

Advancing Natural Capital Accounting for Financial Institutions

Linking land-use change from cattle ranching in
Brazil and air pollution from coal power
in the U.S.A. to financials

Regional Analysis – Cattle Ranching in South America

The cattle ranching sector in South America was chosen for further analysis in terms of regulatory frameworks, reporting disclosures and market mechanisms.

Corporate transparency and market mechanisms

Pressure on cattle ranchers to operate in a more environmental sustainable way is being driven through supply chain interventions and responsible procurement policies from upstream consumers of livestock for meat production and leather.

In 2009, high profile campaigns by non-governmental organizations (NGOs) and pressure from the Federal Public Prosecutor's Offices in Pará, led to two important supply chain interventions: the MPF-TAC Agreement, and the G4 Cattle Agreement.

The two agreements share many similarities. Under both, meatpacking companies committed to block sales from properties with deforestation occurring after the agreements, or that were not registered in the Rural Environmental Registry (CAR), a Brazilian system for storing geo-referenced property boundaries for monitoring purposes.

In 2011, 14 companies were fined \$625 million and the same amount in compensation for environmental damage for breaching the TAC agreements by buying beef from farms exploiting illegally deforested areas. This included JBS. In 2013 26 companies faced \$300 million in fines for the same reason.

Ever since then a large amount of retailers, manufacturers and meat processors have followed by making public commitments to zero-deforestation, including prominent global brands, such as Mars, Colgate-Palmolive, Walmart, Nestle, Tesco, and many more. The implementation of these commitments are beginning to drive on-the-ground transformation and help ensure that beef, leather, and tallow are produced in the Brazilian Amazon without jeopardizing tropical forests. There is also growing demand for Rainforest Alliance Certified™ cattle farms.

Cattle Commitments by Sector
(number of commitments)

- 1–Broadline retailers
- 1–Consumer discretionary
- 1–Consumer staples
- 1–Drug retailers
- 9–Food products
- 3–Food retailers & wholesale
- 1–Integrated oil & gas
- 2–Personal products
- 7–Other/unknown



Note: Based on 307 tracked commitments made by 243 unique companies and sub-brands.
Adapted from Supply Change: Corporations, Commodities, and Commitments that Count.
Source: Supply-Change.org

Major slaughterhouses and supermarket chains are increasingly demanding deforestation-free and best-practice certified products. Therefore ranchers who do not abide by environmental regulations and best practice have increasingly limited avenues for selling their product. The consequence is that their bargaining power is further reduced and they are forced to sell their products at lower costs on short terms contracts. Whereas farmers who implement best practice are able to sell their product at a premium and are engaged with buyers who are willing to sign long term contracts, thus resulting in a steady cash flow.

Regulatory Requirements

Environmental regulations are also becoming stricter. This is associated with increasing compliance and environmental management costs.

Mechanisms such as PES Schemes and Biodiversity Offsets are also being put in place. One of the mechanisms under the Forest Code in Brazil is the Environmental Reserve Quota (Portuguese acronym, CRA). It is a tradable legal title to land areas with intact or regenerating native vegetation exceeding the requirements of the Legal Reserves (LR). The CRA (surplus) on one property may be used to offset a Legal Reserve debt (i.e. a property with less than the minimum requirement of forest cover) on another property within the same biome and, preferably, within the same municipality or state. Full implementation of the CRA could create a viable trading market for forested lands, incentivizing forest conservation.

These types of schemes create a recognized market for natural capital which provides companies with the ability to be account for preserved forest as an asset on their balance sheet.

Sector Analysis

Cattle Ranching - Details of Sector

Name of Sector	Cattle Ranching
Region	South America (However for the purpose of this case study, focus has been placed on Brazil)

Section 1. Profile of the Sector

Meat production in Brazil has increased steadily over the past five years, mainly driven by strong demand from export markets. Companies in this industry raise or fatten animals for the purpose of selling animals or animal products.

Brazil has just over 200 million head of cattle. It is the largest commercial herd of cattle in the world, about a quarter of which is used for milk production. It is also the second largest exporter of beef. Other large livestock producers include China, the EU, India, and the US.

Cattle ranching makes up the largest share of Brazilian agribusiness, generating revenue of more than \$50 billion per year and offering about 7.5 million jobs.

The sector is quite fragmented and can be very roughly divided into three groups:

Large farmers with large-scale, modernized, and relatively efficient systems;

Farmers with medium-scale systems which include remote urban farmers that keep large, low-input cattle herds for cultural reasons but are barely involved in management and show less interest in productivity, profitability, or sustainability concerns;

Small-scale family enterprises

The small-scale producers are the most numerous but only account for 18.6% of the cattle raised. It is the large farmers who dominate the market and own the largest proportion of the country's herd. Approximately 46% of the country's herd is in properties with more than 500 ha of pasture (IBGE 2006). Overall there are approximately 1.2 million cattle ranchers in Brazil. See table below for further detail:

Table 2. The structure of livestock production properties in Brazil, divided into four property size categories. Data: IBGE 2006.

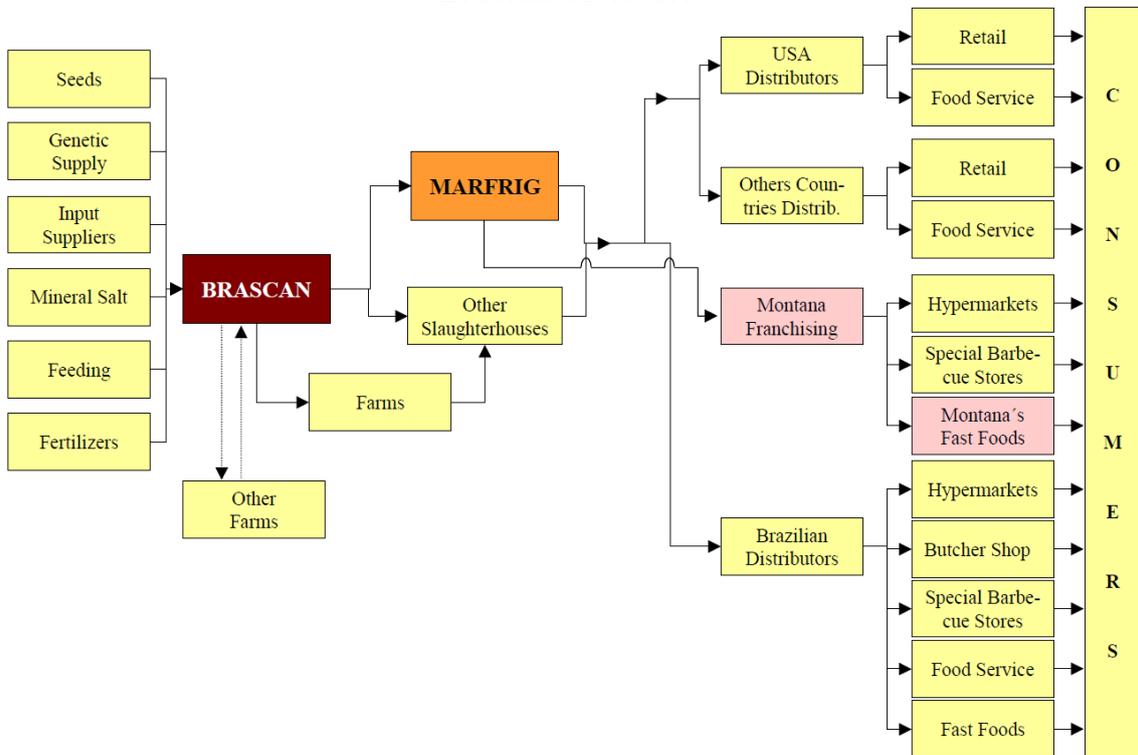
Property size (ha)	No. of properties in Brazil	% of all properties in Brazil	% of total area in Brazil
<100	1,883,622	86.30	18.6
100 - 500	232,547	10.7	23.4
500 - 1,000	35,513	1.6	11.9
>1,000	30,879	1.4	46.1
Total	2,182,561	100.0	100.0

