timber prices) with the 'financial crisis scenario', which reflects the five-year recession. This is modelled by a –25% price decline from former levels, and then a snapping back to the long-term trend after five years, as assumed in the no crisis scenario. Based on a 50-year cash flow projection, including typical biotic, abiotic, market, and country risk factors, the investment in the 'no crisis' scenario yields 9.6% IRR (in USD). Including the years of financial crisis will result in a 5.7% drop in the expected IRR. This moderate loss in profitability supports the view that forestry investments maintain their value even in a financial crisis environment.

Simulation results underline that forestry investments with a focus on biological growth (indicated here as TSFR-type investments, or 'pure play' forestry) show persistent out performance even during periods of financial crisis, at least for investors with long-term horizons. Short-term investors may be subject to significant loss potential from liquidity needs, capital market over reactions, or market disturbances.

Based on the idea of value additivity and portfolio theory, a forest investment is a portfolio of various return components, as discussed above, weighted uniquely with the characteristics of the specific forest. However, investors need to assess the return

attribution. Is forestry investing more an alpha-generating strategy or a beta play?[31] This question also highlights the type of investor for whom forestry assets are attractive – both during financial crises and beyond. Passive investors interested in optimising systematic portfolio risk usually prefer pure beta plays, and should thus concentrate on pure TSFR assets. Active investors, who are more confident in their asset selection ability and are seeking opportunities to generate alpha, may want to focus more on non-biological growth components.

In summary, we believe the TSFR concept can explain variations in historic returns for various markets, and can be helpful for future return projections of forestry assets. Investments with a pure TSFR focus (and systematic portfolio management) will most likely retain a low correlation to other asset classes. These are attractive to long-term-oriented passive investors and can serve as a potential inflation hedge. Thus, we see that ecological sustainability is transferred, in a sense, to financial market sustainability. Finally, investments with a strategy based on future land and timber price increases or business elements along the forestry and timber value chain have been highly successful in the past. But it is important to note that they are subject to a much higher correlation risk with traditional asset classes.

6 Transfer of results to other asset classes

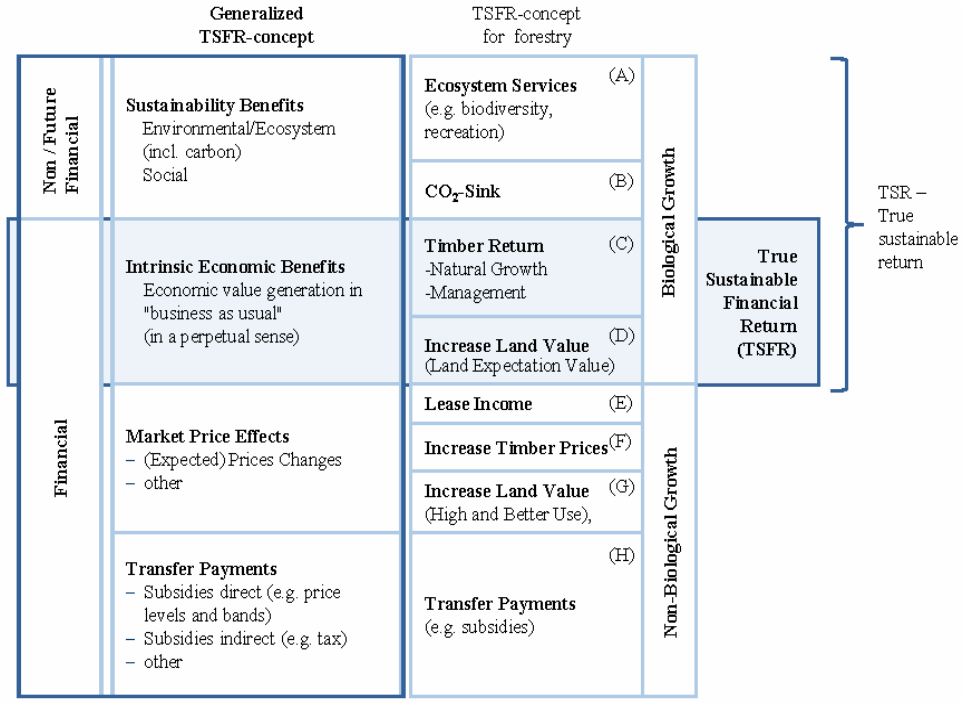
We next address whether the observations from forestry are relevant to other sustainable and responsible investments. From a methodological standpoint, the analyses on forestry investments underline the importance of an in-depth examination of return components. This is the first step in a search for assets not previously traded on the capital markets that might complete the investment universe. The decomposition helps explain the true characteristics of an asset, as well as its return differences by region, strategy, style, and with regard to sustainability (e.g., the proportion of TSFR). While it seems generally important for investors to understand asset mechanics, forestry assets further illustrate the importance of investment vehicle selection. Note that direct investment in forestry assets allows a clear focus on biologically driven returns; investment in listed companies generates a far more dispersed return structure.

