EMERGING MARKETS DIALOGUE

Natural Capital Risk Exposure of the Financial Sector in India

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CONTENTS

EXECUTIVE SUMMARY

All companies and financial institutions depend on natural capital for their business activities. Natural capital includes resources such as timber, minerals and land, as well as services such as a stable climate, fresh water and clean air. India is one of the fastest growing economies in the world, helped in large part by its abundant natural capital.

Indian banks and investors are exposed to financial risks as a result of the loans and investments they provide to businesses with natural capital impacts. These risks come from stricter environmental regulations which increase compliance costs; from droughts and resource shortages which disrupt production and supply chains; and from reputational damage and changing consumer preferences which reduce company revenues.

In contrast, there are many opportunities to profit from the shift to a greener economy that protects and enhances natural capital through renewable energy and resource efficiency.

This study helps companies, banks and investors in India understand these risks and opportunities using a technique called natural capital valuation. This technique puts a monetary value on environmental and social impacts so that they can be integrated into decision making in a more effective way. The study was commissioned by German Development Cooperation (GIZ) on behalf of the German Ministry for Economic Cooperation and Development (BMZ) through the Emerging Markets Dialogue Program on Green Finance and conducted by natural capital analysts Trucost. YES Bank supported the study as knowledge partner.

The study quantifies the natural capital costs of 50 economic sectors in India that are relevant to the financial sector through shareholdings and loan books. For 10 sectors, natural capital impacts were calculated on a regional basis. The study calculated the exposure of banks and investors to these natural capital costs by mapping the amount of money loaned or invested in those sectors. It identifies the drivers that can force companies to pay natural capital costs, threatening loan repayments and reducing shareholder returns.

Key findings

- Indian banks are financing business sectors with a total natural capital cost of INR 90,496 billion, equivalent to 2.9 times the credit provided to those sectors. If these natural capital costs were internalized by borrowers, it would impact their ability to repay loans significantly.
- Indian banks are more exposed to natural capital risks than equity investors due to loans made to natural capital intensive sectors such as agriculture and power generation, as well as industries including food processing and iron and steel manufacturing. Government policy mandating loans to agriculture increases this exposure. Equity investors are less exposed due to the absence of agricultural companies in the Bombay Stock Exchange (BSE).
- Industrial sectors[1] together account for 28% of all natural capital costs financed, while representing 43% of credit disbursed. The majority of unpriced natural capital costs within industry occur within the food processing industry, which accounts for 12% of natural capital costs financed by banks due to the high water consumption of its agricultural supply chain. The power sector, represents 5% of the natural capital costs financed by banks due to greenhouse gas emissions associated with coal-fired power generation.

[1] See Industrial sectors listed on page 14.

- The agriculture sector has the highest natural capital risk for banks as it represents 71% of all the natural capital costs financed despite accounting for only 13% of credit disbursed. This is because activities such as cotton and wheat farming have natural capital costs that are 10.7 times and 8.7 times their respective revenues.
- Indian banks are primarily exposed to natural capital costs associated with water use (48% of natural capital costs), followed by land use (19%) and greenhouse gas emissions (12%).

Recommendations

- **Financial institutions should acquire more detailed data on sector exposure to natural capital risks as a priority.** Banks and investors could use the approach to natural capital valuation outlined in this study to quantify and manage the natural capital risks they face through corporate loans and equity investments. As a result, FIs can integrate natural capital costs in their decision-making processes and encourage investments into resource efficiency. They can use their influence with companies to encourage improved disclosure of environmental performance data.
- **Banks should provide training in natural capital valuation to enable employees to quantify exposure to natural capital risks.** Risk managers, credit analysts and other key staff should be given the skills to move beyond a qualitative understanding of environmental and social issues towards quantification and analysis of natural capital risks.
- **Sector-specific natural capital considerations should be included in credit analysis.** Banks can use this study as a basis to identify the most significant operational and supply chain impacts of a sector, so that they can develop appropriate assessments and incorporate these into financial analysis.
- **Long-term timeframes present significant opportunities for product innovation.** The impacts of climate change are expected to become more severe in future. Banks can become more resilient by incorporating environmental factors into long-term loan decisions. They can also finance projects that have a net environmental benefit such as renewable energy, sustainable farming, and industrial resource efficiency. Indian banks can use this study to assess whether the natural capital costs generated by a sector are from direct operations or its supply chain.
- **Financial institutions should work with the Indian government and other stakeholders to develop a national green accounting framework.** India was the first country in the world to commit to developing green national accounts, and work is underway to deliver this ambition. Banks, investors, companies, governments, economists and environmentalists need to work together to successfully develop and implement this framework.

INTRODUCTION AND STUDY AIM

All companies, including financial institutions (FIs), depend on natural capital for their business activities. Natural capital includes resources such as timber, minerals and land, as well as services such as a stable climate, fresh water and clean air. India is one of the fastest growing economies in the world, supported in large part by its abundant natural capital.

However, the degradation of ecosystems leads to reduced natural capital and causes disruptions in business operations as well as increasing costs. In response, governments are implementing pollution penalties and providing incentives towards green economies that will accelerate value and support to businesses that respond to sustainability.

FIs are exposed to these risks and opportunities through their investment and lending activities. For example, banks' loan portfolios are likely to face higher credit risks if lending occurs predominantly to high-impact, high-dependency sectors. The shareholder value for investors decreases once a company faces higher input costs or penalties for negative environmental effects. Investment strategies may underperform if they do not effectively mitigate natural capital risks and encourage investment in more sustainable sectors and business models.

This study helps companies, banks and investors in India understand these risks and opportunities using a technique called natural capital valuation. The technique puts a monetary value on environmental and social impacts so that they can be integrated into decision making in an effective and business-like way. FIs can use the environmental key performance indicators (EKPI) identified by the natural capital approach as a basis for integrating this new and valid cost dimension into their risk assessments, lending decisions and risk strategy.

The study by Trucost was commissioned by GIZ to support the aims of the Emerging Markets Dialogue Program on Green Finance (EMD Green Finance) to contribute to green finance research. The purpose of this study is to identify the Indian sectors and regions in which FIs are most exposed to natural capital risks. YES Bank supported the study as knowledge partner.

The study calculated the exposure of banks and investors to these natural capital costs by mapping the amounts of money loaned or invested to those natural capital intensive sectors and regions. It then developed a framework to identify the drivers that can force companies to pay natural capital costs, threatening their ability to service loan repayments and potentially reducing shareholder returns. This information can be used to assess the natural capital risks in a bank's loan book or an investor's portfolio.

The study quantifies the natural capital costs of 50 economic sectors in India that are relevant to the financial sector through shareholdings and loan books. These include sectors such as: coal-fired power generation, iron ore mining, textiles manufacturing, food processing and agricultural sectors such as cotton, wheat and rice farming. For each sector, the natural capital costs associated with six key environmental impacts were calculated: GHG emissions, land-use conversion, water consumption, waste, water pollution, and air pollution.

For 10 of the sectors the study also calculated the different natural capital impacts across six regions of India as defined by the Ministry of Home Affairs. The purpose of this approach was to demonstrate that the same activity can have different natural capital impacts depending on the geographical location. For more detail on the methodology used for this assessment, refer to the appendix.

RELEVANCE OF NATURAL CAPITAL TO INDIA

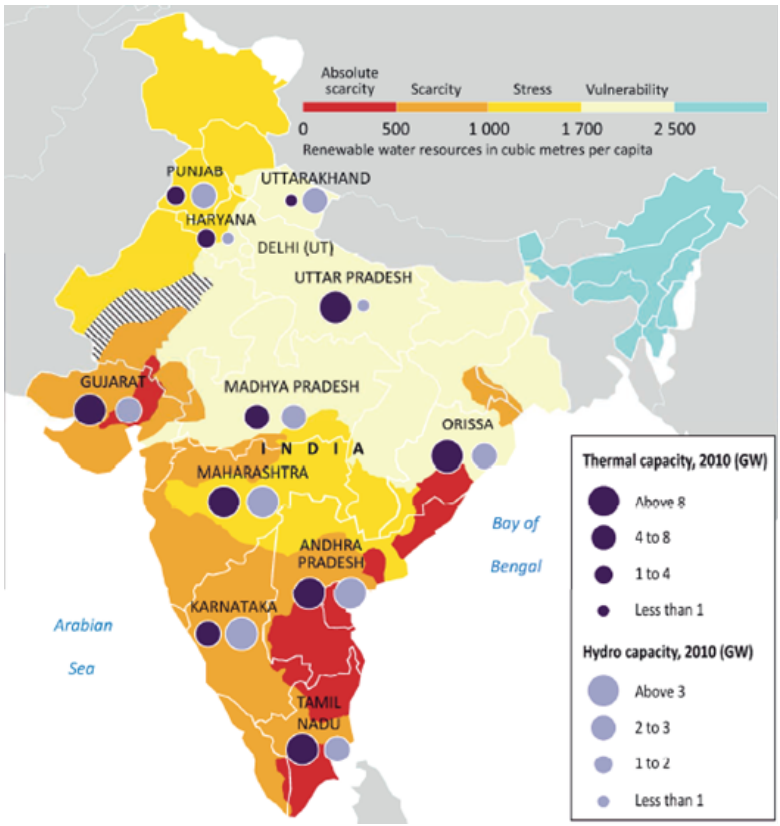
What is natural capital and how does it impact economies, companies and investors?

Natural capital can be defined as the limited stocks of physical and biological resources found on Earth including water, land, air and habitats (TEEB, 2015). Natural capital is essential for economic growth and yet is largely either unvalued or undervalued by markets. Natural capital consists of ecosystems from which human beings obtain a range of benefits: provisioning services such as food and freshwater; regulating services such as climate regulation and flood control; cultural services such as recreation and tourism; and supporting services such as nutrient recycling and soil formation.

Natural capital underpins economic activity with companies dependent on essential resources like water and raw materials. Companies are dependent on ecosystem services to provide resources and raw materials such as fossil fuels, timber and minerals. Ecosystems also play a major role in providing sufficient supplies of good quality water (TEEB, 2010). One of the major risks in India is water availability. For instance, coal-fired power stations, the dominant source of power in the country, require large volumes of water for cooling purposes.

Almost half of India's coalfired power generation capacity is located in two regions facing severe water stress. Figure 1 shows the relationship between coal-fired power generation in India and areas under water stress. Around 19% and 28% of total coal power capacity is located in the northern and western regions respectively — regions that are facing severe water stress (Kumar, 2013). In addition, the country's growing hydroelectric power generation capacity is also directly reliant on water availability.

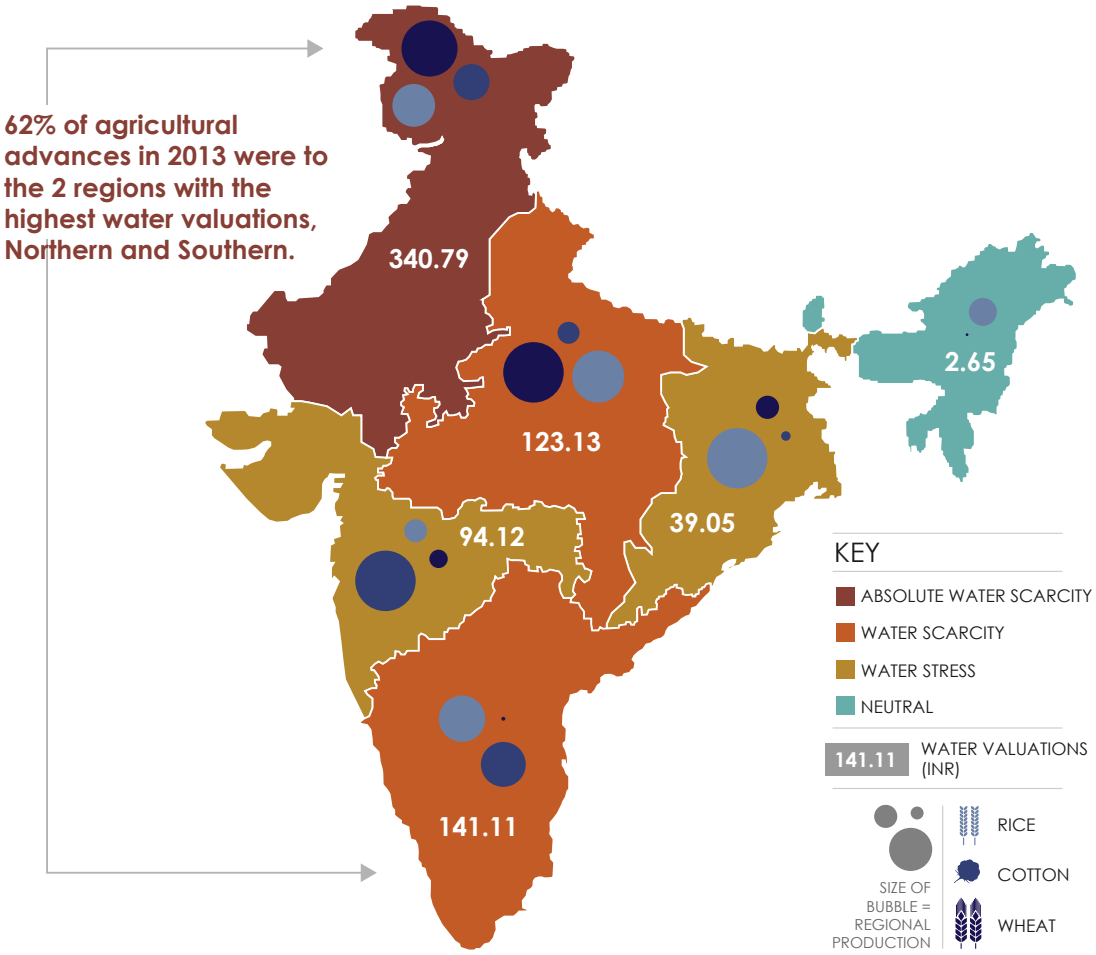
FIGURE 1: INSTALLED COAL POWER GENERATION CAPACITY IN INDIAN IS LOCATED IN AREAS UNDER SIGNIFICANT WATER STRESS



Source: (IEA 2012)

India's agriculture sector, which provides a livelihood to almost half of the population, is heavily dependent on water, with two-thirds of cultivated land relying on rainfall. Figure 2 shows the location of rice, cotton and wheat production in India relative to water scarcity. Over 62% of bank lending to agriculture occurs within the northern and southern regions of the country — regions with the highest natural capital intensities for water within the Trucost natural capital model (see Figure 23 within the appendix for details).