The cattle supply chain in Brazil is made up of a complex network of producers, which cover various segments and combinations of the four primary productions phases: breeding, rearing, fattening and processing. Some

of the large companies (i.e. Cotril Alimentos) are fully integrated across phases of the supply chain from breeding to processing. Other large ranchers are involved in the raising of the cattle which are then subsequently traded, auctioned, sent to finishing lots or sold to processors (i.e. Brascan).



Brascan's Network



Source: Authors - Pensa 2004

Some small to medium-size ranches exist as part of a cooperatives.

Middlemen or distributors exist along the various stages of the process. They facilitate the exchange of cattle through auctions, trading and sales. This provides further complexities and complications around traceability of financial flows across transactions between actors involved in cattle ranching and farming.

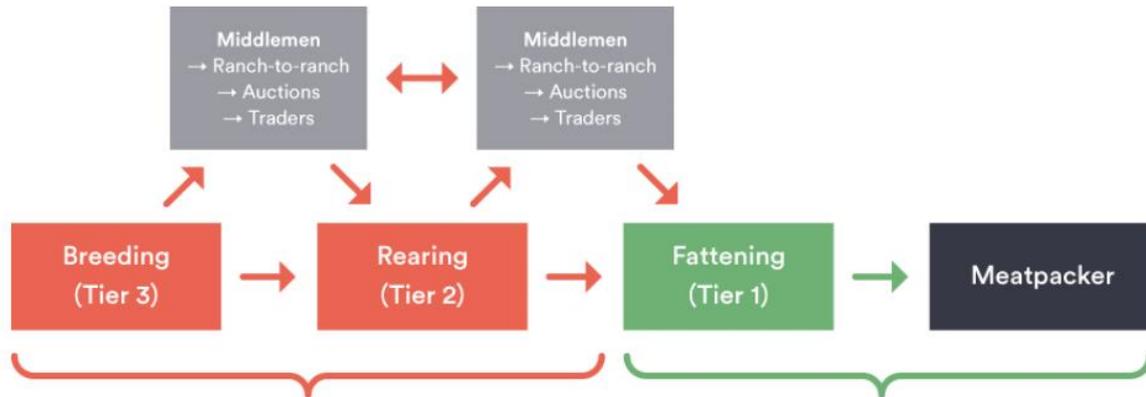


Diagram from: <http://www.zerodeforestationcattle.org/ch5t1.html>

There has been considerable consolidation of the beef processing firms which has created an environment in which ranchers have limited bargaining power and ever fewer options for selling their cattle. The market share of the three largest processors, JBS, Marfrig and Minerva, grew from 24% in 2011, to 37% in 2013 (BeefPoint, 2013). In terms of beef processed, JBS alone accounts for 50% (IMEA 2011).

Small butcheries were formerly the most common sellers of domestic beef, but these have been increasingly replaced by large retailers such as supermarkets. The largest beef retailer groups in Brazil are Grupo Pão de Açúcar, Carrefour, and Wal-Mart (ABRAS 2013).

Overall large multi-national retailers and global food brands play a prominent role in the domestic market for beef products in Brazil.

Additionally, the cost to manage 145 hectares (358 acres) of cattle pasture so that no additional deforestation is needed is roughly R\$412,000 (Datu Research 014).

Section 2. Primary Sources of Finance (Identify up to 3)

Corporate Loans

Recently ADEP, a boutique investment bank based in Cayman Islands, has provided financing worth \$25 million to be used for fattening 70,000 cattle, held by ranch operators in Goias and Sao Paulo states. White & Case LLP, Macquarie Group Ltd. and Swiss Re AG have assisted with the deal. Ranches will pay returns using the profit generated by cattle sales to comply with the religion's ban against interest.

Loans & underwriting		Shareholders	
Financial institution*	Country	Financial institution*	Country
Banco Bradesco	Brazil	Banco do Brasil	Brazil
Banco do Brasil	Brazil	Banco Bradesco	Brazil
Banco do Nordeste do Brasil	Brazil	Bank of New York Mellon	United States
Bank of America	United States	BlackRock	United States
BNDES	Brazil	BNDES	Brazil
BTG Pactual Group	Brazil	Caixa Econômica Federal	Brazil
Credit Suisse	Switzerland	Comgest	France
Deutsche Bank	Germany	Credit Suisse	Switzerland
Goldman Sachs	United States	Dimensional Fund Advisors	United States
Grupo Santander	Spain	Fidelity Investments	United States
HSBC	United Kingdom	Itaú Unibanco	Brazil
Itaú Unibanco	Brazil	Norwegian Government Pension Fund - Global	Norway
JPMorgan Chase	United States	Skagen	Norway
Morgan Stanley	United States	SulAmérica	Brazil
Rabobank	Netherlands	Vanguard	United States

* selection of financial institutions listed in alphabetical order, based on provisions of loans and underwriting services between 2009 and 2014, and shareholdings at the most recent filing date as of November 2014; Source: Thomson ONE, "Loans and underwriting", viewed in November 2014; Bloomberg, "Loans search", viewed in November 2014; *Jornal GGN* (2010, July 31), "O apoio do BNDES aos frigoríficos"; Fabriani, F. (2013, September 14), "BNB tem perda milionaria com operacao duvidosa", *O Estado de Sao Paulo*; Landim, R. and D. Friedlander (2010, July 25), "Aposta de R\$ 18,5 bilhões do BNDES em frigoríficos assusta concorrentes", *Estadão*; Minerva (2014), *Financial statements 2013*, p.65; Thomson ONE, "Shareholders", viewed in November 2014; own calculations and estimates.

