

# TOWARDS INCLUDING NATURAL RESOURCE RISKS IN COST OF CAPITAL

State of play and the way forward



Secretariat:



**Disclaimer**

*This information is provided on an "as is" basis. The user assumes the entire risk of any use made of this information. The World Bank Group, Global Canopy Programme, UNEP FI, their affiliates and any third party involved in, or related to, computing or compiling the information hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to any of this information. Without limiting any of the foregoing, in no event shall the authors or any third party involved in or related to computing or compiling the information have any liability for any damages of any kind. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the United Nations Environment Programme concerning the legal status of any country, territory, city or area or of its authorities, or concerning delimitation of its frontiers or boundaries. Moreover, the views expressed do not necessarily represent the decision or the stated policy of the United Nations Environment Programme, nor does citing of trade names or commercial processes constitute endorsement.*

Copyright © Natural Capital Declaration, November 2015

**Intellectual Property**

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder, provided acknowledgement of the source is made. The NCD would appreciate receiving a copy of any publication that uses this publication as a source. Please provide feedback or recommendations to [secretariat@naturalcapitaldeclaration.org](mailto:secretariat@naturalcapitaldeclaration.org)

**Citation:**

*Towards Including Natural Resource Risks in Cost of Capital, State of play and the way forward, Natural Capital Declaration, 2015*

## About the Natural Capital Declaration

The NCD was launched at the UN Conference on Sustainable Development (Rio+ 20 Earth Summit) in 2012 by UNEP FI and the UK-based non-governmental organisation, Global Canopy Programme (GCP). It is a worldwide finance led initiative to integrate natural capital considerations into financial products and services, and to work towards their inclusion in financial accounting, disclosure and reporting. Signatory financial institutions are working towards implementing the commitments in the Declaration through NCD projects. These are overseen by a steering committee of signatories and supporters and supported by a secretariat formed of the UNEP FI and GCP. This project to advance environmental risk management is included in a work programme to build capacity for asset managers and banks to understand and integrate natural capital factors into financial products and services.

[www.naturalcapitaldeclaration.org](http://www.naturalcapitaldeclaration.org)

## About The Global Canopy Programme (GCP)

The Global Canopy Programme (GCP) is a tropical forest think tank working to demonstrate the scientific, political and business case for safeguarding forests as natural capital that underpins water, food, energy, health and climate security for all. GCP works through its international networks – of forest communities, science experts, policymakers, and finance and corporate leaders – to gather evidence, spark insight, and catalyse action to halt forest loss and improve human livelihoods dependent on forests. The Global Canopy Programme is a registered UK charity, number 1089110.

[www.globalcanopy.org](http://www.globalcanopy.org)

## About UNEP FI

The United Nations Environment Programme Finance Initiative (UNEP FI) is a unique global partnership between the United Nations Environment Programme (UNEP) and the global financial sector. UNEP FI works closely with over 200 financial institutions who are Signatories to the UNEP FI Statements, and a range of partner organizations to develop and promote linkages between sustainability and financial performance. Through peer-to-peer networks, research and training, UNEP FI carries out its mission to identify, promote, and realise the adoption of best environmental and sustainability practice at all levels of financial institution operations

[www.unepfi.org](http://www.unepfi.org)

## About Sociovestix

Sociovestix Labs is a social enterprise founded in 2012 by four academics with in depth expertise in computer science and financial statistics. Its data science unit develops social media analytics methods to measure the attention and emotion which societies direct towards individual ESG themes. Its investment statistics unit develops sustainable measures of investment performance which precisely and reliably assess the long term returns and downside risks investors are facing in today's turbulent financial markets. On this basis, Sociovestix advises on the generation of DynamicESG investment strategies to realise the return enhancement and risk reduction opportunities equivalent to those identified in our statistical analysis. As a social enterprise it has both financial and social aims. Its financial aim is to create value for clients through the potential of DynamicESG technology. Its social aim is to provide a clear voice to all groups in societies in both developed and emerging markets. It achieves this by directly communicating their concerns on ESG issues to mainstream and responsible investors.