FIGURE 2: RICE, COTTON AND WHEAT PRODUCTION IS LOCATED IN AREAS FACING SIGNIFICANT WATER STRESS



Source: (IEA 2012), Trucost

Whilst essential to support growth, the use of natural capital can lead to negative impacts which in some cases create future risks to business. Economic growth, industrialization and population growth have been made possible by natural capital consumption. However, it has come at the cost of environmental degradation and externalities such as pollution, caused when the full social cost of growth and development is not paid for. Instead, the cost is paid by a third party, usually tax payers through government spending and local communities through poorer quality of life. For example, the cost of air pollution to society in India in 2010 was estimated at USD 500 billion per year in lives lost and ill health (UNEP 2014). As a result, the ability of the economy and business to rely on future natural capital and ecosystem services as an input to growth and production is at risk. A study by the World Bank in 2013 found that environmental degradation in India amounted to about USD 80 billion, equivalent to 5.7% of GDP in 2009 (World Bank 2013). This level of natural capital consumption and degradation is unlikely to remain sustainable, increasing the risk of future disruptions to business operations and increased costs.

The government recognizes natural capital as an essential input to the economy which is facing increasing risks due to climate change. The most recent government five-year plan cautions that government strategies for development must reconcile the objective of economic development with that of environmental protection and sustainability: "No development process can afford to neglect the environmental consequences of economic activity, or allow unsustainable depletion and deterioration of natural resources. Agitations around land acquisition, deforestation, water use, air and water pollution and also our response to natural disasters, have become more common" (Planning Commission, 2013). India is known to be one of the countries likely to be severely affected by the impact of climate change on monsoon occurrence and agricultural yields (Planning Commission, 2013). Figure 3 details the predicted impacts of climate change on India, likely to severely impact the country's stocks of natural capital and disrupt ecosystem services, creating risks to sectors of the economy and businesses reliant on these inputs.

FIGURE 3: CLIMATE CHANGE IS EXPECTED TO IMPACT AGRICULTURAL YIELDS AND HUMAN HEALTH IN INDIA

ITEM	ASSUMPTIONS
Extreme heat	Under 4°C warming, the west coast and southern India are expected to shift to high-temperature climatic regimes with significant impacts on agriculture
Changing rainfall patterns	Sudden changes in the monsoon could lead to more frequent droughts as well as greater flooding in large parts of India
Droughts	Droughts are expected to become more frequent and crop yields are expected to fall significantly because of extreme heat by the 2040s
Groundwater	More than 60% of India's agriculture is rain-fed, making the country highly dependent on groundwater. Falling water tables could impact agricultural output
Glacier melt	Alterations in the flows of the Indus, Ganges, and Brahmaputra rivers could significantly impact irrigation, affecting the amount of food that can be produced in their basins as well as the livelihoods of millions of people
Sea level rise	Sea-level rise and storm surges would lead to saltwater intrusion in the coastal areas, impacting agriculture, degrading groundwater quality, contaminating drinking water, and possibly causing a rise in diarrhea cases and cholera outbreaks
Agriculture and food security	Seasonal water scarcity, rising temperatures, and intrusion of sea water would threaten both rice and wheat yields, putting at risk the country's food security
Energy security	Declines in water availability cut pose a risk to the India's thermal power generation
Health	Higher incidence of diseases such as malaria in areas where colder temperatures had previously limited transmission

Source: World Bank (2013) India Climate Change Impacts

Over the last decade there has been increasing global momentum for valuing ecosystems and their services and for the inclusion of natural capital values into decision-making processes. Multiple global initiatives and assessments have taken place leading to commitments by international bodies. These include the Natural Capital Declaration (NCD), launched as an international response to the materiality of natural capital to the health of FIs. It is a commitment by FIs to work towards integrating natural capital criteria into financial products and services. The declaration aims to support FIs to accurately evaluate the nature and types of risks that their portfolios are exposed to in relation to natural capital. Similarly, the Natural Capital Coalition (NCC) is a global platform that brings together multiple initiatives focused on developing the business case for integrating natural capital in to decision making by sharing progress, knowledge and tools. Natural capital valuation is receiving increased focus, with FIs globally committing to integrate the approach into decision making.

In September 2015, a tool to incorporate water risk into corporate bond credit risk analysis was launched. The 'Corporate Bonds Water Credit Risk Tool' aims to help identify companies that depend heavily on access to water in locations that are exposed to water stress, and to quantify the potential impact of water scarcity on a company's creditworthiness. Seven financial institutions – UBS, Robeco, Calvert Investments, Pax World, J Safra Sarasin, Banorte and Bancolombia – helped develop the corporate bond tool through a partnership between the Natural Capital Declaration (NCD), German International Cooperation (GIZ), and the German Association for Environment and Sustainability in Financial Institutions (VfU), financed by the German Ministry for Economic Cooperation and Development (BMZ). In addition, in April 2015, the EDM Green Finance published a report on the natural capital risks facing FIs in Brazil, leading to several Brazilian FIs considering natural capital risks across their lending portfolios.

Natural capital valuation as an approach to ESG integration

From the perspective of the financial sector, natural capital is a subset of environmental, social and governance (ESG) factors that can be material to FIs, predominantly through their allocations of capital to companies through loans and investments. For FIs, incorporating ESG principles means embedding ESG considerations into investment and lending decisions, portfolio allocation strategies and product development. In recent years, ESG-guidance and principles such as the IFC performance standards, the PRI guidance documents for investors and the equator principles, have been providing FIs with important frameworks for identifying and understanding environmental risks.

To date, most approaches to incorporating environmental and social risk (such as sustainability indices) focus on assessing company policies and management with regards to environmental and social risks. The strength of these approaches lies in the evaluation of how a company responds to relevant environmental and social risks. The difference with respect to the natural capital approach is that this does not systematically quantify the potential impact of environmental and social risks on a company's financials.

The natural capital valuation approach supplements the ESG analysis with economic valuation of environmental inputs. It enables the monetary quantification of resources used by a company and environmental externalities created, enabling the systematic integration of environmental risks into valuation and pricing mechanisms. This allows for consideration of environmental externalities in financial analysis of companies, and the potential impacts on financials and credit risk. The quantification of environmental risks in monetary terms enables their aggregation at portfolio level. A FI can therefore stress test its portfolio for specific environmental risks and adjust its asset allocation strategy according to environmental risks.

How can unpriced natural capital be valued?

Trucost uses an economic modelling technique called input-output modelling which describes the economic interactions between each sector in the economy. The model quantifies the amount of resources required (the inputs) to produce a unit of output. Trucost then integrates data concerning the use and emissions of over 700 environmental resources across more than 500 business activities. By applying a price to each environmental resource, based on the environmental impact of that resource, Trucost can assess, in financial terms, the economic and environmental performance of each sector.

Trucost's natural capital valuation of water estimates the cost of water use on the local population by analyzing, among other factors, local water availability. Similarly, the natural capital valuation for air pollution estimates the local cost of air pollution impacts on human health, crop and forest yields, while the valuation of land use estimates the cost of local environmental services provided by land that are lost when it is converted for agricultural or industrial use.

Figure 4 describes how each environmental KPI is measured, and highlights the sectors that Indian banks currently lend to (with lending to this sector expressed as a percentage of total bank credit disbursed included) that are most exposed to each environmental KPI.

FIGURE 4: SECTORS INDIAN BANKS LEND TO MOST IMPACTED BY EACH EKPI MODELLED

EKPIs	PHYSICAL QUANTIFICATION	SECTORS INDIAN BANKS ARE MOST EXPOSED TO (% OF TOTAL BANK LENDING)
GHG emissions	**Tonnes of carbon dioxide, methane and nitrous oxide emitted to the atmosphere.**	**Coal power generation (6.6%), Iron & steel (4.6%), Chemicals & chemical products (2.5%)**
Air pollution	**Tonnes of ammonia, sulphur dioxide, nitrogen oxide, volatile organic compounds and particulates emitted.**	**Coal power generation (6.6%), Cotton (0.6%),**
Waste	**Tonnes of waste sent to landfill and incinerated.**	**Chemicals & chemical products (2.5%), Petroleum, coal products & nuclear fuels (0.9%)**
Land use	**Surface occupied by the business activity and expressed in square meters (m^2).**	**Cattle ranching & farming (0.7%)**
Water use	**The blue water footprint (m^3).**	**Wheat farming (2%), rice farming (3%), textiles (3.3%), Food processing (2.8%)**
Water pollution	**Tonnes of heavy metals and organic substances discharged.**	**Food processing (2.8%)**

Source: Trucost, RBI 2015

What drives natural capital cost internalization?

The following section outlines the mechanisms by which unpriced natural capital costs can be internalized by companies. These drivers can be either direct or indirect, as natural capital costs pass through supply chains.

In the absence of adequate market mechanisms, unpriced natural capital costs can trigger tighter regulation as governments intervene. The purpose of these regulations is to control the natural capital impact of companies and to drive natural capital cost internalization by companies. **Increased costs** can also be associated with compliance or litigation, for example meeting new soft commodity standards, or remediating polluted land. These policies aim to place a monetary value on the unpriced natural resource and pollution impacts of companies by quantifying the cost of the externality generated. In 2015, the Indian government doubled the tax on coal production to INR 200 per tonne in order to encourage companies to upgrade plants to increase fuel efficiency (Singh, 2015).

Operational risks stemming from natural capital degradation increase costs for a company, placing pressure on profitability. Corporates operating in sectors reliant on natural capital inputs may face difficulty maintaining profit margins in the face of rising input prices. Thus, companies which depend on water as a key input to the production process will face **increasing operational costs** in the event of increasing water scarcity. For example, the Dhamra Port project, a joint venture between Tata Steel and Larsen & Toubro, was delayed by four years due to controversy over the environmental impacts of the construction of the port and challenges in obtaining environmental permits. As the main shareholders in the project, both companies faced financial losses, as demonstrated by the sharp decline in Tata Steel's share price in 2009 when the controversy escalated (IFMR 2013). Industries with narrowing margins such as steel (Mazumdar, 2015) are more exposed to the impacts of higher input costs. This has impacts downstream in industries reliant on steel as a key production input, for example automobile manufacturing.

Reputational risks stem from negative public perception of a company's activities, damaging brand value and reducing revenue. In some cases it may cause investors **to divest from a company.** Reputation risk is likely to be greater for client-facing industries which rely on brand equity to support sales generation, such as luxury retail and auto manufacturing. In 2015, financiers Société Générale and Crédit Agricole pulled out of funding a joint venture between a power utility and Bangladesh's Power Development Board (PDB) to develop a proposed 1,320MW coal plant. This was due to environmental concerns about the plant's location near the world's largest mangrove forest (Roy, 2015)."