Private Equity

As of 2008 Contril Alimnetos had 169 million heads of cattle, one of the largest cattle herds in the world. Vision has been actively involved in providing finance and asset backed loans since 2006 to the Cotril Group, and in 2007 obtained a 36% private equity stake in the business.

Microfinance

Microfinance is a key source of funding for small-scale farms in rural areas. The Agroamigo of the Bank of Northeast of Brazil is one the largest rural microfinance providers in Brazil (PRONAF). 81% of their total portfolio is indexed in livestock activities.

Section 3. Key Indicators

Water Use

Livestock water use is water associated with livestock watering, feedlots, dairy operations, and other on-farm needs. Water management is extremely important for livestock producers to minimise the risk of operational disruptions and ensure food safety.

Globally, livestock production accounts for about one third of total freshwater consumption. A significant portion of this is from cattle whose daily water requirements are much higher than that of other types of livestock. Cattle daily water requirements range from 40-100 litres per head compared to sheep daily water requirements of 4 - 12 litres per head. The total water footprint for 0.5 kilogram of beef in the supermarket is 6,810 litres.

Land Use

The vast majority of the impact associated with cattle farming comes from the farming stage due to land-use conversion. In Brazil nearly 80 per cent of deforested areas in Brazil have been converted to pasture.

Cattle ranching has rapidly spread north-westwards across Brazil into the Amazon biome, which now supports nearly 60 million cattle, about one-third of the entire Brazilian herd. Around 19% of production is in the highly valuable Amazon region in the North of Brazil, whereas 11% of production occurs in the South, which has the lowest natural capital intensity (Trucost 2015).

The Amazon region provides valuable ecosystem benefits for local, regional, and global communities. It provides habitat for wildlife, support biodiversity, and removes and stores large amounts of greenhouse gases (GHG) from the atmosphere. Forests like the Amazon also help regulate important natural processes, such as rainfall patterns and nutrient cycles, which are critical for the productivity of agriculture.

Cattle farming in Brazil is predominantly based on extensive pasture systems where the average number of cattle per hectare is 0.8 heads. Whereas in the United States of America cattle farming is predominantly based on intensive pasture systems where the average number of cattle per hectare is nearly double that of Brazil.

Water and Land Pollution

Of the 172 million ha of pasture for cattle ranching in Brazil, more than 10% is degraded (IBGE 2006). This is mainly due to overgrazing which leads to soil erosion. The loss of valuable topsoil can reduce agricultural productivity for crops and land grazing. Cattle ranching also contributes to water pollution as runoff from ranches can include soil erosion as well as manure, antibiotics and hormones given to the animals, plus fertilizers and pesticides.

Accounting tools or mechanisms that enable disclosure of financial risks derived from natural capital depletion/degradation and the value of natural capital assets.

Section 4. Internalisation of Natural Capital Costs (what to recognise)

TABLE 1.
Ranchers' costs to comply with regulations

SOURCE: Industry interviews

LICENSE	AGENCY	COST
LAU - Licença Ambiental Única (environmental license)	SEMA (Mato Grosso)	Variable
CAR - Cadastro Ambiental Rural (Environmental Rural Register)	SEMA	R\$ 300 – R\$ 3,000
LAR - Licença Ambiental Rural (Environmental Rural License)	SEMA (Mato Grosso)	R\$ 3,000 – R\$ 7,000
Geo-Referencing	INCRA	R\$ 10,000 – R\$ 15,000
Land titles	INCRA	Variable

Compliance Costs

The figure below lists ranching licenses required in Mato Grosso and Pará since 2009, along with fees, which vary according to ranch size. At a minimum, the initial expense of regulatory compliance costs a rancher R\$ 16,500 and can reach as high as R\$ 28,000 (Datu Research 2014).

Fines

Fines for breaching the Forest Code normally range from US \$ 3,000 to about US\$ 30 million. These are direct costs to the business and can definitely be material to the business. Plus it includes sanctions such as the confiscation and disposal of goods associated with environmental crimes and incarceration.

According to a recent news article from 1 April 2015, a rancher was fined US\$ 230,000 in 2009 and banned from selling cattle after trying to clear an embargoed forest area.

However it is important to note that weak enforcement over the laws is an issue as well as some prevailing loopholes associated with “laundering” and circumventing the tracking systems (CAR). As a result many ranches often lack incentives to comply with the regulations. This is especially true in remote areas where land grabbing and speculation is still widespread and state-level environmental agencies often lack the capacity for monitoring and enforcement.

From 2001 to 2005 the government only managed to collect less than 3% of the value of fines (Barreto, Pereira, & Arima, 2008). However the probability of getting fined has increased considerably since due to the advancement in systems such as the Rural Environmental Registry System (CAR).

Opportunity Cost of Land Preservation

By requiring farms to set aside land for preservation or in some cases reforestation represents an opportunity cost to the business in terms of potential revenue/profit forgone from being able to farm that portion of land.

Brascan, have over 150,000 hectares of agricultural land and 70,000 heads of cattle. The cattle is managed on 80,792 hectares and approximately 50,000 agricultural hectares set aside land for legal and environmental reserves. Another 13,100 hectares are leased to sugarcane producers; soybean and corn crops are rotated on 8,400 hectares; and rubber, pineapple and other products are produced on 2,100 hectares.

MATO GROSSO

	Total Area (Ha)	Legal Reserve	Environmental Reserve (Ha)	Actively Managed (Ha)	Cattle	Soy/Corn
SAN MARTIN RANCH "MORUMBI"	30,000	15,000	1,198	13,802	13,802	
SAN FRANCISCO RANCH	12,919	2,585	462	9,872	9,872	
SAN ANTONIO RANCH	17,800	3,560	510	13,730	6,230	7,500
	60,719	21,145	2,170	37,404	29,904	7,500

MATO GROSSO DO SUL

	Total Area (Ha)	Legal Reserve	Environmental Reserve (Ha)	Actively Managed (Ha)	Cattle	Soy/Corn	Pineapple	Sugarcane	Other
SAN DIEGO RANCH	12.148	2.430	381	9.337	9.337	-	-	-	-
SAN JORGE RANCH	5.391	1.078	18	4.295	4.295	-	-	-	-
SAN JOSE I E II RANCH	20.008	4.002	721	15.285	15.285	-	-	-	-
FAZENDA ALEGRIA	1.641	640	56	945	105	-	-	-	840
PIRAPITINGA RANCH	16.600	3.320	1.451	11.829	8.399	600	630	2.200	-
	55.788	11.469	2.627	41.692	37.422	600	630	2.200	840

SÃO PAULO

	Total Area (Ha)	Legal Reserve	Environmental Reserve (Ha)	Actively Managed (Ha)	Cattle	Soy/Corn	Sugarcane	Rubber
BARTIRA RANCH	14.320	2.864	927	10.529	4.389	-	5.500	640
FORMOSA RANCH	6.800	1.360	281	5.159	5.159	-	-	-
MOSQUITO RANCH	13.088	2.618	852	9.618	3.918	300	5.400	-
	34.208	6.842	2.060	25.306	13.466	300	10.900	640