[www.sociovestix.com/about](http://www.sociovestix.com/about)

Sociovestix Labs

## About the ICMA Centre, Henley Business School, University of Reading

Part of the triple-accredited Henley Business School, the ICMA Centre is the product of the first active collaboration between the securities industry and a university finance department. The Centre has a global reputation for its excellence in undergraduate, postgraduate and executive education, as well as pure and applied research and consultancy. With over 20 years' experience, the ICMA Centre's key strengths are as follows:

- The integration of applied finance theory and industry specific education.
- Innovative teaching by world renowned academics and industry practitioners.
- Strong links with banks, trade bodies and other financial institutions.
- The largest and best equipped dealing rooms in any European business school.

[www.icmacentre.ac.uk/about-us](http://www.icmacentre.ac.uk/about-us)

ICMA Centre

# ACKNOWLEDGEMENTS

The NCD would like to thank the World Bank Group for commissioning Sociovestix Labs Ltd to conduct research, and the Gordon and Betty Moore Foundation for co-funding this study.

**Editors:** Liesel van Ast, Global Canopy Programme; Ekaterina Grigoryeva, World Bank Group; Anders Nordheim, UNEP FI; Iain Henderson, UNEP FI; Ivo Mulder, UNEP and Andrew Mitchell, Global Canopy Programme.

**Research and contributing authors:** Theodor F. Cojoianu, ESG Data Specialist, Sociovestix Labs Ltd; Dr. Andreas G. F. Hoepner, Associate Professor of Finance, ICMA Centre, Henley Business School & Director, Sociovestix Labs Ltd; Rupini D. Rajagopalan, Researcher and PhD. Candidate, ICMA Centre, Henley Business School; Dr. Damian S. Borth, Managing Director, Sociovestix Labs Ltd.

The authors would like to express their appreciation to all the professionals who provided useful insights and inputs into the project by confirming their organisation's natural capital capability, by completing an online Financial Institutions survey or by providing comments during a consultation on a draft version of the study. In alphabetical order, we would like to thank:

Øistein Akselberg (DNB), Maria Belen Sanchez (Banco Pichincha), Antonella Bernascon (Intesa Sanpaolo SpA), Vicky Beukes (Nedbank), David Bresch (Swiss Re), Olaf Brugman (Rabobank), Giorgio Capurri (UniCredit); Rafael Castro (S&P Capital IQ), Marta Cerina (S&P Capital IQ), Strahil Christov (European Commission), Jean Clinckemaiellie (CDC Biodiversité, The Caisse des Dépôts Group), Simon Connell, Standard Chartered, Claire Curtin (Trucost), Wagner de Siqueira Pinto (Banco do Brasil), Mark Eckstein (CDC Group), Lisa Eichler (Triple-E Consulting), Carlota Garcia-Manas (Eiris), Andy Gebhardt (Solability), Bahar Gidwani (CSRHub), Sam Gill (Environmental Investment Organisation), Ekaterina Grigoryeva (World Bank Group), Jonathan Harris (Credit Suisse AG), Doris Hauser (Forma Futura Invest AG), Frank Hawkins (International Union for the Conservation of Nature), Toby Heaps (Corporate Knights Capital), Sakariza Qori Hemawan (PT Bank Negara Indonesia (Persero) Tbk a.k.a BNI), Maximilian Horster (South Pole Group), Karin Ireton (Standard Bank), Jessica Jacob (FINDETER Financiera del Desarrollo), Srinath Komarina (YES Bank), Dick Ligthart (ABN AMRO), Courtney Lowrance (Citi), Désirée Lucchese, Climate Disclosure Standards Board, Antoine Mach (Ethical Quote), Marcos Mancini (Banorte), José Maximiano (Caixa Econômica Federal), David McMillan (Caledonia Wealth Management Ltd.), Dylan Meagher (AccountAbility), Sunny Misser (AccountAbility), Hayden Morgan (UK Green Investment Bank), Alessandra Oglino (Rep-Risk), Federico Orbe (Banco Pichincha), Ben Ridley (Credit Suisse AG), Vanessa Otto-Mentz (Santam), Eric Read (Scotiabank), Jackeline Rincón Castillo (Banco de las Microfinanzas – Bancamía), Leonard Panjaitan (BNI), Angela Olufunwa (Trucost), Rebecca Shade (UK Export Finance), Maki Shibatsuchi (Bank of Tokyo-Mitsubishi UFJ), Alice Sireyjol (PwC UK), Lauren Smart (Trucost), Jonas Solehav (SEB), Mariya Soshinskaya (FMO), Julia Spinasse (Banco Bradesco), James Stacey (Earth Capital Partners), Rick Stathers (Schroders), Emma Strong (UK Green Investment Bank), Gabriel Thoumi (Network for Sustainable Financial Markets), Jeroen van der Laan (Triple-E Consulting), Petter Vilsted (Norfund), Rahel Wendelspiess (UBS AG), Rodrigo Zeidan (Fundacao Dom Cabral).