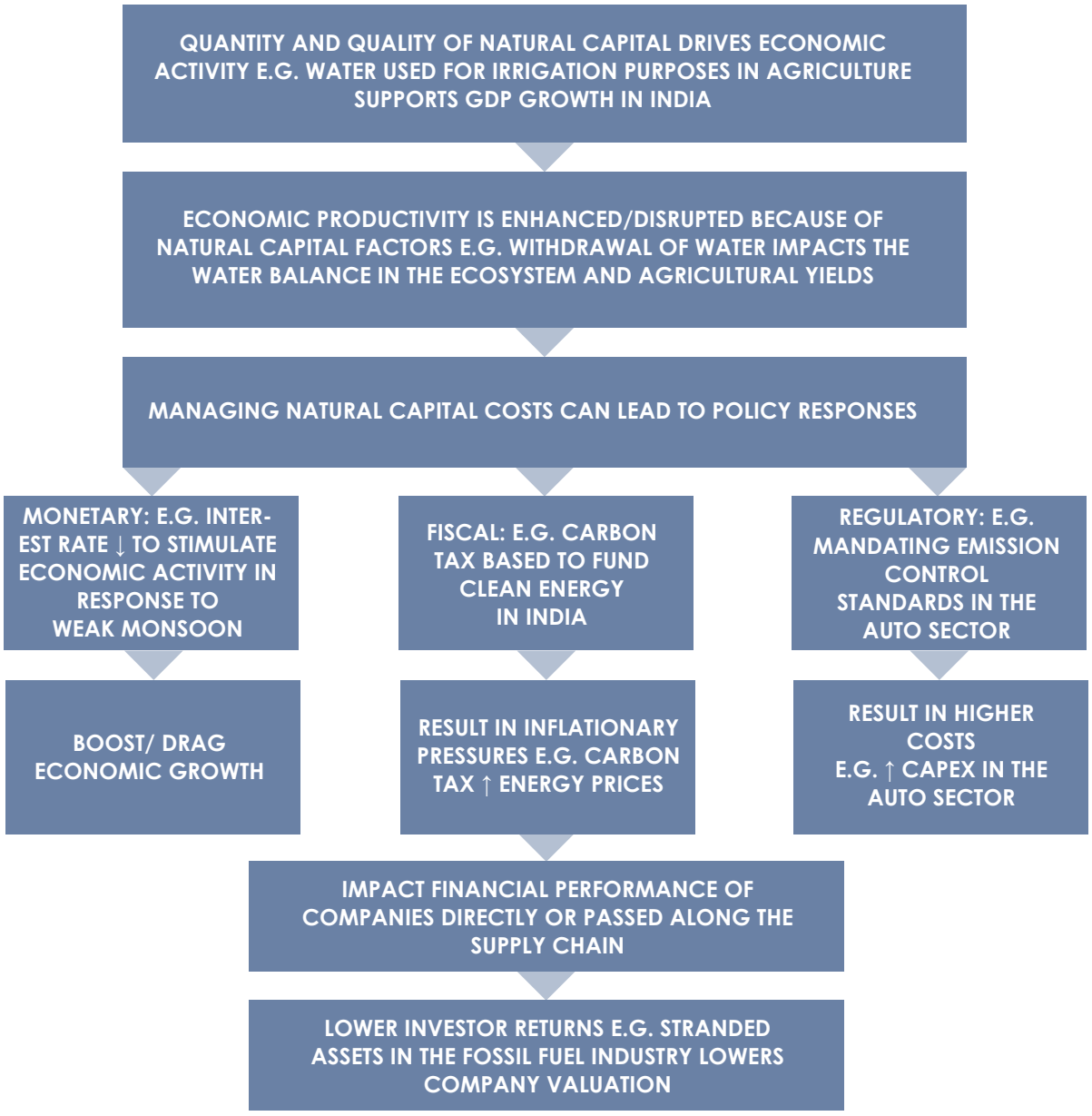
Climate risks result from disruptions to vital infrastructure such as roads and transport caused by changing weather patterns and extreme weather events. Climate change may require **increased investments** in activities such as improved infrastructure, investments into fuel-efficient vehicle development, land-use and transport planning. The effects of climate change in the last few years in India have become increasingly apparent, growing in scale and impact. In recent years India has suffered unprecedented hail storms, the worst drought in over forty years and floods. The Intergovernmental Panel on Climate Change (IPCC) has warned that unchecked climate change will exacerbate erratic rainfall patterns, crop loss, heat waves, droughts and other extreme events in India (Kumar, 2014).

Market risks include growing demand for sustainable products. Changing consumer preferences towards goods with more sustainable production practices and supply chain initiatives create a form of market risk in the form of **reduced demand and sales** for companies that do not embrace this shift. There have been growing numbers of multinational clothing companies making commitments to source sustainable cotton. For example, Ikea has stated that it intends to buy 100% sustainable cotton from sources such as the Better Cotton Initiative by the end of 2015 (Business call to Action n.d.). As India is the largest organic cotton producer in the world, this type of growth in market demand could have a positive impact on the revenues of Indian companies in this sector (Modak, 2014).

Why does natural capital matter to Indian financial institutions?

Indian banks and investors are exposed to financial risks as a result of the loans and investment they provide to businesses with significant natural capital impacts. The cost of environmental externalities can have significant impacts on company profitability, as discussed in figure 5, creating risks to lenders and investors with vested interests in company performance. Banks' loan portfolios are likely to face higher credit risks if lending occurs predominantly to high-impact, high-dependency sectors or in non-resource efficient business models. The shareholder value for investors can be impacted once a company faces higher input costs or penalties for negative environmental effects created. Investment strategies may underperform if they do not effectively mitigate natural capital risks by at least partially investing in eco-friendly sectors and business models. FIs can use a natural capital valuation approach as a basis for integrating this new and valid cost dimension into their risk assessment process.

FIGURE 5: UNPRICED NATURAL CAPITAL COSTS DRIVE ADVERSE IMPACTS ON THE MACRO ECONOMY, COMPANY AND INVESTORS

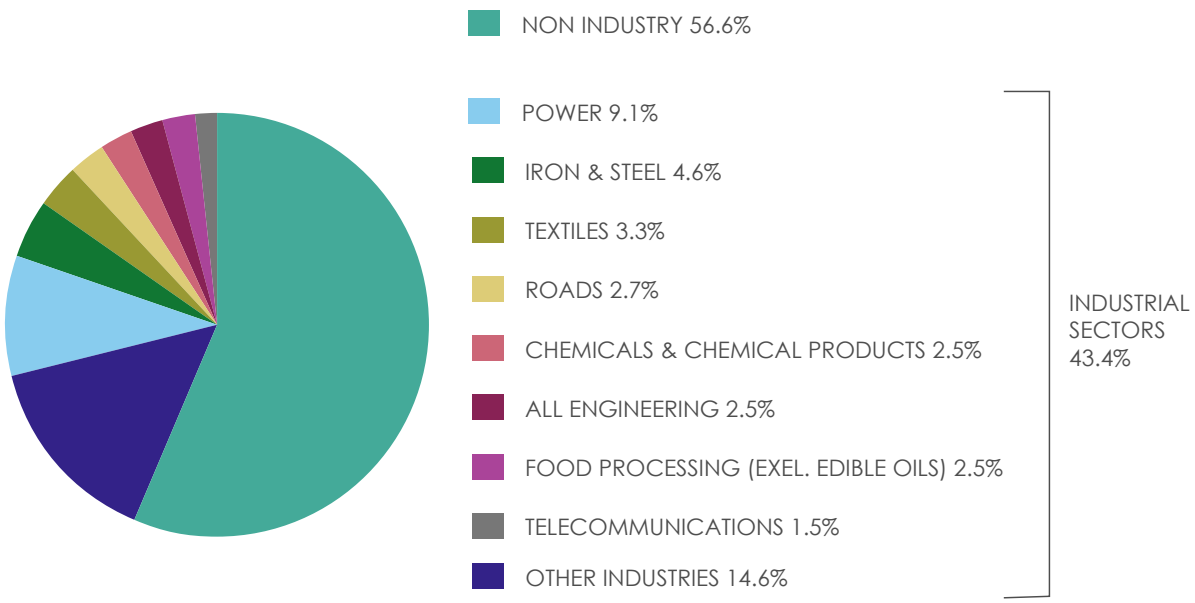


Source: Adapted from HSBC (2013) Natural Capital: Identifying implications for economies, Trucost (2015)

Commercial bank lending to natural capital intensive industrial sectors accounts for 43.3% of all loans in India, as shown in figure 6.[2] Four industrial subsectors together comprise the majority of this lending (25.5%): infrastructure, iron and steel, textiles and food processing. Lending to infrastructure is concentrated on the power subsector (9.1% of total bank lending), as well as telecommunications and roads. As well as consuming water for cooling purposes, coal-fired power generation contributes to high carbon emissions from burning coal, exposing the industry to high natural capital costs. Similarly, the textiles sector is dominated by cotton, which consumes vast amounts of water through inefficient water use practices (Ministry of Textiles, 2015).

Figure 6 shows bank lending by sector, with a focus on the most significant industrial sub-sectors. Non-industrial sectors cover the balance of bank lending.[3]

FIGURE 6: INDUSTRIAL SECTORS ACCOUNTED FOR 43.4% OF GROSS INDIAN BANK LENDING AS AT MARCH 2015



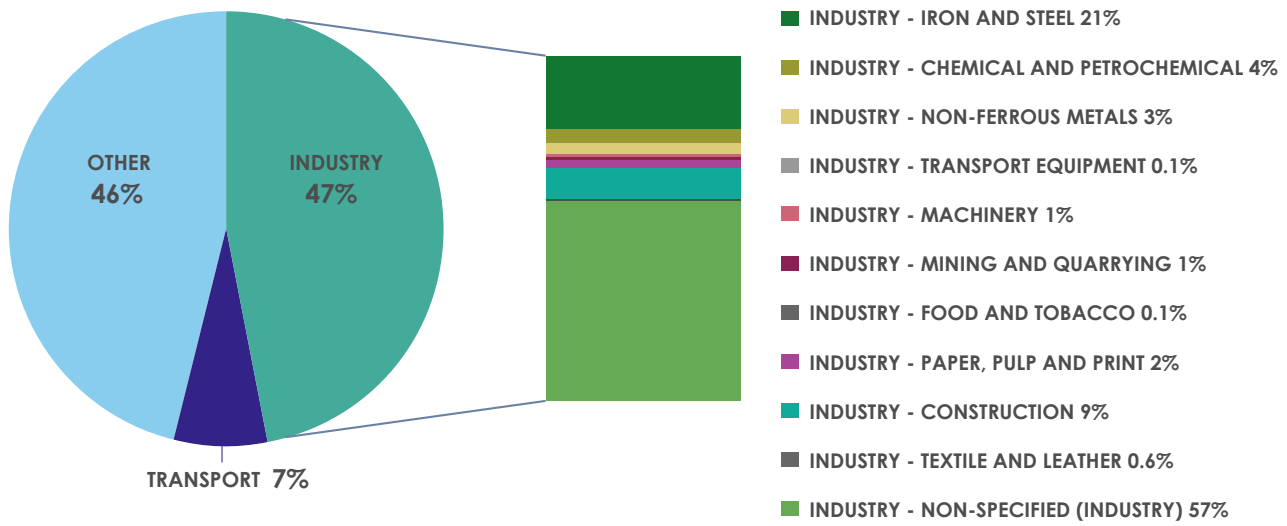
Source: (RBI, 2015)

[2] Industrial sectors include those identified in figure 6: 'power', 'iron and steel', 'textiles', 'roads', 'chemicals & chemical products', 'all engineering', 'food processing (excluding edible oils)', 'telecommunications' and 'other industries'. 'Other industries' refers to smaller sub sectors including: 'mining and quarrying (including coal)', 'beverage and tobacco', 'leather and leather products', 'paper and paper products', 'wood and wood products', 'rubber, plastic and their products', 'petroleum, coal products and nuclear fuels', 'glass and glassware', 'cement and cement products', 'edible oils', 'gems and jewellery', 'construction', 'vehicles, vehicle parts and transport equipment' and 'other industry (not further defined)'.

[3] These include non-industrial sectors, e.g.: 'agriculture and allied lending' (e.g. wheat, cotton, poultry, livestock farming), 'commercial real estate', 'shipping', 'professional services', 'education', 'retail trade', 'wholesale trade', 'professional services'

The most material industrial sectors to banks in terms of lending are also the most energy-intensive sectors in the Indian economy. Industrial sectors consume 47% of energy generated in India, as shown in figure 7. As a result, higher utility rates resulting from natural capital cost internalization in the power generation sector would significantly impact the cost base of the industrial sector. Indian banks are therefore exposed to this risk through lending to large industrial energy users. Iron and steel accounted for 21.4% of the industrial energy use in India and comprises 4.6% of gross bank credit as of March 2015. Similarly, construction consumes 9.2% of industrial energy use and 1% of gross bank credit, whilst chemical and petrochemicals uses 4.4% of industrial energy and accounts for 2.5% of gross bank credit.

FIGURE 7: INDUSTRIAL ENERGY CONSUMPTION BY SECTOR



Source: GOI (2015)

The transition to a greener, lower carbon economy in India will provide new opportunities for financing and investment policies as well as portfolio management. There is a significant business opportunity for banks to help customers transition to a more efficient way of doing business. This could be in the form of project finance, working capital solutions or advisory services for customers operating in or exposed to natural resource sectors, for example for the purpose of retrofits, renewable energy investments or creating water-efficient irrigation infrastructure. Such investments can have a positive knock-on effect for other sectors and businesses that banks lend to, by closing the loop and moving towards a circular economy.[4]

[4] A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.