Reduced Land Productivity

Currently Brazil has an average land productivity 0.8 heads per ha. Bruscan's, who represent better practice, have an average land productivity of 1.3 heads of cattle per hectare. Transition to intensive rotational systems have been shown to improve a range of environmental and economical aspects of agriculture by increasing livestock product yield per unit of land (WWF 2009, Drewry 2006). For example, Eaton et al. (2011) showed that in a 17-month study, mean cattle weights and pregnancy rates were 15% and 22% higher, respectively, for the herd using the rotational system in Brazilian Pantanal. The potential stocking rates of the rotational system were 2 to 6 times higher than rates typical of continuously grazed areas. Increasing stocking rates were shown to have a potential for minimizing pressures on natural resources in Pantanal (Eaton et al., 2011). Other studies show that improve pasture management alone could increase overall farm productivity from 82 kg/ha/yr to 154 kg/h/yr.

Land Degradation & Reduced Productivity

By overgrazing and increasing soil erosion ranchers end up degrading the land. Not only does this decrease productivity compared to those who implement better practice, it can end up costing ranchers over \$1,000 per ha for rehabilitation of the soil to make the land productive.

Droughts and Extreme Weather

There is increasing demand and competition for water in Latin America. Weather patterns are also changing with unseasonably hot weather during certain times of the year and low levels of rainfall.

In 2012 Brazil faced some its driest conditions in 50 years which wiped out thousands of cattle whilst other were forced to sell cattle, therefore flooding the market and forcing ranchers to sell them below market value. Small-scale agricultural farms were most impacted as opposed to the large-scale industrial facilities. The livestock market value in Northeast Brazil is said to have fell by 28%, and in certain villages the reduction reached 50% (DIARIO DO NORDESTE, 2012).

Between the months of July and August of 2014, in some parts of Latin America there was no rainfall for 45 continuous days. While reservoirs and water systems are in place in most large cities across Central and South America, agriculture during those months suffered greatly.

With the current crisis in São Paulo, they are being forced to siphon water from rivers that are supposed to feed the water systems of Rio de Janeiro and Minas Gerais, creating increased competition for water.

Higher Input Costs

Today beef operations margins are only 5% and are susceptible to volatile commodity prices which are used as inputs for cattle ranching operations, mainly for animal feed. This is especially pertinent for feedlot operations. Water scarcity will be a major factor which contributing towards higher commodity prices in the future.

Environmental Management Costs

The cost to manage 145 hectares (358 acres) of cattle pasture so that no additional deforestation is needed is roughly R\$412,000 (Datu Research 014).

Section 5. Natural Capital Risk to Financial Institutions

Legal Liability

Banks can be legally liable in Brazil for financing operations associated with illegal deforestation. In 2011 federal prosecutors in Brazil filed suit against the state-run Banco do Brasil for approving loans to companies that illegally deforested the Amazon and used slave-like labor practices. Prosecutors said they uncovered 55 loans totalling nearly five million dollars that the Banco do Brasil, the country's main bank, approved for law-breaking farms. They also uncovered some 37 loans worth 11 million dollars to farms with similar problems from the Banco da Amazonia.

Credit Risk

As Hammil et al. (2008) argued, ecosystem services and natural resources most microfinance clients depend on for their livelihoods will be hit hard by altered climatic conditions, and this will compromise their ability to pay back their loans.

As the climate gets warmer, Agroamigo's borrowers, due to decreased land productivity, will find it increasingly hard to pay off their microloans, causing significant solvency and liquidity problems. This is precisely what happened during the 2011-2013 large-scale drought where the BNB, following a government's directive, allocated about R\$3.5 billion (US\$ 1.49 billion) in emergency loans as an attempt to mitigate default tides and sustain clients' activities (MOSER and GONZALEZ, 2013).

The combination of compliance costs and environmental management costs can be material for cattle ranchers, especially small-scale family owned businesses. For those who choose not to comply, fines can be even more costly if caught. Plus revenues are capped through market exclusion and changing consumer demands. Therefore it's almost become a necessity that cattle farmers comply with regulations and start to implement better pasture management in order to ensure creditworthiness and improved shareholder value over the long term.

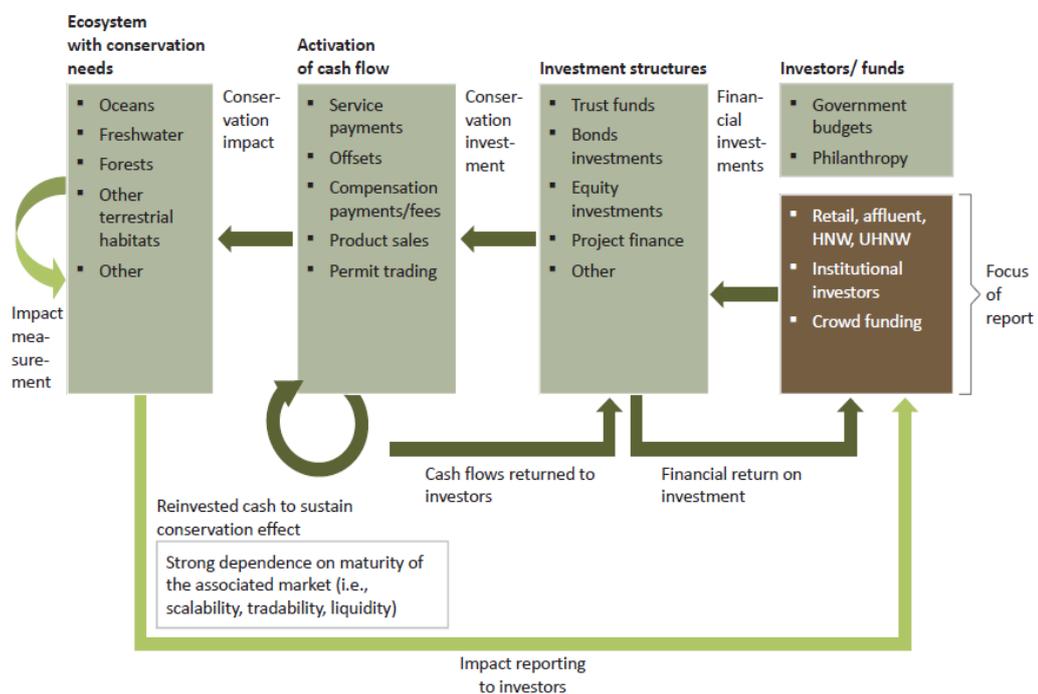
Reputational Risk

If associated with unethical activity through financing banks are at risk tarnishing their reputation. These impacts are harder quantify but are considered material (Demystifying Material Risks)