Design: Transition by Design, [www.transitionbydesign.org](http://www.transitionbydesign.org)

# CONTENTS

Foreword	6
Executive summary	8
Introduction	13
<b>Part 1: Natural capital in the economy</b>	<b>18</b>
Trends in the operating environment and sources of natural resource inputs for business	18
Hidden environmental costs filter through the economy	19
Sectors, locations and indicators matter to the significance of natural capital risk	19
Implications for financial institutions	22
Enabling sustainable finance	23
Business case for financial sector action to address risks and catalyse opportunities	25
Transitioning to a more resilient economy and sustainable growth	25
<b>Part 2: Natural resource and environmental analysis to inform risk assessments</b>	<b>27</b>
Financial Institutions' views on natural capital – a survey	27
Bridging the information gap in factoring environmental risk management into investment/credit risk	31
Integration of natural capital factors into lending and investment decisions	33
Top level service provider assessment statistics	34
Overview of natural capital data, modelling and other services from service providers	35
<b>Part 3: Framework for methodological development</b>	<b>38</b>
Outline of the project work programme	44
<b>Appendices</b>	<b>47</b>
Appendix 1: Case studies – sector-specific natural capital impacts and dependencies	47
Appendix 2: Research Providers Evaluated	50
Appendix 3: Bibliography	51

# FOREWORD



The value that nature provides to revenue-generating activities, depends on the stocks and flows and the quality of ecosystem goods and services available. This is “natural capital”, and is being eroded rapidly and globally. Over-exploitation, pollution and environmental degradation are undermining the earth’s capacity to deliver the natural resources and stable environmental operating conditions required to sustain economic activities and a growing world population. This is a critical challenge to both the public and private sectors.

Use of natural resources may exceed the rate at which they can be renewed, leading to renewable natural resources such as fish and forests effectively being rendered finite by over-exploitation. Extraction, production and consumption of resources, and related impacts such as air and water pollution, are compounding pressures on services such as a climate regulation, clean air and fresh water.



Some ecosystem services that are cheap or freely available today, will no longer be available in the future or will become more costly. Loss of ecosystem services can affect the conditions within which businesses operate. Ecosystem decline can influence customer preferences, cash flows, stockholder expectations, regulatory regimes, public policies, the cost and availability of finance and insurance. Reverberating effects can undermine economic stability. Financial impacts may be localised and sector specific initially, but eventually additional costs will be internalised across industries and global supply chains. The true value and precarious financial health of companies will become more evident – often in sudden and dramatic fashion.