KEY FINDINGS

FIGURE 8: KEY TERMS

KEY TERM	DEFINITION
Natural Capital Intensity (NCI)	The ratio of total natural capital costs generated (INR millions) relative to revenue generated (INR millions).
Natural Capital Exposure Ratio (NCE)	This term relates to commercial bank lending and is the ratio of un-priced natural capital risks to gross credit disbursed by commercial banks.
Natural Capital	The limited stocks of physical and biological resources found on Earth including water, land, air and habitats.
Natural capital cost	Un-priced environmental externalities resulting from the absence of adequate market mechanisms.
Natural capital risks	The risks associated with the internalization of natural capital costs through a risk driver for example environmental regulation.
Cost internalisation	When external costs are privatized to the creator of those costs e.g. a polluter.
Indirect impacts	Impacts from a company's supply chain.
Direct impacts	Impacts from a company's own operations.

Source: Trucost

Natural capital intensities in India

The breakdowns of total natural capital cost across each of the six environmental KPIs were calculated for 50 key sectors in India. Figure 9 displays the results, organized under the relevant sector as classified by the Reserve Bank of India (RBI) (highlighted orange). These sectors are ranked in terms of significance to total bank lending, with each of the components then ranked from highest to lowest natural capital intensity (NCI). The total natural capital cost associated with these 50 sectors amounts to INR 90,496 billion, equivalent to 2.9 times the amount of credit provided by Indian banks. As shown in figure 9, primary and industrial sectors have the highest NCIs, with cattle ranching topping the list at 16x. This means that for every INR million of revenue generated in the cattle ranching sector, 16x more natural capital costs are generated (in INR million). Currently, companies operating within these sectors are not paying these environmental costs; however, they are facing the associated risks of cost internalization through various drivers, for example resource and input availability and regulation.

FIGURE 9: NATURAL CAPITAL INTENSITIES FOR 50 SECTORS (BLUE HIGHLIGHTS DEEP DIVE SECTORS)

% OF GROSS BANK LENDING	SECTOR	NATURAL CAPITAL COST (MN INR / MN INR REVENUE)						
		GHG EMISSIONS	AIR POLLUTANTS	WASTE	LAND USE	WATER USE	WATER POLLUTANTS	TOTAL
12.5%	AGRICULTURE AND ALLIED ACTIVITIES							
0.7%	Cattle ranching and farming	1.9	0.2	0.1	7.9	5.4	0.5	16.0
0.6%	Cotton farming	0.2	1.8	0.1	0.9	7.3	0.3	10.6
2.1%	Wheat farming	0.4	0.2	0.2	1.1	5.0	1.7	8.6
0.7%	All other grain farming	0.3	0.2	0.2	4.5	1.8	1.4	8.4
0.7%	Sugarcane farming	0.2	0.1	0.1	0.8	5.5	0.4	7.2
3.1%	Rice farming	0.2	0.1	0.2	0.9	3.5	0.5	5.4
1.9%	Oilseed (except canola, flaxseed, safflower & sunflower & soybean) farming	0.3	0.1	0.1	1.3	2.0	1.6	5.4
0.7%	Poultry hatcheries	1.2	0.1	0.1	2.2	0.8	0.9	5.4
0.7%	Milk (dairy) production	0.5	0.1	0.1	1.1	1.3	0.1	3.2
0.7%	Potato farming	0.1	0.1	0.1	0.3	1.1	0.2	1.8
0.7%	Coffee farming	0.1	0.0	0.1	0.7	0.6	1.0	2.5
9.1%	POWER							
6.6%	Coal power generation	2.0	0.3	0.2	0.0	0.1	0.0	2.6
0.5%	Natural gas power generation	1.4	0.1	0.2	0.0	0.0	0.1	1.9
0.5%	Hydroelectric power generation	0.0	0.0	0.2	0.0	0.5	0.0	0.8
0.5%	Natural gas distribution	0.1	0.0	0.5	0.1	0.0	0.0	0.7
0.5%	Electric power distribution	0.1	0.0	0.2	0.0	0.0	0.0	0.3
0.5%	Wind power generation	0.1	0.0	0.2	0.0	0.0	0.0	0.3
4.6%	IRON AND STEEL							
2.3%	Iron and steel mills and ferroalloy manufacturing	0.6	0.0	0.3	0.0	0.1	0.0	1.0
2.3%	Steel product manufacturing from purchased steel	0.3	0.1	0.2	0.0	0.0	0.0	0.6
3.3%	TEXTILES							
3.3%	Textile and fabric finishing mills	0.1	0.1	0.1	0.0	0.5	0.0	0.9
2.7%	COMMERCIAL REAL ESTATE							
2.7%	Real estate	0.0	0.0	0.0	0.0	0.0	0.0	0.1
2.7%	ROADS							
2.7%	Support activities for transportation	0.0	0.0	0.1	0.0	0.1	0.0	0.2
2.5%	CHEMICALS AND CHEMICAL PRODUCTS							
0.8%	Other basic organic chemical manufacturing	0.8	0.3	0.3	0.1	0.2	0.2	1.8
0.5%	Petrochemical manufacturing	0.5	0.1	0.4	0.1	0.0	0.1	1.2
0.4%	Fertilizer manufacturing	0.6	0.2	0.3	0.0	0.0	0.0	1.2
0.8%	Pharmaceutical preparation manufacturing	0.0	0.0	0.0	0.0	0.2	0.0	0.3
2.5%	FOOD PROCESSING (EXCLUDING EDIBLE OILS)							
0.7%	Sugar cane mills and refining	0.2	0.1	0.1	0.1	0.4	0.3	1.1
0.1%	Coffee and tea manufacturing	0.1	0.1	0.1	0.1	0.4	0.2	0.9
1.7%	All other food manufacturing	0.1	0.0	0.1	0.3	3.6	0.4	4.5

% OF GROSS BANK LENDING	SECTOR	NATURAL CAPITAL COST (MN INR / MN INR REVENUE)						
		GHG EMISSIONS	AIR POLLUTANTS	WASTE	LAND USE	WATER USE	WATER POLLUTANTS	TOTAL
2.5%	ALL ENGINEERING							
1.9%	Architectural, engineering, and related services	0.0	0.0	0.0	0.0	0.0	0.0	0.1
0.6%	Electronic computer manufacturing	0.0	0.0	0.0	0.0	0.0	0.0	0.1
1.5%	TELECOMMUNICATIONS							
1.5%	Telecommunications	0.0	0.0	0.0	0.0	0.0	0.0	0.1
1.4%	TRANSPORT OPERATORS							
0.7%	Rail transportation (Diesel)	0.1	0.0	0.1	0.0	0.0	0.0	0.3
0.7%	Rail transportation (Electric)	0.0	0.0	0.1	0.0	0.0	0.0	0.2
1.1%	VEHICLES, VEHICLE PARTS AND TRANSPORT EQUIPMENT							
0.4%	Motorcycle, bicycle, and parts manufacturing	0.1	0.0	0.1	0.0	0.0	0.0	0.3
0.4%	Automobile manufacturing	0.1	0.0	0.1	0.0	0.0	0.0	0.3
0.4%	Light truck and utility vehicle manufacturing	0.1	0.1	0.1	0.0	0.0	0.0	0.3
0.9%	CEMENT AND CEMENT PRODUCTS							
0.9%	Cement manufacturing	1.1	0.2	0.2	0.0	0.0	0.0	1.5
0.9%	PETROLEUM, COAL PRODUCTS AND NUCLEAR FUEL							
0.5%	Petroleum refineries	0.1	0.0	0.8	0.1	0.0	0.0	1.1
0.5%	Crude petroleum and natural gas extraction	0.2	0.0	0.2	0.0	0.0	0.0	0.5
0.6%	MINING AND QUARRYING (INCLUDING COAL)							
0.1%	Bituminous coal underground mining	0.6	0.0	1.3	0.0	0.1	0.0	2.1
0.1%	Bituminous coal and lignite surface mining	0.3	0.0	1.3	0.1	0.0	0.0	1.7
0.1%	Iron ore mining	0.1	0.2	1.1	0.1	0.0	0.0	1.5
0.1%	Stone mining and quarrying	0.8	0.0	0.2	0.2	0.4	0.0	1.5
0.1%	Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying	0.1	0.0	0.6	0.0	0.1	0.0	0.8
0.6%	TOURISM, HOTELS AND RESTAURANTS							
0.3%	Food services and drinking places	0.1	0.0	0.0	0.1	0.6	0.1	0.9
0.3%	Hotels and motels, including casino hotels	0.0	0.0	0.0	0.0	0.1	0.0	0.2
0.6%	PAPER AND PAPER PRODUCTS							
0.6%	Paperboard mills	0.2	0.3	0.1	0.0	0.1	0.0	0.8
0.3%	COMPUTER SOFTWARE							
0.3%	Other computer related services, including facilities management	0.0	0.0	0.0	0.0	0.0	0.0	0.1
0.2%	LEATHER AND LEATHER PRODUCTS							
0.2%	Leather and hide tanning and finishing	0.2	0.7	0.1	0.1	2.3	0.1	3.5

Source: Trucost

Figure 10 provides a regional analysis of natural capital impacts, showing a clearer picture of the location-specific natural capital risks that companies operating in different regions of India are exposed to. A summary of the natural capital impacts generated by each sector in different regions of India is provided in the table below for 10 sectors.

FIGURE 10: REGIONAL BREAKDOWN OF NCI FOR 10 SECTORS

SECTOR	REGION												
	NORTHERN		CENTRAL		EASTERN		NORTH–EASTERN		WESTERN		SOUTHERN		INDIA
	BN INR	%	BN INR	%	BN INR	%	BN INR	%	BN INR	%	BN INR	%	TOTAL IMPACTS
Wheat Farming	6,380	50%	5,170	41%	674	5%	6	0%	451	4%	24	0%	12,705
Rice Farming	5,728	26%	5,049	23%	5,328	24%	976	4%	894	4%	4,324	19%	22,300
Cotton farming	2,719	30%	515	6%	61	1%	0	0%	3,360	37%	2,343	26%	8,998
Milk (Dairy) Production	808	23%	946	26%	459	13%	39	1%	531	15%	794	22%	3,576
Iron ore mining	3	0%	335	21%	955	61%	0	0%	134	9%	134	9%	1,561
Hydroelectric Power Generation	321	47%	106	15%	35	5%	9	1%	51	7%	165	24%	687
Petroleum Refineries	1,933	15%	670	5%	775	6%	376	3%	7,186	57%	1,641	13%	12,582
Cement manufacturing	494	23%	476	22%	158	7%	20	1%	298	14%	680	32%	2,127
Coal Power Generation	2,320	20%	2,599	22%	1,469	13%	12	0%	3,225	27%	2,124	18%	11,749
Natural Gas Power Generation	107	20%	21	4%	2	0%	35	7%	249	47%	116	22%	530
TOTAL IMPACT	20,813	27%	15,887	21%	9,917	13%	1,474	2%	16,380	21%	12,344	16%	76,815

Source: Trucost

Indian banks are more exposed to natural capital risks than equity investors. Banks are more exposed to natural capital risks than equity investors due to loans made to natural capital intensive sectors. By contrast, The S&P Bombay Stock Exchange (BSE) 200, which accounts for 85% of the market cap of the listed universe at BSE, is dominated by the financial sector (29%), followed by IT (12%) and consumer discretionary (8%). The concentration of the equity market on low NCI sectors suggests that equity investors in India are less exposed to natural capital risks than commercial banks. Government policy mandating loans to the agriculture sector further increases commercial bank exposure to natural capital risks. Equity investors are less exposed due to the absence of agricultural companies in the Bombay Stock Exchange (BSE).

The industry sector accounts for 43.4% of gross bank lending, and generates 28% of all unpriced natural capital costs from bank lending in India. The majority of unpriced natural capital costs within industry occur within the food-processing subsector. The food processing (excluding edible oils) subsector accounts for 12% of total unpriced natural capital costs financed by commercial banks (and comprises only 2.5% of total bank lending), mainly due to the high water consumption of its agricultural supply chain. Climate change risks in the sector's supply chain, such as a weak monsoon, could have knock on effects on food manufacturers, as a poor harvest leads to poor raw material availability (Bundhun, 2015).

Power generation contributes 5% of total natural capital costs financed by commercial banks and is of strategic importance for India's energy industry. The power sector, which accounts for 9% of commercial bank lending in India, is predominantly driven by coal, which comprises 61% of the total 275 GW installed domestic power generation capacity and therefore dominates the energy mix. Coal power generation has a NCI of 2.6x, driven principally by significant GHG emissions and air pollution, which together account for 89% of the total natural capital impacts of coal power generation. The sector is expected to see investments of INR 1,499,914 crore[5] during the 12th 5 year plan on the back of increasing demand and power shortages (Planning Commission, 2013). This means financiers should focus on developing appropriate credit assessments that consider these unpriced natural capital costs.