Lost Opportunities

Aside from the financials, legal and reputational risks at stake, financial institutions risk losing out on a range of opportunities to improve their return on investment. For example by providing alternative forms of finance and assistance which enable cattle ranchers to build greater and more diverse natural capital wealth stores and derive benefit from their environments while reducing environmental vulnerability, ranchers will be able to reduce costs, increase their yields and productivity, maintain steady cash flow, and bolster profits which will increase ROI, increase the clients risk-return profile and create further demand for credit in the future. This might take place in form of conservation finance which is becoming an asset class of its own through mechanisms which create possibilities for materialising and leveraging nature such that it can be “banked” such PES scheme or REDD+. See diagram below:

Figure 3: Conservation finance framework



Source: CS/WWF/McKinsey

Section 6. Accounting for Natural Capital Risk by Financial Institutions

The preservation and growth of environmental wealth is particularly important to the agriculture sector. It is a primary industry and as such natural capital is a key input and dependency. Therefore it is essential that financial institutions account for natural capital risks as part of their dealings with agribusinesses.

There is evidence to suggest that banks are considering these natural capital risk in their decision making process. For example most Financial Institutions now use registration in the CAR as a criterion in the consideration of credit worthiness for both public and private agricultural loans. Plus various other qualitative considerations are taken into account through ESG assessments and major banks in the region are constantly consultant and engage with farmers about these matters. However further work still needs to be on quantifying and accounting for these the risks.

Coal Power - Details of Sector

Name of Sector	Coal power generation
Region	North America

Section 1. Profile of the Sector

For the twelve months ending in March 2013, United States' coal plants produced 1,517,203 gigawatt hours of electricity, or 37.4 percent of total U.S. electricity production.¹ Coal's share in power production has fallen since its peak in 1988 due to major increases in production from natural gas and smaller increases from nuclear and wind.

As of 2011, the Energy Information Administration listed 589 coal-fired power plants in the U.S., down from 633 coal-fired power plants in 2002. Of these 589 plants, 332 were owned by electric utilities, 98 by independent power producers, and the remainder by industrial and commercial producers of combined heat and power.²

Section 2. Primary Sources of Finance (Identify up to 3)

- Bonds
- Loans
- Shares

Section 3. Key Indicators

Environmental KPIs (air pollutants and greenhouse gases) for coal power generation in Northern America is estimated at US\$317bn which is 1.3x revenue.

Greenhouse gases and air pollutants

The generation of electricity from coal power produces air pollutants including carbon dioxide, sulphur dioxide and nitrous oxide.

Water use

Coal power generation is heavily dependent on water to operate the generation units.

Section 4. Internalisation of Natural Capital Costs

Environmental costs

American Electric Power (annual report 2014, p.10)

'We will seek recovery of expenditures for pollution control technologies and associated costs from customers through rates in regulated jurisdictions. Environmental rules could result in *accelerated depreciation, impairment of assets or regulatory disallowances*. If we are unable to recover the costs of environmental compliance, it would reduce *future net income and cash flows* and impact financial condition.'

¹ "Table 1.1: Net Generation by Energy Source: Total (All Sectors)," U.S. Energy Information Administration, May 21, 2013

² "Count of Electric Power Industry Power Plants, by Sector, by Predominant Energy Sources within Plant, 2002 through 2011" U.S. Energy Information Administration

'The rules and proposed environmental controls will have a material impact on the generating units in the AEP System. We continue to evaluate the impact of these rules, project scope and technology available to achieve compliance. As of December 31, 2014, the AEP System had a total generating capacity of nearly 37,600 MWs, of which over 23,700 MWs are coal-fired. We continue to refine the cost estimates of complying with these rules and other impacts of the environmental proposals on our coal-fired generating facilities. Based upon our estimates, additional investment to meet these proposed requirements ranges from approximately \$2.8 billion to \$3.3 billion through 2020. These amounts include investments to convert some of our coal generation to natural gas. If natural gas conversion is not completed, these units could be retired sooner than planned.'

Compliance Costs

The Clean Air Act (CAA), as well as state laws and regulations impacting air emissions, including State Implementation Plans related to existing and new national ambient air quality standards for ozone and particulate matter. Owners and/or operators of air emission sources are responsible for obtaining permits and for annual compliance and reporting.

The Clean Water Act (CWA) which requires permits for facilities that discharge wastewaters into the environment.

The Comprehensive Environmental Response, Compensation and Liability Act, which can require any individual or entity that currently owns or in the past may have owned or operated a disposal site, as well as transporters or generators of hazardous substances sent to a disposal site, to share in remediation costs.

The Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), which requires certain solid wastes, including hazardous wastes, to be managed pursuant to a comprehensive regulatory regime.

The National Environmental Policy Act, which requires federal agencies to consider potential environmental impacts in their decisions, including siting approvals.

Duke Energy

Compliance costs – emission allowances - \$23 million (Annual Report 2014, p.149) (\$63 million in 2013)

Litigation

A \$127 million increase in *operating and maintenance expenses* primarily due to a litigation reserve related to the criminal investigation of the Dan River coal ash spill (See Note 5 to the Consolidated Financial Statements, "Commitments and Contingencies," for additional information), repairs and remediation expenses associated with the Dan River coal ash discharge and other ash basin related assessment costs, higher non-outage costs at generation plants, higher storm costs, higher distribution costs, higher nuclear outage expense including the impacts of nuclear levelization, and higher energy efficiency program costs, partially offset by decreased corporate costs and lower costs associated with the Progress Energy merger.

Decrease in Government Subsidises

In a July 2011 EIA report on federal fossil fuel subsidies, coal was estimated to have tax expenditures (provisions in the federal tax code that reduce the tax liability of firms) with an estimated value of \$561 million in FY 2010, down from \$3.3 billion in FY 2007.³

³ www.sourcewatch.org/index.php/Federal_coal_subsidies

Section 5. Natural Capital Risk to Financial Institutions

Impact on companies' cash flow:

- Increase in costs (emissions allowances, pollution control technologies)
- Increase in expenses

Reduced profit

Change in revenue if regulated prices can be increased to allow for companies' increased costs.

Impacts on financing mechanisms:

Bonds

Lower ability to attract capital

Increase the bond rate

Reduce the ability to pay bond payments

Loans

Reduced capacity to repay loans

Difficulty finding a loan provider

Shares

Lower earnings per share (i.e reduced dividends)

Lower share price/market capitalisation

Section 6. Accounting for Natural Capital Risk by Financial Institutions

There is no evidence through desktop review of financial institutions currently accounting for natural capital risk. The survey of Working Group 3 members produced a variety of responses in relation to this issue and found that there are a number of approaches currently being used (however these are not specific to coal power generation).