This dispersion leads to ideas of broader sustainability screening in the future. When addressing sustainability and responsibility today, investors often think of screening equity and bond portfolios. This narrow focus is the result of the screening services offered in the market, which almost exclusively concentrate on capital market products.[32] However, alternative assets may offer attractive return characteristics for long-term-oriented investors searching for diversification.

In line with a broadening of asset classes under consideration and more active responsible investors, we expect to see more demand for screening expertise and services in asset classes themselves, rather than a focus on packaged and listed organisations. This broader view may help investors avoid potential disappointments, such as that described by Scholtens and Spierdijk (2007), and should lead to more transparency.

With respect to the TSFR, Figure 8 illustrates how we can restructure the forestry-specific approach into a more generalised concept, to allow for broader use. Leveraging the TSFR concept along the four dimensions of sustainability benefits, intrinsic economic benefits, market price effects, and transfer payments may offer a template for screening in other asset classes.

Figure 8 Return components of investments – TSFR concept (see online version for colours)



We note that wind farms and solar parks are good examples, as both segments currently enjoy significant institutional investor activity.[33] Investors in wind farms can expect returns ranging from 10% to 16% (10% to 14% onshore, 14% to 16% offshore), depending "upon the nature of government support, feed-in-tariffs, etc." [Mansour and Yun Xu, (2009), p.26]. By screening these return expectations against the four segments and TSFR, we can see that the components of market price effects and transfer payments appear to be of major importance to profitability projections. However, the intrinsic economic benefits of wind farm operations (a 'TSFR-type component') are not available. Investor feedback indicates these returns are much lower. And, although wind farms may still be highly attractive as sustainable investments, a screening exercise using the TSFR concept can separate the return drivers included in a typical (and specific) wind farm project. The overall investor risk position and potential correlation with traditional asset classes thus becomes transparent.

We observe similar screening and results for photovoltaic investments. Mansour and Yun Xu (2009) cite return estimates of 10% to 12% for photovoltaic projects. They note further that these projects depend heavily on the incentive regime. The TSFR in that case may be much lower. We would even expect the return performance to respond to government announcements, budget situations, and economic cycles. And investing in solar power via listed technology companies may lead to even higher investment volatility.

For a responsible investor seeking a sustainable investment during turbulent times, it may be worthwhile to execute the strategies presented here in a diligent and systematic way to avoid surprises. In fact, to go even further, we could encourage a discussion about

the sustainability of businesses that rely heavily on market price changes and transfer payments. Government subsidies are often needed to attract private capital, but this should be reflected in individual investment decisions and especially in risk assessments.

7 Summary and outlook

This article analyses the investment mechanics of the forestry industry. Many institutional investors hold forestry as a strategic diversifier. One large European pension fund describes forestry "as a stable investment, not least because trees grow regardless of economic cycles. Timber is one of the few commodities that have appreciated faster than inflation over the long term" (Responsible Investor, 2007).

We examined forestry investing from the standpoint of three critical questions:

- Are forestry investments suitable as portfolio diversifiers during turbulent times, and if so, why?
- Are certain types of investments better positioned to be diversifiers than others? How homogeneous is this asset class?
- Can the lessons learned from forestry be transferred to other asset classes?

With systematic screening and appropriate selection, forestry investments seem to offer significant value to investors by adding an attractive low correlation with other assets. We found that biological returns are the main driver for this, with some logical natural limitations.

We first introduced the TSFR concept for investment screening. For long-term-oriented investors, the TSFR provides a good indication of long-run, sustainable return levels without leverage and in a 'perpetual' sense. We then compared various investment types and vehicles to identify the most attractive ways of investing in forestry. Depending on investment horizon and illiquidity level, investments tied to biological growth drivers and 'as direct as possible' with regard to investment structure seem the most attractive. Forestry then qualifies as a sustainable and responsible investment, and we found that it generally holds its value and attractiveness during periods of financial crisis (provided investors exhibit consistent rational behaviour).

The TSFR methodology also appears useful for other asset classes. We encourage further testing of this and active feedback to allow for a broader and better use of systematic and appropriate screening of alternative investments.

There is good reason to anticipate increased demand for sustainable and responsible investments from both retail and large institutional investors (Hesse, 2008). Increasing interest in forestry may come from both a financial and general sustainability standpoint, and from a carbon standpoint, because trees are a critical part of any successful climate change strategy. Ultimately, the business model is proven and successful: trees grew in 1929, they grew in 2008, they grow today, and they will almost certainly grow in the future.

Acknowledgements

The authors would like to thank exceptionally careful reviewers and Carolyn Currie, as well as Bob Izlar and Anke Koenigs for useful comments and suggestions on an earlier draft of this paper. The financial support by the German Ministry of Education and Research is acknowledged.

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Notes

1 See Grober (1999) for an overview on the works of Carlowitz and the sustainability discussion.

2 See United Nations General Assembly (1987). More recent definitions of sustainable investments can be found in Hoffmann et al. (2004) and Hasselgren (2009).