Whilst agriculture and allied activities only represents 13% of total bank lending, the sector accounts for over 71% of natural capital costs financed by banks. The sector returns an NCE ratio of 8.8x, meaning that unpriced natural capital costs financed by commercial banks are 8.8x greater than the gross credit disbursed to the sector. This is not surprising, as primary sectors such as Cattle Ranching and Farming, Cotton Farming and Wheat Farming appeared as the sectors having the highest natural capital intensities in the India natural capital model (e.g. cattle ranching and farming is the highest at 16x, followed by cotton farming at 10.6x). Managing the natural capital risks associated with lending to Agriculture and Allied Activities deserves special attention due to the RBI directive mandating domestic commercial banks to lend 18% of their Adjusted Net Bank Credit (ANBC) to Agriculture in order to channel adequate credit to the rural sector.

The breakdown of direct and indirect (supply chain) natural capital costs varies by sector. Direct impacts are the impacts associated with the operations of a company, whereas supply chain impacts, which are also known as indirect impacts, are generated due to procurement of resources such as raw materials, energy or logistics. Figure 11, which shows the breakdown between direct and indirect natural capital costs for 10 sectors, along with each sector's NCI. As illustrated agricultural sectors such as wheat, rice and cotton farming have higher direct impacts when compared to supply chain impacts. This is expected for primary sectors[6] as they are directly dependent on natural resource inputs, for example fresh water and land use. For wheat farming, 76% of the impact is due to direct operations and 24% from the supply chain. The natural capital impacts from these primary sectors often impact on other sectors downstream, such as food processing or steel making, which rely on raw primary goods as inputs such (for example sugar, rice and wheat or iron ore). As an example, petroleum refining has the highest impacts in its supply chain among the sectors, contributing 98% of the total impact. This is derived from the impacts of oil and gas extraction that occur as part of petroleum refining supply chain.

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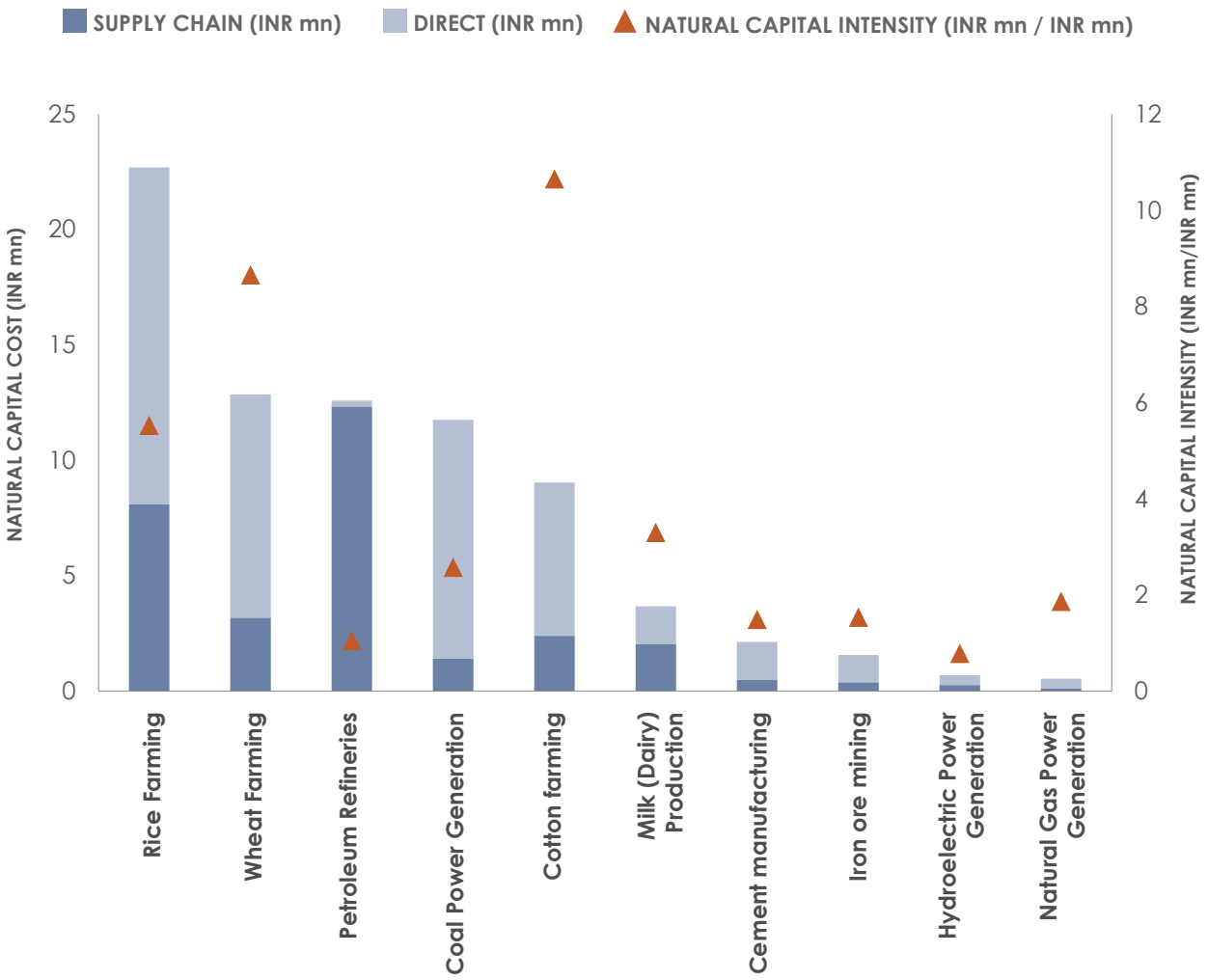
[5] In the Indian numbering system a crore is equal to ten million.

[6] The primary sector of the economy is the sector of an economy making direct use of natural resources. This includes agriculture, forestry, fishing and mining. The secondary sector produces manufactured goods.

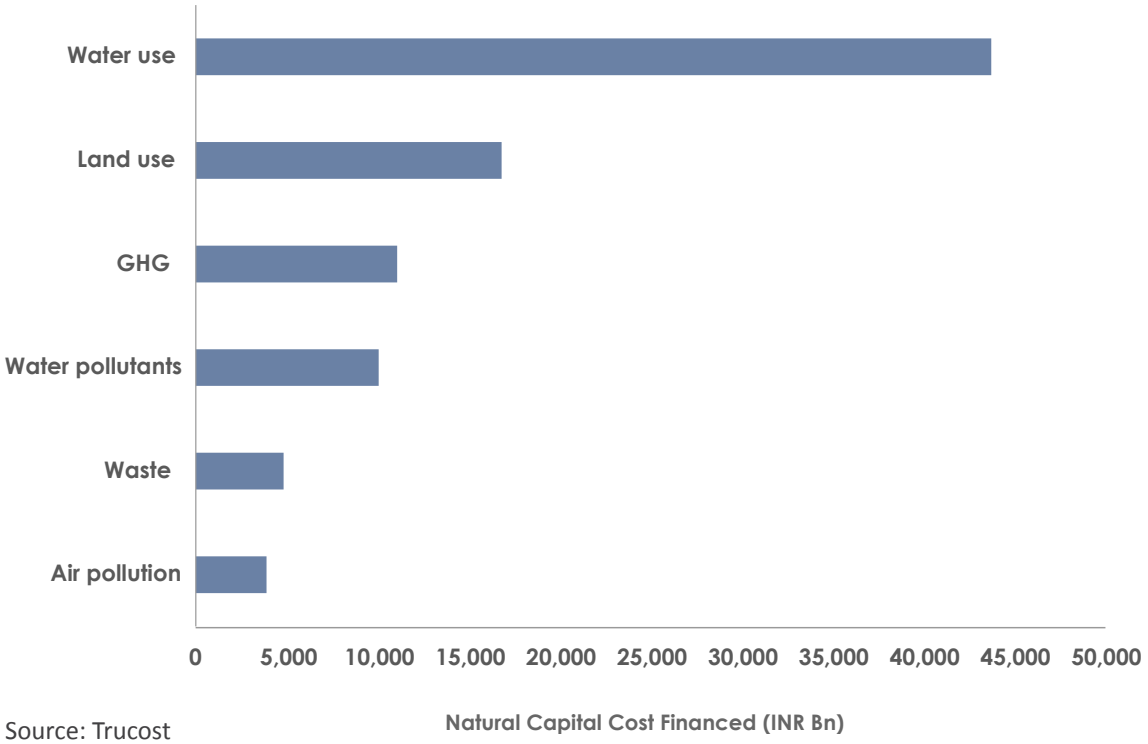
FIGURE 11: DIRECT AND INDIRECT (SUPPLY CHAIN) NATURAL CAPITAL COSTS AND INTENSITIES FOR 10 SECTORS



Source: Trucost

The most significant natural capital risk commercial bank are exposed to through lending is water, followed by land use. As shown in figure 12, Indian banks are primarily exposed to natural capital costs associated with water use (48% of total unpriced natural capital costs), followed by land use (19%) and GHG emissions (12%). The Northern and Southern regions in India accounted for 18% and 44% of loans to the agriculture sector in 2013 respectively. This is an important finding, as these two regions are the most water stressed in India, and the agriculture sector in general is relatively water intensive. As a result, bank lending to agriculture in these regions is exposed to significant natural capital risks driven by water scarcity, which are likely to increase in future due to the impacts of climate change. As an example, rice farming is the most important and strategic cereal crop in India, accounting for around a quarter of total cultivated land in 2013. Approximately 65% of its total natural capital costs stem from water use, while land use accounts for 16% of the total cost. Further, most of the natural capital costs (72%) of rice farming are concentrated in the Northern, Central and Eastern regions.

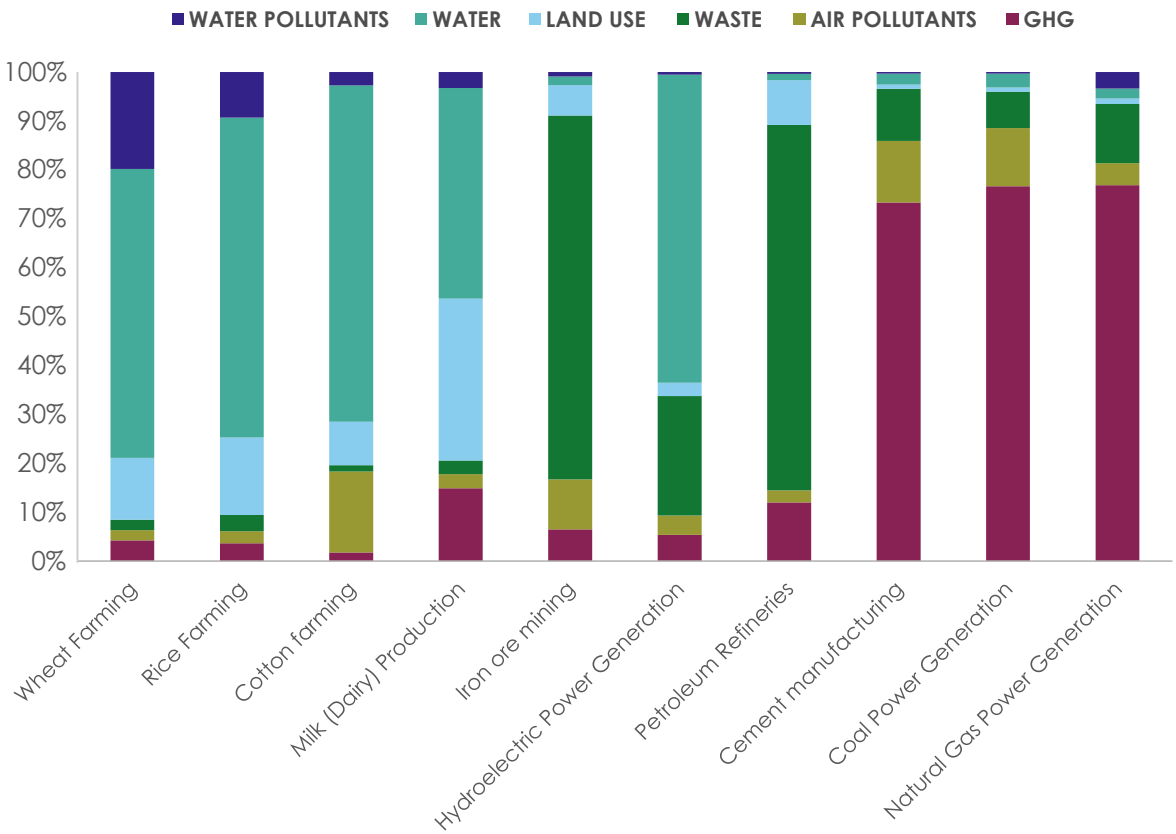
FIGURE 12: NATURAL CAPITAL COSTS ASSOCIATED WITH COMMERCIAL BANK LENDING BY EKPI