These include:

- Screening through a specific policy
- Evaluation of ecosystem services
- Credit evaluation process
- Financial analysis of customers as part of credit risk assessment to achieve a credit risk rating
- Part of qualitative ESG risk assessment of clients

In all instances raised, the valuation is done on a case-by-case basis and there is no discussion or identification of where this is being done at a portfolio level.

Framework for the financial sector for coal power generation and cattle ranching

In 'Natural Capital at Risk' TEEB recommends that investors build natural capital risks, adjusted for the likelihood of internalisation, into asset appraisal and portfolio risk models. To support this, financial institutions need guidance on how to account for natural capital risks linked to clients and investee companies.

This draft framework seeks to develop an approach to link the most significant environmental external costs associated with two 'externality heavy' sectors with their primary sources of financing. It seeks to identify common principles and areas where differentiation is required, to support natural capital accounting at a company and sector level in the future.

A number of observations have been made through this process.

When accounting for environmental externalities associated with a company's operations it is necessary to consider what proportion is borne by the private sector versus what proportion is borne by society and the public sector. Furthermore, some of the externalities borne by the private sector are already being internalised through regulations and standards, market dynamics, and stakeholder action (KPMG, 2014). These become financial costs to the private sector and ultimately impact the bottom-line.

Sectors

The materiality of different natural capital risks or factors depends on the sector and the region. The two sectors that this framework is built around are cattle ranching in Brazil and coal power generation in North America.

These sectors have been identified by Trucost as 'externality heavy' and represent both developing and developed regions of the world.

Data limitations

The ability for financial institutions to accurately account for natural capital risks relies heavily on companies measuring and publicly reporting on their natural capital impacts and dependencies. However it also relies on countries incorporating natural capital into their national accounts in order to understand the environment for different regions that companies operate within.

Currently, the reporting in the cattle ranching sector is close to non-existent and so the lack of mechanisms to force internalisation of externalities, coupled with the lack of disclosure of impacts, makes it difficult for financial institutions to account for natural capital.

There is significant development of mechanisms and disclosure in the coal power generation sector in North America, which provides more tangible examples of externalities and where and how they are being internalised.

One of the biggest barriers currently in accounting for natural capital at the financial institution level is the lack of available data. Individual companies are rarely considering environmental externalities,

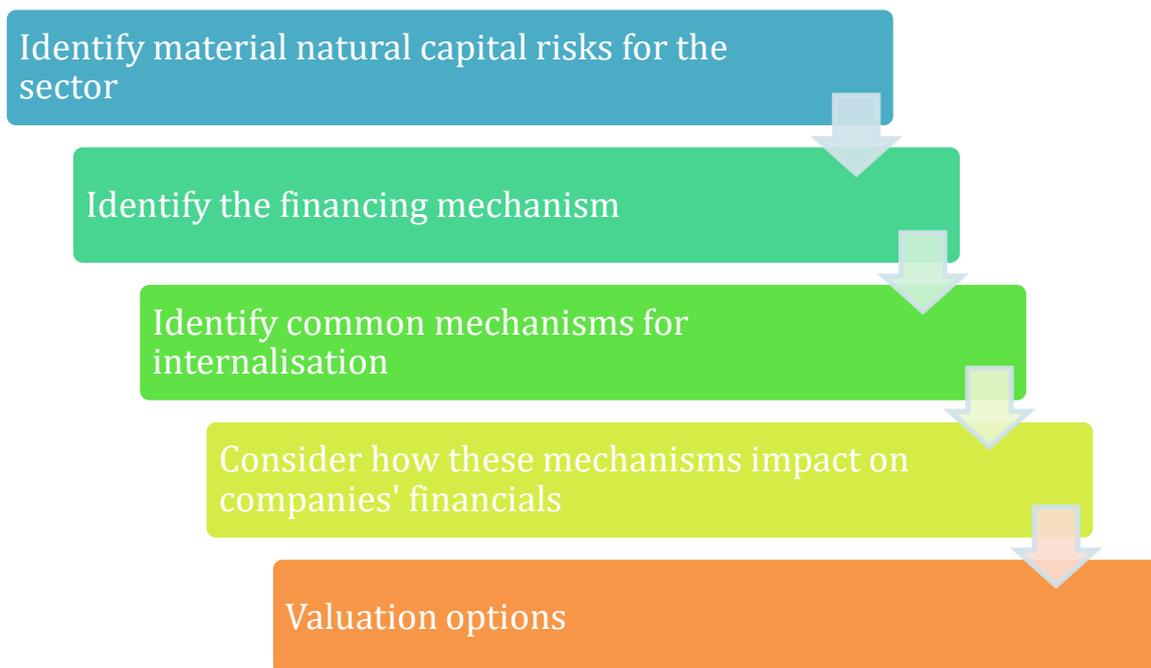
beyond where there are formal mechanisms in place, and this is currently occurring in limited circumstances and predominantly only extends to greenhouse gases.

The greatest need to enable natural capital accounting at a portfolio level is high quality, quantitative information for material sources within organisations' reporting boundary. When reported, measures, indicators and other information about sources of environmental impact should be reported according to recognised standards or methodologies, with accompanying explanatory text, where necessary.

Framework

This documents provides a high-level draft framework for accounting/integrating natural capital risk in lending books or investment portfolios for key financial instruments used in one or two "externalities heavy" sectors.

The key steps in accounting for natural capital risk in this framework are based on the coal power generation sector. Notes are made where there are differences for the cattle ranching sector, where known and/or available.



The steps are outlined in more detail below.

The ultimate outcome of the draft framework options is to be able to evaluate, or account for, natural capital at a portfolio or lending book level. Valuation can be done at a company or a portfolio level – the key difference is the assumptions needed and level of effort to apply to the process. A portfolio approach adds significant complexity in assumptions around sectors, whereas aggregating company level valuations requires significant resources to undertake the separate company analyses.

1. Identify material natural capital risks for the sector

Consider natural capital in terms of both:

- Dependencies – what elements of natural capital is the company/sector dependent upon?
- Impacts – what elements of natural capital does the company/sector operations impact upon?

Materiality would be based on the degree to which the sector might impact natural capital and the degree to which it is dependent on natural capital.