3 See BMU (2006) for a broader corporate definition.

4 Examples include illegal logging activities in Indonesia. See http://www.panda.org/who_we_are/wwf_offices/indonesia/environmental_problems_indonesia.

5 For an overview of certification schemes, see http://www.fsc.org and http://www.pefc.org. There is a great deal of literature available on forestry certification schemes, including from the World Wildlife Fund.

6 'Aber vielleicht übersieht die Staatengemeinschaft eine bewährte und geprüfte Methode, die seit Jahrtausenden funktioniert, die Biosphäre', Translation by the authors.

7 See Faustmann (1849), who developed the first discounted cash flow-related evaluation method.

8 See Markowitz (1952) and related literature. With regard to forestry, see, e.g., Zinkhan et al. (1992).

9 In other words, financial returns are not strongly determined by the movements of major traditional asset classes like stocks or bonds. For more details on the concept of correlation in an investment context, see Markowitz (1991) and related literature.

10 REDD means Reducing Emissions from Deforestation and forest Degradation. Afforestation activities in a Kyoto context are included in the Land Use and Land Use Change and Forestry (LULUCF) section. For a definition and further discussion, see http://www.fao.org and http://www.unfccc.org. Also, for an overview and definition of the Kyoto Protocol, see UNFCCC (2009).

11 We do not elaborate further on various retail-oriented smaller-scale investment schemes operating in continental Europe. According to Scholtens and Spierdijk (2007), in the Netherlands, more than 30 tropical timber funds have attracted investment, although operational efficiency, reliability, and transparency appear less than sufficient. We encourage investors, especially retail investors, to strictly challenge offerings in tropical timber and in more mainstream forestry investments. In this case, the presence of large financial institutions may not be sufficient to ensure legitimacy.

12 See Röckemann et al. (2009b) for a more detailed discussion of the portfolio effects of forestry.

13 We do not analyse cost components or risk here. We assume market- and location-typical cost levels (for planting, management, harvesting, etc.). However, we do not assume selective design of risk reduction through insurance cover (see, e.g., Yin and Izlar, 2001; Röckemann et al., 2009a).

14 This is a typical strategy with A/R projects in the Kyoto context.

15 For details, see, e.g., First Forest (2009).

16 There is a broad range of literature on the ecosystem services of forests. A compact overview can be found on the US Forest Service website (US Forest Service, 2006).

17 See UNFCCC (2009).

18 Organisations such as The Nature Conservancy (http://www.nature.org) have a strong track record of easements.

19 For historical price data and projections, see, e.g., http://www.risiinfo.com.

20 For a more detailed discussion, see, e.g., Wossidlo et al. (2009).

21 They seem to be substantial for investments such as solar energy and wind farms. See Mansour and Yun Xu (2009) for a recent overview.

22 The NCREIF Index is the most commonly used and the only market-based indicator of US forestry investments (http://www.ncreif.com).

23 The return levels represent generalised, typical, and conservative estimates for 'biological growth investments', at ten- to 15-year horizons, using current market prices for professionally managed forestry investments at a wholesale level. Investors may use these levels for a first cross-check on potential projections. Scholtens and Spierdijk (2007) discuss retail teak investment schemes that promise returns up to 19% per year.

24 One can easily run comparisons for other indices such as Euro Stoxx with similar results. These investments are typically marketed as 'timber investments'.

25 Calculations are for 2007. More information is available at http://www.georgenichols.com.

26 Details are available from Forst Ebnath's annual documents (see http://www.forst-ebnath.de). The forests are reportedly certified by PEFC.

27 Forst Ebnath has a free float (shares that are readily available for trading) of less than 4%.It is thus difficult to separate 'asset-driven' factors from 'market-based' factors. This investment option has only limited scalability.

28 See http://www.ncreif.com for details on this index.

29 The Index is regularly audited. However, the fund inflows are reported on a strictly voluntary basis by participants, who are large and reputable US firms in the professional timberland investment market.

30 For an illustration of GUMP and initial results, see Röckemann et al. (2009b, 2009c). For various quantitative approaches, see, e.g., Clutter et al. (1983).

31 In other words, is it a strategy leaning toward a 'typical market return' (beta), or toward a more significant active contribution by an asset manager from buy/sell decisions (alpha)?

32 Examples include "one of the world's leading rating agencies" that "provides the crucial head start in the segment of sustainable investments…. Our sustainability research covers share and bond issuers" (Oekom Research, http://www.oekom-research.com/index_en.php). And Swiss-based SAM was named 'Best Asset Manager Investing in ESG' for the second time in a row in November 2009(for more information, see http://www.sam-group.com/downloads/about/sam_press_releases/20091120_ESG_Award_e.pdf). The company's focus is on listed companies.

33 Both are also often referred to as sustainable: "Sustainable energy sources are most often regarded as including all renewable sources, such as biofuels, solar power, wind power, wave power, geothermal power and tidal power" (quoted from http://en.wikipedia.org/wiki/Sustainable_energy, accessed on 23 November, 2009).