Source: Trucost

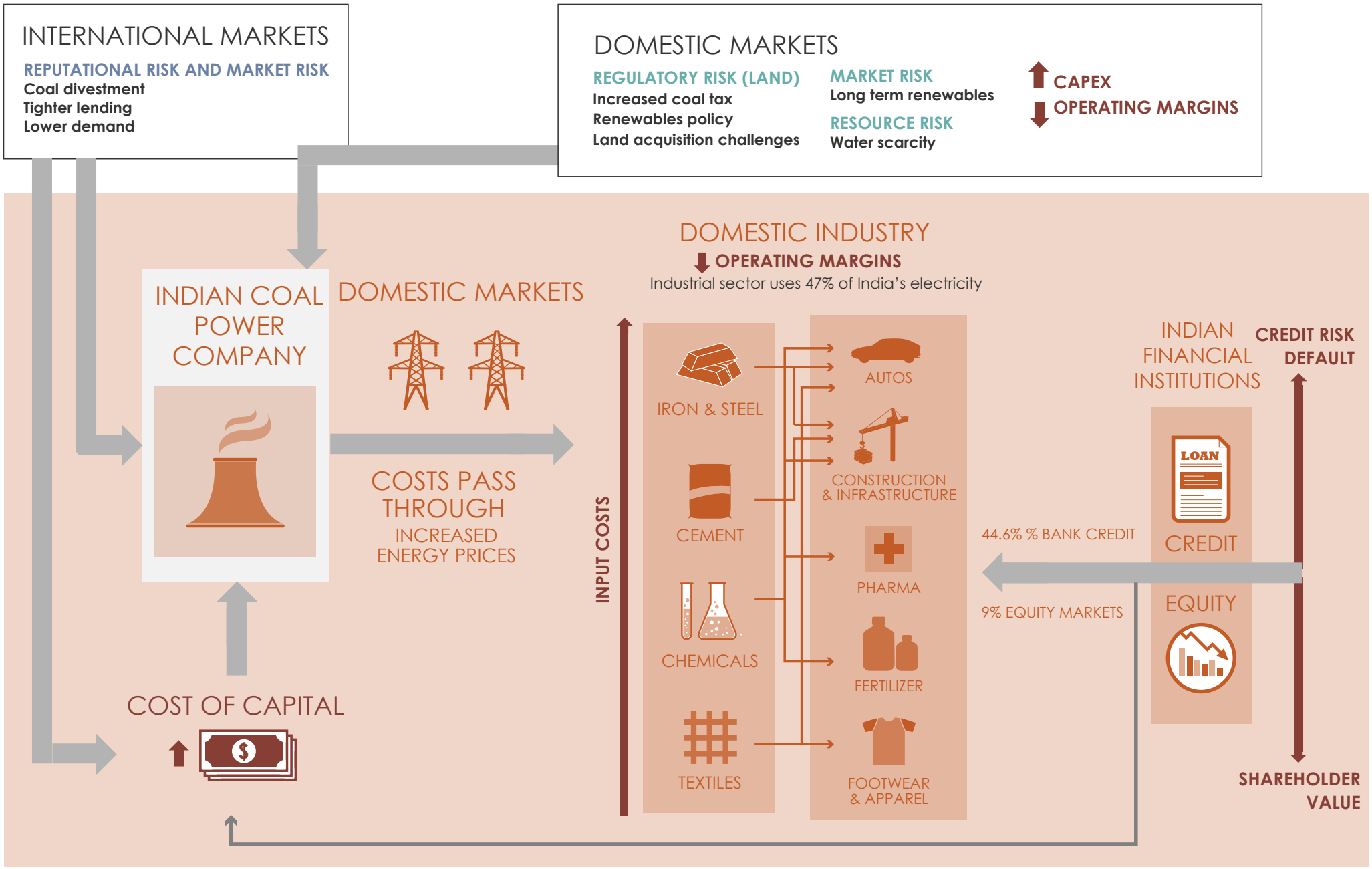
Figure 13 displays the relative weight of each EKPI to the total natural capital cost profile for 10 sectors. This analysis identifies the most significant potential risks and focus areas for investors when financing projects in these specific sectors. For example, GHG emissions is the most significant driver of natural capital costs within the cement manufacturing, coal power generation and natural gas power generation sectors, whilst waste generation is significant for iron ore mining.

FIGURE 13: NATURAL CAPITAL COSTS ASSOCIATED WITH COMMERCIAL BANK LENDING BY EKPI



Source: Trucost

FIGURE 14: HIGHLIGHTS DOMESTIC AND INTERNATIONAL DRIVERS OF NATURAL CAPITAL COST INTERNALISATION FOR THE COAL INDUSTRY



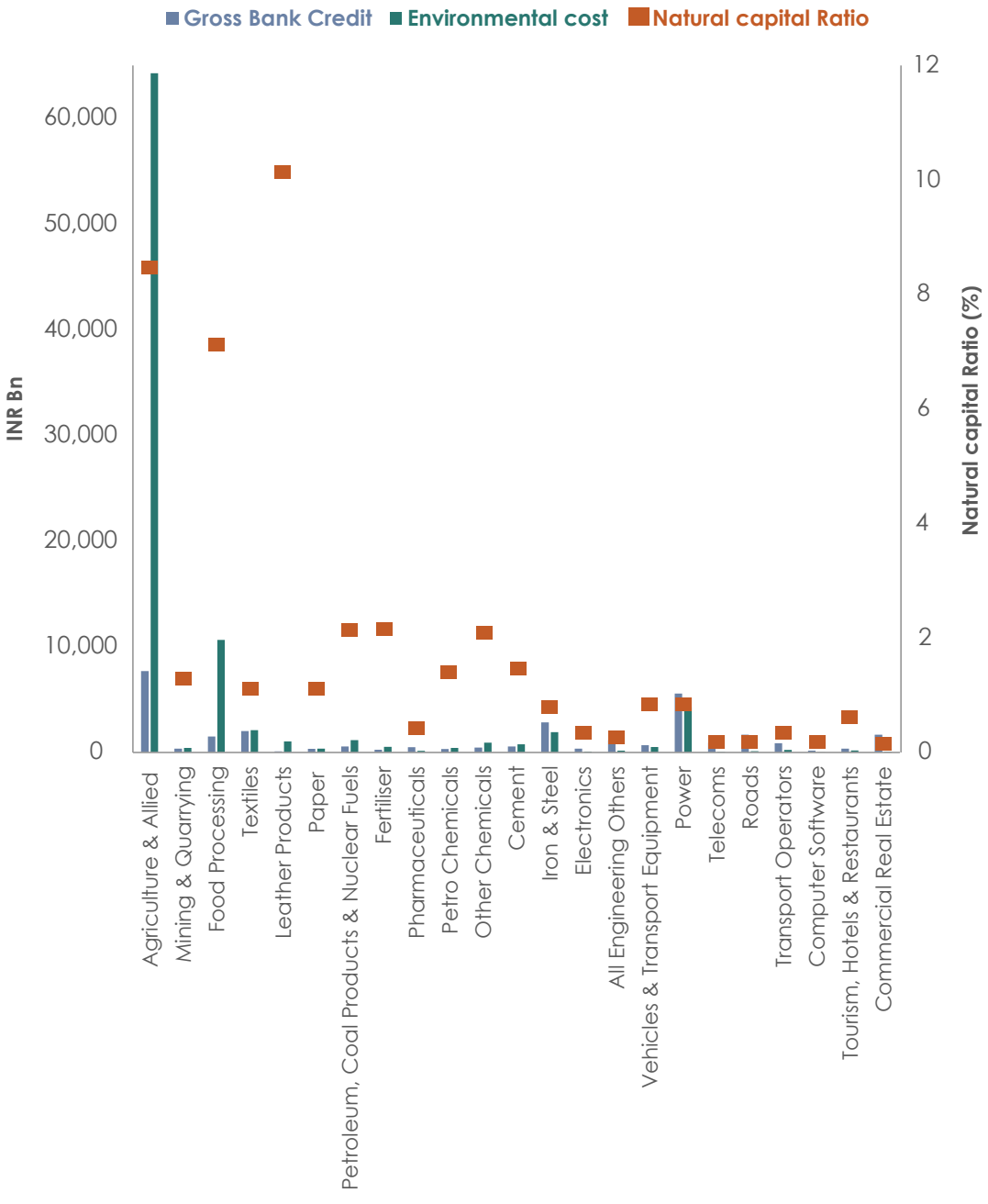
Source: Trucost

Mapping the exposures of Indian financial institutions to natural capital

The natural capital costs of sectors were mapped to the exposure of Indian financial markets in order to identify regions and sectors most exposed to natural capital risks. Data from the RBI capturing the deployment of gross bank credit by sector was used, given that commercial banks account for 60% of total assets within the financial system. In figure 15, the exposure of commercial banks in India is split by sectors, displayed along with the total natural capital cost for each sector as calculated by Trucost, and the relative NCE ratio. A higher NCE ratio is associated with larger natural capital costs relative to the level of financing, and therefore identifies those sectors that pose a higher risk to banks. In the below diagram, leather products, agriculture and allied services and food processing sectors have the highest NCE ratios.

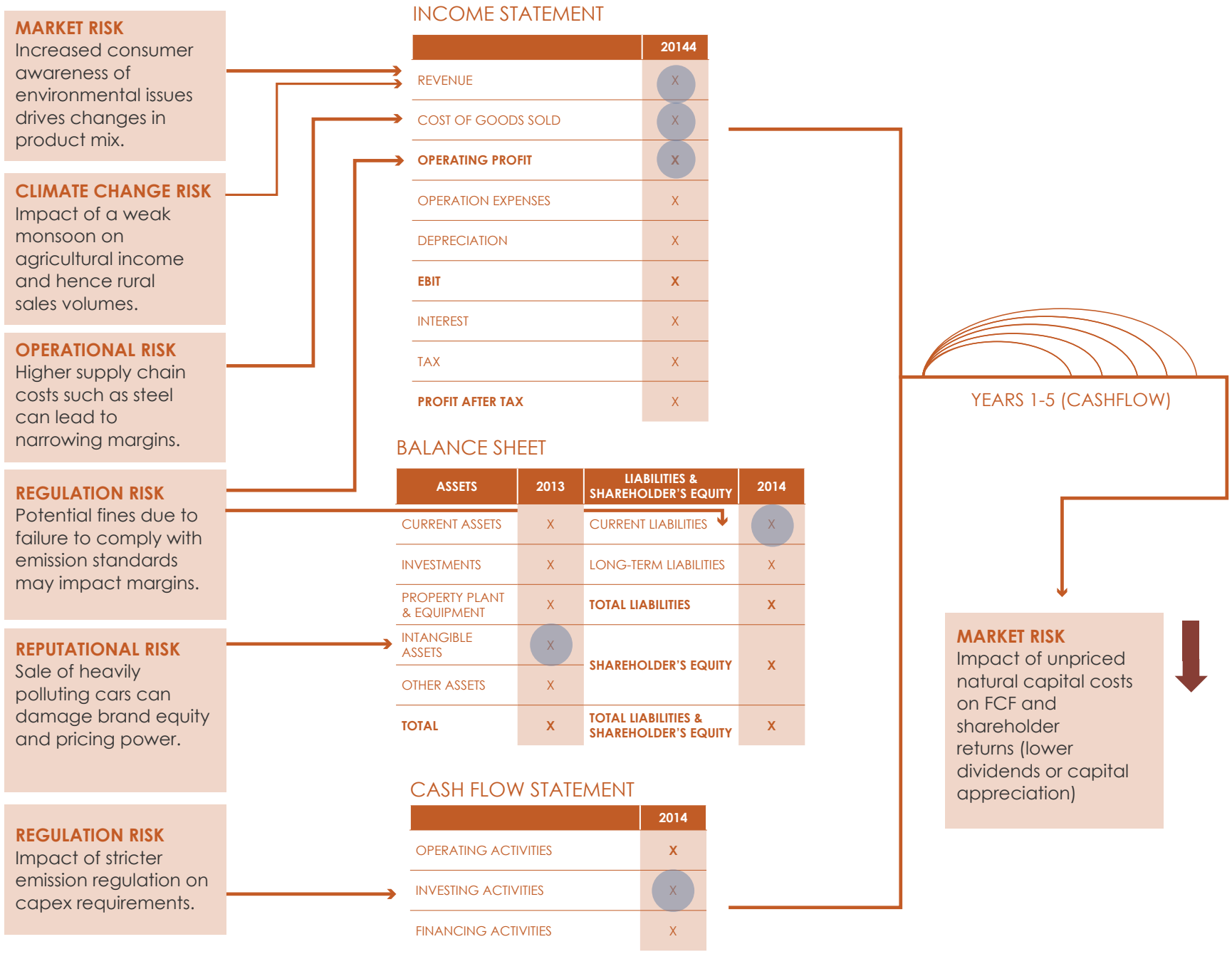
To highlight how various natural capital risks can impact companies differently across sectors, figure 16 displays how various natural capital risks could impact on the financials of a typical automotive company.