Cattle ranching

- Water use
- Land use (deforestation)
- Water and land pollution

Coal power generation

- Greenhouse gas emissions
- Air pollutants
- Water use

Cattle farming - Brazil

BRF S.A. – operating risk

The company, formerly Brasil Foods S.A., was one of 26 Brazilian beef producers facing fines of \$282 million in 2013. It was exposed to fines of at least US\$9 million⁴ because of public civil action filed by federal prosecutors which argued that BRF bought cattle from areas embargoed by the Brazilian Institute of Environment and Renewable Resources (IBAMA).⁵ However, the company received a non-monetary sanction, after it signed a Conduct Adjustment Instrument (TAC) with federal prosecutors in June 2013 and the process was terminated. [GRI G4-EN29]⁶ BRF is required to implement the TAC rules of procedures.⁷ The company discloses potential penalties for environmental breaches together with financial information regarding other legal proceedings in its consolidated financial statement, making it difficult to identify the value of environmental liabilities.⁸ In 2013, 61 of 198 civil actions were filed on the part of the consumer (administrative and legal) were settled or agreements reached against payment of a total of R\$ 231,000 (US\$74,000).⁹ As of December 31, 2014, BRF S.A. had R\$57.4 million (US\$18.4 million) in provisions for civil contingencies, compared to net income of R\$4.9 billion (US\$1.6 bn).¹⁰

⁴ <http://news.mongabay.com/2013/0417-brazil-fines-beef-producers.html>

⁵ www.organicauthority.com/blog/organic/brazilian-cattle-ranchers-fined-for-destroying-rainforest/

⁶ http://ir.brf-global.com/arquivos/BRF_RA_EN_140228c.pdf

⁷ <http://api40.10kwizard.com/cgi/convert/pdf/BRFSA-20140331-20F-20131231.pdf?ipage=9501310&xml=1&quest=1&rid=23§ion=1&sequence=-1&pdf=1&dn=1>

⁸ BRA S.A., Form 20-F, March 2015

⁹ http://ir.brf-global.com/arquivos/BRF_RA_EN_140228c.pdf

¹⁰ www.twst.com/update/99354-brf-brasil-foods-sa-brf-net-income-increases-1094-reaching-r22-billion-in-2014-02262015

The company's 20-F filing to the U.S. Securities Exchange Commission for the year ending March 2015 states: "Because of the possibility of unanticipated regulatory measures or other developments, particularly as environmental laws become more stringent in Brazil, the amount and timing of future expenditures required to maintain compliance could increase from current levels and could adversely affect the availability of funds for capital expenditures and other purposes. Compliance with existing or new environmental laws and regulations, as well as obligations in agreements with public entities, could result in increased costs and expenses."

More significant than environmental penalties or compliance costs is the potential loss of license to operate at plants in Brazil. BRF's plants are subject to environmental licensing, based on pollution and use of natural resources. If environmental licenses are not renewed by environmental authorities, the company may incur fines of up to R\$10 million and other administrative penalties, suspension of operations or closing of the facilities in question. These penalties may also apply in if the company fails to fulfill the conditions in environmental licenses already held. There is no guarantee that environmental licenses will be renewed.

Coal power – North America

Pinnacle West Capital Corporation – environmental capex set to top \$300 million

In June 2015, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Justice reached a federal Clean Air Act settlement with several Arizona and New Mexico-based utility companies requiring an estimated US\$160 million in upgrades to install pollution control technology to reduce harmful air pollution from the Four Corners Power Plant located on the Navajo Nation near Shiprock in New Mexico. The settlement also requires \$6.7 million to be spent on three health and environmental mitigation projects for tribal members and payment of a US\$1.5 million civil penalty.¹¹ Arizona Public Service Company (APS) is the operator and primary owner of the plant. APS is a wholly-owned subsidiary of Pinnacle West Capital Corporation is its Pinnacle West Capital Corporation is an investor owned electric utility holding company. It derives essentially all of its revenues and earnings from APS.¹² Pinnacle West Capital Corporation's Form 10-K Annual Report for the period ending 31 December 2015 states: "The Four Corners and Navajo Plant participants' obligations to comply with EPA's determinations, coupled with the financial impact of potential future climate change legislation, other environmental regulations, and other business considerations, could jeopardize the economic viability of these plants or the ability of individual participants to continue their participation in these plants."

APS estimated that its share of an EPA determination in 2012 which requires APS to install and operate pollution control technology at the plant by July 31, 2018 would be 63% share of the cost of these controls - at least US\$350 million between 2015 and 2017. These costs included in capital expenditure estimates. The company reported environmental capital expenditure for APS of US\$36 million 2015, rising to US\$162 million in 2016 and US\$161 million in 2017. The total capital

¹¹ <http://yosemite.epa.gov/opa/admpress.nsf/ab2d81eb088f4a7e85257359003f5339/f2ba23128e2c5e1185257e6e00624f90>

¹² www.pinnaclewest.com/about-us/default.aspx

expenditure of the three years - prior to the latest settlement – equates to 33% of Pinnacle's operating revenue for 2014 (US\$1,100 million).¹³

El Paso Electric Company, Public Service Company of New Mexico, Salt River Project Agricultural Improvement and Power District and Tucson Electric Power Company are current co-owners of the plant and Southern California Edison Company is a former co-owner. The settlement resolves claims that the companies violated the New Source Review provisions of the federal Clean Air Act by unlawfully modifying the Four Corners Power Plant without obtaining required permits or installing and operating the best available air pollution control technology. The new controls aim to reduce sulphur dioxide (SO₂) and nitrogen oxide (NO_x) emissions.

2. Identify the financing mechanism

The financing mechanism that is used to connect the institution with the company/sector is an important consideration. It is the link between the external costs that impact the company/sector and the impact on the institution itself. It will impact upon the extent of exposure as well as nature of the impacts of the externalities will in turn impact the institution. The link between the external costs and, subsequently, the impact on the primary sources of financing for the two key sectors are outlined below. This includes impacts that will affect both the financial institution as well as the company/sector.

Cattle ranching

- Corporate loans
- Private equity
- Microfinance

Coal power generation

- Bonds
- Loans
- Shares

This step requires clarity around the scope and boundary of the activities involved as they relate to the financial mechanism that links the bank to the activity/company. For example, the scope for a loan is limited to the project for which credit has been provided (if known). And the scope for equity investment is limited to the proportion of the overall project of which the financial institution is an investor in the activity/company.

3. Identify common mechanisms for internalisation across the sector based on regulatory frameworks, market mechanisms, and stakeholder action

Mechanisms for internalisation	Where to look? i.e. Source
Clean-up / environmental remediation costs	Sustainability Reports
Compliance costs (i.e. capital costs associated with meeting government/industry standards and regulations)	Annual Reports Regulator Websites
Fines, suspensions, and lawsuits	Analyst Reports
Cost of certifications schemes	Certification Websites

¹³ <http://d1lge852tjjqow.cloudfront.net/CIK-0000764622/be898e11-8e74-4b32-95f6-b7539c0eea62.pdf?noexit=true>

Supply chain disruptions	Media Research Reports
Higher input costs as a result of resource scarcity	
Market mechanisms (i.e. Sulphur emissions trading scheme)	
Government taxes and levies	
Decrease in government subsidies	
Offset schemes for biodiversity/ecosystem services	
Cost of environmental management and monitoring	

The following boxes show the top environmental costs for each of the two sectors – currently only environmental costs involves a market mechanism (emissions trading for coal power generation sector), however the rest are largely regulatory or legal costs.