In line with these changing conditions, financial institutions will face increasing risks associated with making decisions on client creditworthiness and capital allocation. Information used to allocate financial capital now needs to include the economic implications of environmental damage, over-exploitation of natural resources, and climate change. This means that banks, institutional investors and insurers need to understand how companies, or entire sectors, are positioned for risks and opportunities that could affect their ability to operate, compete, innovate and grow. Systematic approaches are needed to quantify, monitor and manage exposure to natural resource and environment-related financial risks.

This scoping study provides a blueprint of options to include science-based information on the state of the environment and renewable natural resources into credit risk assessments. By providing insight into the current state of play and the direction of travel – towards grounding financial risks in the physical environment – it will inform implementation of a larger project to develop coherent global methods for financial institutions to evaluate financial risks resulting from corporate impacts and dependencies on natural capital. Financial institutions have embarked on this work programme under the Natural Capital Declaration (NCD), starting in November 2015.

This report – *Towards Including Natural Resource Risks in Cost of Capital, State of play and the way forward*, provides the groundwork for developing much-needed approaches and tools to integrate natural capital risks and opportunities into financial products and services. The report and related project built upon it, will build knowledge and effective capabilities for the financial sector to contribute to a shift towards a greener economy. Ultimately, this would provide a more systematic approach for capital markets to recognize and reward companies

with better than sector average risk exposure from impacts and dependencies on natural capital through lower risk-adjusted cost of financial capital.

The NCD's work to contribute to the transition towards a sustainable financial system, supported by the Swiss State Secretariat for Economic Affairs SECO, is in line with the objectives of UNEP's Inquiry into the Design of a Sustainable Financial System and has the potential to improve the financial sector's understanding and management of financial risks associated with natural resource depletion and environmental impacts connected to the deployment of financial assets.

By integrating these factors into lending and investment decision-making, the financial sector has an opportunity to make a significant breakthrough in enhanced risk management practices, and is positioned to play a major role in facilitating the transition to sustainable consumption and production practices. The integration of natural capital, as a subset of environmental, social and governance (ESG) issues, into investment research and processes will enable investors to make better decisions consistent with their fiduciary duties. This work is also vital to support international efforts to meet targets agreed under the UN Framework Convention on Climate Change and under the UN Sustainable Development Goals.

We believe this report will serve as a step towards a transformational change in how financial sector positions itself in this changing world.



**Eric Usher**

Acting Head of UNEP FI and NCD Co-Director



**Andrew Mitchell**

Founder and Executive Director Global Canopy Programme and NCD Co-Director

# EXECUTIVE SUMMARY

The Natural Capital Declaration (NCD), the global finance-led initiative convened by the Global Canopy Programme (GCP) and the UN Environment Programme Finance Initiative (UNEP FI), is implementing a major project to advance environmental risk management in the financial sector. The project aims to develop evidence to evaluate natural capital dependencies and impacts as a material risk for financial institutions, and identify the indicators needed to support this. It also aims to develop approaches to embed natural capital considerations into credit risk assessments. The Swiss State Secretariat for Economic Affairs SECO is supporting the NCD work programme to implement the project over 2.5 years from November 2015. The project consists of two phases:

- Phase 1 will develop and test methodologies, approaches and tools to map natural capital risks across financial institutions' lending and investment portfolios.
- Phase 2 will develop methodologies and guidance to embed natural capital considerations into credit and investment risk assessments.

The World Bank Group and Gordon and Betty Moore Foundation co-funded this study, "Towards Including Natural Resource Risks in Cost of Capital, State of play and the way forward", as the first component of Phase 1. This study represents a working paper to evaluate current and potential approaches for banks and asset managers to understand and assess natural capital risks in portfolios. This report has been prepared by the NCD Secretariat, based on research by ICMA Centre, Henley Business School, University of Reading and Sociovestix Labs Ltd to examine capabilities to understand natural capital risks for financial institutions and embed them in credit risk assessments. The study explores the rationale for the financial industry to map and integrate natural capital risk into credit risk management and assesses the current state of global knowledge to inform the project's implementation.