FIGURE 15: BANK'S CREDIT EXPOSURE AND ITS NATURAL CAPITAL EXPOSURE



Source: RBI (2015), Trucost

FIGURE 16: POTENTIAL NATURAL CAPITAL RISKS FOR AUTOMOTIVE COMPANIES

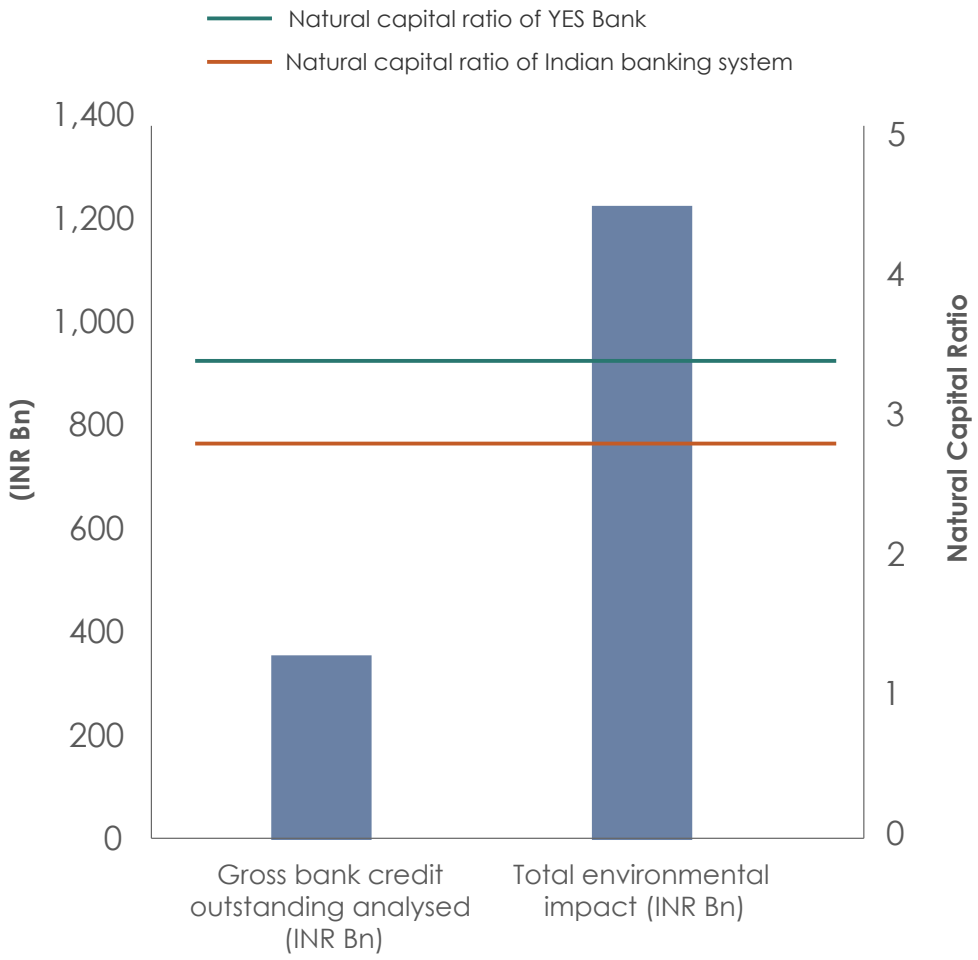


Source: Trucost

CASE STUDY – YES BANK

YES Bank has a NCE ratio of 3.4x, higher than the industry benchmark across commercial banking of 2.9x. Natural capital costs at the sector level were mapped to YES Bank's sectoral distribution of loans and advances. The analysis covered 47% of YES Bank's loans and advances as of March 2015.[7] The India natural capital model estimates that the unpriced natural capital costs apportioned to the loans and advances of YES Bank are INR 1,226 billion, compared to investments analyzed of INR 357bn. The bank's NCE ratio is 3.4x, which means that per INR m of credit disbursed, it is financing over three times the natural capital costs generated by these sectors.

FIGURE 17: YES BANK IS FINANCING UNPRICED NATURAL CAPITAL COSTS 3.4X THE VALUE INVESTED



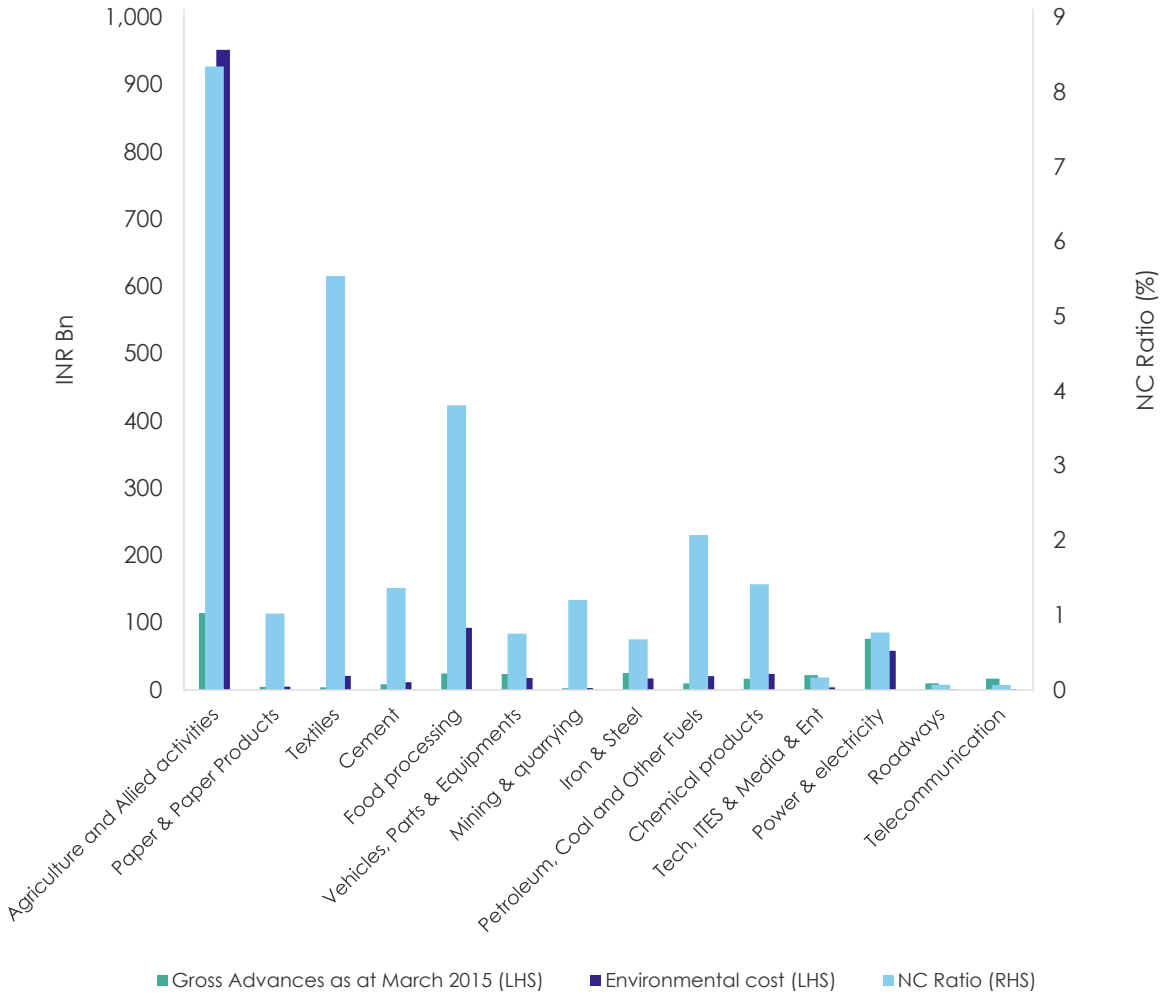
Source: Trucost

YES Bank has higher exposure to the agriculture and allied activities sector than the industry average. Agriculture accounts for 15% of YES Bank's loans and advances compared to 13% of total industry commercial bank lending. The sector accounts for 78% of natural capital costs within YES Bank's loan book compared to 71% for the commercial banking industry as a whole. This is in line with the development goals of the RBI which requires domestic banks to make the agriculture sector a priority with advances equaling to 18% of adjusted net bank credit or credit equivalent amount of off-balance sheet exposure (whichever is higher). Yet as shown in figure 18, the sectors with the highest natural capital intensities in India were

[7] The reported sectors Other Industries (31% of its loan book) and Granular & Retail Advances (16%) was too broad a category to be able to be mapped to Trucost sectors and was therefore excluded from the analysis.

agriculture sectors such as cotton farming (NCE ratio of 12.9x) and wheat farming (10.5x) due to the significant use of direct water for irrigation. Therefore, it is particularly important for banks to apply best practice risk management strategies to loans in the agriculture sector.

FIGURE 18: YES BANK'S CREDIT EXPOSURE AND ITS NATURAL CAPITAL DEPENDENCE



Source: Trucost

YES Bank should priorities working with agricultural bank customers to highlight the importance of managing natural capital risks in the sector. Trucost carried out a sensitivity analysis of natural capital costs to changes in the amount of total lending to agriculture and allied activities. As shown in the figure 19, if YES Bank reduces advances to agriculture and allied activities to 12.5% of total loans (in line with the domestic banking industry), the bank reduces its NCE to 3.2x. Further, decreasing the weight of the sector to the low-exposure scenario of 5% has an even greater impact, reducing the ratio to just 2.1x.
This sensitivity analysis highlights the relative significance of the agriculture sector in relation to the natural capital costs associated with YES Bank's lending, and highlights the importance of working with bank customers within this sector to ensure natural capital risks are managed effectively.

FIGURE 19: SENSITIVITY OF NATURAL CAPITAL COSTS FINANCED TO CHANGES IN THE % OF ADVANCES TO THE AGRICULTURE SECTOR[8]

% OF GROSS ADVANCES TO AGRICULTURE & ALLIED TO TOTAL GROSS ADVANCES	TOTAL NATURAL CAPITAL COSTS FINANCED (INR bn)	NC RATIO
Current scenario: 15.1%	**1,226**	**3.4x**
Industry benchmark scenario: 12.5%	**1,064**	**3.2x**
Low exposure scenario: 5%	**590**	**2.1x**

Source: Trucost

[8] Based on FAO data: In 2013 the average national share of credit to agriculture (C2A) 1991-2013 in Europe was 4.07% of total commercial credit – compared to 5.1% world average and 9.15% 'other developed' countries.

RECOMMENDATIONS

FIs in India could begin quantifying the risk exposure across their loan books and investment portfolios by using natural capital accounting techniques and natural capital risk driver frameworks alongside traditional financial analysis. This will allow FIs to manage risk and identify opportunities to capitalize on the transition to a low-carbon, resource-efficient economy.

Acquiring more detailed data on sector exposure to natural capital risks is a priority, in order to minimise exposure. Banks can quantify their portfolio-level natural capital exposure by using the natural capital intensities of the sectors and regions covered by this study (figure 9). Indian banks can use the risk framework outlined in the study to identify the drivers that may force companies to pay the natural capital costs of their impacts, and to quantify their magnitude, probability and timescale. For example, if the key risk driver is reputational risk, bankers could assess the extent to which company revenues are driven by brand value. Banks could also use their influence in the due diligence process for loans to encourage companies to disclose the natural capital impacts of their operations, especially in natural capital intensive sectors such as agriculture, infrastructure and power generation. For bankers to clearly understand natural capital risks in their individual bank loan books, acquiring more detailed data on sector exposure is necessary. A greater understanding of the types of natural capital risks across the portfolio will also allow FIs to encourage companies to improve resource efficiency.

FIs should invest in natural capital training in order to build capacity for risk managers to identify and quantify exposure to natural capital risks. Within Indian commercial banks, portfolio risk managers, relationship managers and credit analysts should be given the skills to progress beyond ESG considerations towards understanding the value of natural capital, how it can be measured, the drivers of risk internalisation specific to key sectors, and the potential exposure of the bank across its total portfolio. Beyond the granular customer and sector level, it is vital that natural capital is a key consideration amongst the senior management and the executive team whilst developing sustainable long-term commercial strategies that strengthen reputation and brand value.

Sector specific natural capital considerations should be included into credit analysis: Indian banks can use this study to identify the most significant environmental impacts of a particular sector in order to develop appropriate assessments and incorporate these into financial analysis. For example, if the key impact is GHG emissions (for example, see figure 13), bankers should assess the impact of a carbon price on a borrower's financial statements. To reflect the uncertainty of future carbon regulations, banks can include a sensitivity analysis incorporating different carbon prices. To mitigate exposure to natural capital risk, banks might also consider loans to sectors with low natural capital risks such as telecommunications, real estate and computer manufacturing. Banks can also think about extending loans to industries expected to benefit from environmental regulation such as the renewable energy sector in India. Water scarcity should be a priority consideration in risk assessments for banks financing companies, especially if these companies operate in the Northern and Southern regions, which are under severe water stress. In particular, India's rural development banks should strive to include natural capital risks into credit appraisals and collect granular data on the type of crop financed since different crops have different natural capital impacts.