Cattle ranching

- Compliance costs
- Fines
- Opportunity cost of land preservation

Coal power generation

- Environmental costs
- Compliance costs
- Litigation
- Decrease in government subsidies

4. Consider how these mechanisms impact a company's financials

Cattle ranching

(note: there are very limited current examples, so some instances below are theoretical impacts)

Impact on companies' cash flow:

- Increase in costs (environmental compliance costs, fines for breaching the Forest Code, purchase of co-benefit certificates)
- Reduced revenue from a reduction in productivity due to land degradation
- Reduced profit due to volatile input costs, including water

Impacts on financing mechanisms:

Loans

- Reduced capacity to repay loans
- Difficulty finding a loan provider

Private equity

- Reduced value of company
- Reduced return on investment
- Difficulty raising additional capital and finding new shareholders

Microfinance

- Reduced capacity to repay loans
- Increased interest rates

Coal power generation

Impact on companies' cash flow:

- Increase in costs/expenses (emissions allowances, pollution control technologies)

- Reduced profit
- Change in revenue if regulated prices can be increased to allow for companies' increased costs.

Impacts on financing mechanisms:

Bonds

- Lower ability to attract capital
- Increase the bond rate required
- Reduce the ability to pay bond payments

Loans

- Reduced capacity to repay loans
- Difficulty finding a loan provider

Shares

- Lower earnings per share (i.e reduced dividends)
- Lower share price/market capitalisation

This next section considers a range of questions that a financial institution will need to consider as part of the assessment of the natural capital impact in lending books or investment portfolios.

Impact to a company's Profit and Loss Statement

Operating Costs/Expenses

How much will costs increase as a result of environmental damages, or for rehabilitating land, or for impairment associated with written-down assets?

Will there be higher input costs?

Revenue

To what extent are revenues dependent on natural capital? How much would revenue decrease if natural capital was degraded?

Depreciation

How would useful economic lives of assets be altered if natural capital was degraded?

Tax

If governments levy taxes on environmental impacts, how would this affect the company's tax bill?

Interest

What impact would poor environmental performance have on a company's cost of capital?

Impact to a company's Balance Sheet

Intangible Assets

Would new market mechanisms, such as biodiversity markets, create credits that would qualify as intangible assets?

Property, plant and equipment

Could trends in natural capital reduce the value in use or recoverable value of PPE, resulting in the need for impairment?

Provisions



Secretariat:



How would tighter rules on rehabilitating industrial sites affect restoration provisions? Would tighter environmental regulation lead to the increasing of environmental provisions?

The second element of this step is how this might impact the company's:

- a) **Creditworthiness** (relevant to debt investments and project finance)
- b) **Environmental Liabilities** (relevant to debt investments and project finance as it relates to collateral should the proponent default)
- c) **Market value** (relevant to equity investments)

OR B – Group into risk families, assess consequence and frequency for each, and run Value at Risk calculation.

5. Accounting for natural capital

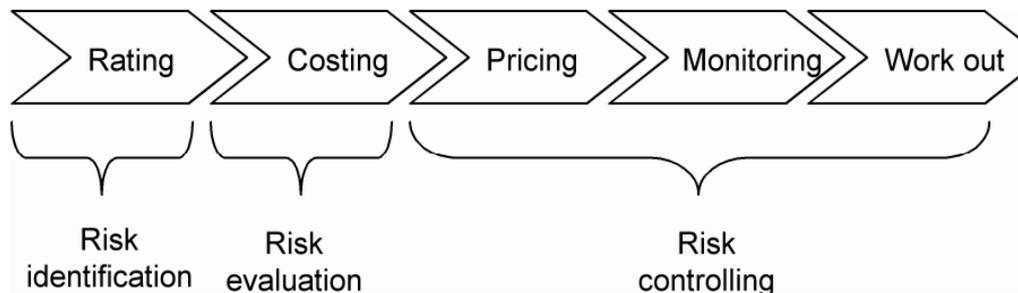
Option 1 – LCA and Shadow Pricing

TruCost methodology whereby one uses an environmentally extended input-output model to assess either water use, land use, air pollutants; and then applies shadow price to provide societal cost as a proxy for exposure to risk in monetary value.

The same Scope 3 GHG principles can then be to identify a bank's exposure based on the type of financial mechanism.

Option 2 - Credit Risk Assessment and Valuation

The process of credit risk management and especially the part that concentrates on the management of the counterparty risk can be structured into the five phases shown below:



The objective of the rating is to determine the borrower's default risk. The banks first conducts a credit personal credibility check followed by a credit worthiness evaluation to determine a loan's probability of default.

The aim of costing is for the bank to quantify the expected loss from lending based on the probability of default and the loss given default (i.e. expected loss when a borrower goes bankrupt). This depends mainly on the value the bank estimates receiving if it calls in security on a loan and subsequently sells it.

In the pricing the identified costs are integrated into the credit conditions. By charging every borrower a premium based on his expected loss, the average loss in lending can be compensated for. During the loan period, the credit is watched and changes in credit risk are monitored. If a borrower's expected loss increases, the reasons for this need to be analysed and measures of correction taken. In the context of natural capital accounting, this approach would entail finance professionals assessing the materiality of natural capital risks, quantify natural capital risks, and incorporate these risks directly in the credit risk analysis for corporate valuations.

It essentially involves integrating potential impacts on cash flows in the DCF valuation model. It would potentially allow for practical ways to create risk-adjusted premiums/cost of capital.



General Approach:

1. Source and combine data on ecosystems as well as companies resource dependence
2. Quantify the risks resulting from ecosystem degradation (including climate change) and overuse of resources using environmental economics approaches
3. Determine impact on financial metrics through cash-flow analysis (at company level) and/or scenario models based on probabilities
4. Integrate into standard valuation and credit risk assessment models

Option 3 - E-RISC

Assessing the materiality and relevance of natural resource-related risks for sovereign credit risk analysis

General Approach:

1. Examine the country's natural resource situation (bio-physical analysis).
2. Combine with information about the structure of the economy to determine the magnitude of potential impacts resulting from the natural resource situation (economic analysis).
3. Consider the macroeconomic situation to determine the ability of the country to absorb a natural resource-related shock (financial resilience analysis)

Recommendations

- There needs to be a lot more work done around the development and testing of analytical tools which help provides insights into how environmental risks affect standard financial metrics, such as EBITDA.
- There is a need to develop specific and standardised methodologies to quantify various natural capital risks associated with each of the 6 EKPIs for fixed-income investments.
- Quantifying and account for natural capital risks for equity investments will most likely be speculative.
- Framework will need to allow natural capital-related risk to be assessed across portfolios and might be best expressed in terms of exposure or value at risk.
- To incentivise uptake, the approach needs to be straightforward and practical. We believe this is best done by leveraging off systems and processes that are already in place. This includes companies harnessing tools which are already in place such as GRI and financial institutions leveraging these reports.