Long term risk timeframes presents significant opportunities for product innovation: Climate change impacts are expected to become more severe in the long-term and may threaten India's economic growth. As a result, Indian banks should prioritize integrating environmental factors into long-duration loans, as well as loans disbursed to cyclical industries sensitive to economic growth. Banks should consider innovative financing instruments such as green bonds to fund projects with a net environmental benefit such as renewable energy, low-carbon transport infrastructure and sustainable farming techniques. Such projects

should be assessed in a robust and transparent manner to ensure they deliver genuine natural capital savings. Indian banks can use this study to assess whether the natural capital costs generated by a sector are from direct operations or its supply chain (e.g. figure 11). In the case of direct impacts, bankers should primarily asses a company's sustainability strategy in managing environmental risks. For indirect impacts, banks should assess factors such as ability to pass through extra costs to its customers and supplier engagement strategies.

India was the first country in the world to commit to developing a framework for green national accounts by 2015. This stream of work is underway in partnership with TEEB India, and aims to publish a set of accounts that track the nation's plants, animals, water and other 'natural wealth' measurements alongside traditional financial measures such as GDP. The commitment of the Indian Government to natural capital accounting presents a favourable landscape and opportunity for collaboration with FIs in India looking to integrate natural capital into their decision-making frameworks. Natural capital accounting cannot be accomplished by FIs alone, but requires multi-stakeholder involvement from finance and accounting professionals, ecologists, economists and societal institutions. This study highlights the importance of natural capital to FIs and the broader economy in India, and recommends the cooperation and alignment of natural capital accounting approaches between government policy makers and FIs in order to fully integrate natural capital considerations into decision making.

Green bond opportunities

$35 billion of green bonds were issued worldwide in 2014. In February 2015, YES Bank successfully issued India's first green bond, raising a total subscription of INR 1000 crore for infrastructure – double the targeted amount (YES Bank 2015). The launch of this bond signals the growing confidence in the Indian renewable energy sector. The government has ambitious plans to expand renewable energy capacity from 35 GW currently to 175 GW by 2022, providing significant opportunities for FIs. The government has approached eight FIs to raise funds for renewable capacity expansion through the issuance of green bonds, including public sector entities like the Indian Renewable Energy Development Agency and IDBI Bank, as well as private sector entities like ICICI Bank and YES Bank. In March 2015, the Indian Export-Import Bank raised $500 million in India's first dollar-denominated green bond issue. Compared to developed countries where the green bonds market has traditionally been centered, India offers high deposit rates, and as a result rupee-denominated bond issues are expected to be much more attractive (Mittal 2015).

How to integrate natural capital into credit lending decisions

In corporate lending, there is often a long-term business relationship between banks and clients, so achieving a full understanding of risks prior to engagement is critical: Assessment of credit worthiness includes consideration of historical performance, goodwill and expectations of continued performance demonstrating a debtor's ability to pay. Unpriced natural capital costs have the potential to be internalized, impacting the performance of a company through changes to key earnings drivers such as revenue and profitability. From the point of view of a lender considering a borrower's credit worthiness, many factors are considered. Common credit ratios are used within credit assessments and are often included in loan agreements or credit policy as covenants.

FIGURE 20: COMMON CREDIT RATIOS THAT COULD BE IMPACTED BY UNPRICED NATURAL CAPITAL COSTS

CREDIT RATIOS	CALCULATES	IMPACT OF UNPRICED NATURAL CAPITAL COSTS
EBITDA Margin (EBITDA/Revenue)	Gives the core operating profitability of the borrower (the higher the margin the less operating expenses eat into the bottom line). All measures of profitability begin with revenue – the amount of income generated from the sale of goods and services.	As operating expenses increase, the EBITDA margin is reduced, and the company's profitability is impacted. Operational expenses can be increased by higher input costs or increased regulatory burden.
Net Debt/EBITDA	A measurement of leverage typically used to determine a borrower's ability to pay its debt. This ratio shows the number of years to pay back debt if the net debt and EBITDA remains constant. Generally a ratio of 4 or higher is considered too high. This does not include the risks of capital expenditures. Loan agreements often include a requirement that the borrower must remain above a certain debt to EBITDA ratio otherwise the loan is immediately due.	Unpriced natural capital costs can impact EBITDA by reducing earnings (income minus the cost of goods sold). As with the EBITDA Margin, any increase in costs of production that increase operating expenses will impact on a borrowers EBITDA.
Interest Cover Ratio (EBIT/Annual Interest Expense)	Calculates the borrowers' ability to meet interest payments and to take on additional debt. A high ratio indicates that the borrower can easily meet all of its obligations, the lower the ratio the more the company is burdened by debt expense.	Reduced earnings will reduce EBIT and lead to a lower ICR ratio, placing increased burden on the borrower.
Debt Service Ratio (commonly calculated as Operating Income/ Total Debt Service Costs)	The ability of the borrower to service current debts by comparing available cash with current debt obligations, providing a useful indicator of financial risk.	Any changes to a borrowers cash flow will impact the borrowers DSR. For example an increase in expenses relative to sales volume or low sales (e.g. caused by lower rural demand).

Source: Trucost

APPENDIX

Brief methodology

The study's approach was to build a natural capital model based on Trucost's environmentally extended input output model (EEIO), to quantify the natural capital costs of 50 economic sectors in India that intensively use natural capital and are relevant to the financial sector in terms of their share in equity and loan portfolios. These were industry sectors such as coal power generation, iron ore mining, textiles manufacturing, food processing and cement and agricultural sectors such as cotton, wheat and rice farming. For each sector, the natural capital costs associated with six key environmental impacts were calculated: greenhouse gases (GHGs), land-use conversion, water consumption, waste, water pollution, and air pollution. The valuations that were used for GHG, air pollutants, waste and water pollutants used are detailed in figure 21.

FIGURE 21: MONETARY VALUATION COEFFICIENTS USED FOR DETERMINING UNPRICED NATURAL CAPITAL COSTS FOR INDIA

GHG	AIR POLLUTANTS					LAND USE CHANGE	WATER USE	WASTE	WATER POLLUTANTS
	NH_3	SO_2	NO_x	VOCs	PM_{10}				
INR per t	INR per t	INR per t	INR per t	INR per t	INR per t	INR per m^2	INR per m^3	INR per t	INR per t
7,379	159,918	142,961	204,142	145,836	643,125	6	119	9,069	12,055,651

Source: Trucost

For 10 of the economic sectors, the study also calculated the different impacts in six regions of India as defined by the Ministry of Home Affairs: Northern, Central, Eastern, North-Eastern, Western, and Southern, as shown in figure 22.

FIGURE 22: MONETARY VALUATION COEFFICIENTS USED FOR DETERMINING UNPRICED NATURAL CAPITAL COSTS FOR INDIA

REGION	STATES AND UNION TERRITORIES
Northern	Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, Chandigarh, Delhi
Central	Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Uttarakhand
Eastern	Bihar, Jharkhand, Odisha, West Bengal, Andaman and Nicobar Islands
North- Eastern	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram , Nagaland, Sikkim, Tripura
Western	Goa, Gujarat, Maharashtra, Dadra and Nagar Haveli, Daman and Diu
Southern	Andhra Pradesh, Karnataka, Kerala, Puducherry, Tamil Nadu, Telangana, Lakshadweep

Source: Ministry of Home Affairs, GOI

The purpose of this approach was to demonstrate that the same activity can have different natural capital impacts depending on the geographical location, for example due to different water stress levels, as shown in figure 23.

FIGURE 23: REGIONALIZED MONETARY VALUATION COEFFICIENTS FOR WATER AND LAND USE

NATURAL CAPITAL VALUATION	NORTHERN	CENTRAL	NORTH-EASTERN	EASTERN	WESTERN	SOUTHERN
Water valuations (INR/ m^3)	340.79	123.13	2.65	39.05	94.12	141.11
Land valuations (INR/ m^2)	1.99	5.64	9.59	8.87	6.06	7.35

Source: Trucost

The model was then populated with production information so that the natural capital costs of sectors and regions in India could be quantified. The exposure of banks to these natural capital costs was calculated by mapping the amounts of money loaned to those sectors and regions as illustrated in figure 24. This can be used to assess the potential magnitude of the natural capital risk in a bank's loan book. To illustrate this a case study is included covering the natural capital costs of YES Bank's lending activities.

FIGURE 24: SCOPE OF THE ANALYSIS A

SECTOR	GROSS BANK CREDIT AS OF MARCH 2015 (INR bn)	GROSS BANK CREDIT SECTOR WEIGHT (%)	GROSS BANK CREDIT ANALYSED (INR bn)	GROSS BANK CREDIT ANALYSED (%)
Food Credit*	994	2%	-	0%
Agriculture & Allied Activities	7,700	13%	7,700	100%
Industry	26,651	43%	20,295	76%
Services	14,120	23%	3,092	22%
Personal Loans	11,958	19%	-	0%
GROSS BANK CREDIT	61,423	100%	31,087	51%

*** Food Credit includes advances granted by Scheduled Commercial Banks to Public Food Procurement Agencies under the Food Consortium**

Source: Trucost

After quantifying the overall natural capital costs generated by a sector, a framework was developed to identify the drivers that can lead natural capital cost internalization for a company. Natural capital costs represent the cost to society from a company's use or impact on unpriced natural capital. This social cost is often not paid by companies but can be internalized through other mechanisms such as 'polluter pays' regulation, resource depletion, removal of subsidies, reputational damage and changing consumer preferences.

The final step involved assessing the potential for a company's natural capital risk to be translated into a risk for an investor or financier. To illustrate this a case study is included on the impact of natural capital costs internalization on the stock price and credit ratios on an Indian company and on the YES Bank portfolio. The study then explores how FIs could integrate natural capital considerations into equity valuation and corporate lending decisions to enable better risk management.

GLOSSARY

FIGURE 25: GLOSSARY OF TERMS

TERM	MEANING
ABATEMENT COST	Cost of reducing an environmental impact.
COST OF CAPITAL	The cost of equity, and long and short-term debt.
DIRECT NATURAL CAPITAL IMPACTS	Impacts from a company's own operations.
ECOSYSTEM	Dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Together with deposits of non-renewable resources they constitute 'natural capital'.
ECOSYSTEM SERVICES	Goods (renewable resources such as water and food) and services (such as pollination and purification of water) provided by specific ecosystems to humans.[9]
EEIO	Environmentally extended input-output model; a model that maps the flow of inputs and environmental impacts through an economy.
EKPI	Environmental Key Performance indicator; environmental impact categories developed by Trucost for appraisal of businesses, sectors and regions.
EMISSIONS FACTOR	Unit of an environmental impact per unit of physical production.
ENVIRONMENTAL VALUE	The value to people from environmental goods and services. Where no market price exists, it can be estimated in monetary terms by using environmental valuation methods.
EXTERNAL COST	Cost borne by third parties not taking part in an economic activity.
FAO	Food and Agriculture Organization of the United Nations.
FI	Financial Institution.
GHG	Greenhouse gas.
IEA	International Energy Agency.
IMPACT	Environmental impact either in physical units or as a monetary value (cost).
INDIRECT NATURAL CAPITAL COSTS	Impacts from a company's supply chain
INTERNAL COST	Cost borne by parties taking part in an economic activity.
COST INTERNALISATION	When external costs are privatized to the creator of those costs e.g. a polluter
NATURAL CAPITAL	The limited stocks of physical and biological resources found on Earth including water, land, air and habitats.
NATURAL CAPITAL COSTS	Unpriced environmental externalities resulting from the absence of adequate market mechanisms.
NATURAL CAPITAL EXPOSURE RATIO (NCE)	The ratio of unpriced natural capital risks to gross credit disbursed by commercial banks
NATURAL CAPITAL INTENSITY (NCI)	The ratio of total natural capital costs generated (INR millions) relative to revenue generated (INR millions)
NATURAL CAPITAL RISK	The risks associated with the internalization of natural capital costs through a risk driver for example environmental regulation.

[9] An overview is available at URL:http://www.teebweb.org/resources/ecosystem-services.

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The Emerging Markets Dialogue Programme on Green Finance

The goal of the Emerging Markets Dialogue Programme (EMD) on Green Finance is to increase capital flows to green investments and thereby enable the transformation towards sustainable economies. To achieve this aim, the EMD Green Finance works with public and private actors from Emerging Markets and Europe to overcome barriers and gaps to increasing eco- and climate-friendly investments. For example, the EMD Green Finance works with FIs from Emerging Markets and Europe to quantify environmental risks and opportunities in the financial sector and to jointly develop and test a set of asset class-specific tools to incorporate environmental considerations into lending and investment decisions. GIZ is commissioned to implement the EMD Green Finance by the German Federal Ministry for Economic Cooperation and Development (BMZ).

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