## Natural capital in the economy

Using natural resources at a faster rate than the earth can replenish them erodes the inputs and operating environment that underpin the economy.<sup>1</sup> Ecosystem goods and services such as food, raw materials and fresh water can be seen as the profits from natural capital stocks, which need to be maintained in order to sustain future flows of natural resource and the resilience of the physical conditions that underpin the economy and society. Policy innovation and market standards are emerging to create an enabling environment for financial institutions to contribute to the transition to an inclusive, environmentally sustainable and resilient economic system.<sup>2</sup>

Part 1 of this Working Paper provides a business case for both banks and asset managers to incorporate natural capital factors in their lending and investment decision-making processes. It reviews the current understanding of natural capital and illustrates its economic and financial market risks. Key findings include:

- **There is anecdotal evidence of the material natural capital impacts and dependencies rebounding on the economy.** There is potential for location and sector-specific effects to spread through globalised value chains.
- **Private and public sector efforts to develop methodologies to account for natural capital are gaining momentum.** These costs are yet to be systematically quantified in financial accounting and analysis.

---

1. WWF, Living Planet Report 2014

2. UNEP Inquiry, The Financial System We Need, Aligning the Financial System with Sustainable Development, October 2015



- **Integrating natural capital factors into due diligence can strengthen risk management and advance sustainable lending and investment practices.** More systematic methods to incorporate information on natural resource and environmental risk can address the downside risks of natural capital factors, as well as create opportunities to develop sustainable financial products and services. By including core issues such as exposure to water stress and land-use change in traditional financial analysis, financial institutions will send a direct signal to corporate clients and investee companies that stronger environmental and natural resource management helps to maintain competitiveness and improve financial resilience.

## **Natural resource and environmental analysis to inform risk assessments**

Part 2 of the study provides an independent assessment of existing capabilities to manage natural capital risk in order to inform the research and development phase of the NCD project to map financial sector risks from natural capital dependencies and impacts. It provides results from a survey of 36 financial institutions on their current approaches to natural capital, and an assessment of the current capabilities of 26 service providers and consultancies to offer relevant natural capital data, modelling skills, and other services to financial institutions. The survey results show:

- Almost half of the 36 financial institutions that responded to the survey see natural capital as very or extremely relevant to their core business strategy and/or portfolio risk management. A further one-third said it was moderately relevant.
- 75% of financial institutions surveyed said that they monitor natural capital risks at a transaction level (mainly across banking institutions). Monitoring natural capital factors at a portfolio level was the next most common approach to natural capital considerations in due diligence/lending/investment processes. 42% said that they take natural capital factors into account in credit risk assessments. However, there is no evidence of systematic quantification of these risks.
- The majority of respondents recognise the importance of natural capital indicators for land use, biodiversity, land and water pollution, GHG emissions, air pollution, waste and water consumption.
- 81% of financial institutions surveyed saw the NCD project to advance environmental risk management as an important and viable step towards more practical management of environmental risk. 75% said they were willing to explore, test or adopt natural capital risk methodologies in the near future.
- While financial institutions are yet to substantially incorporate natural capital risks in their decision making processes, there is a growing interest in gaining a deeper understanding of natural capital issues. Barriers to incorporating natural capital risks into decision making processes range from limited budgets and personnel, to existing capabilities to analyse natural capital risks.
- The NCD will establish a knowledge consortium to build on direct empirical studies on the financial impact of natural capital factors relevant to sectors in lending and investment portfolios.

## Findings from the evaluation of research providers and consultancies:

- Only 26 of the 66 potential research providers evaluated have detailed methodologies available publicly or upon request to offer environmental risk-related research services or some capacity to analyse company performance on natural capital factors.
- Eight of the 26 organisations evaluated have quantitative capabilities with natural capital datasets.
- The most common natural capital indicators on which research providers and consultants focus to assess corporate performance are GHG emissions, water risks, climate risks and air pollution. Few methodologies focus on indicators like agricultural production and over-exploitation risks, forestry and land use, and wider pollution impacts. One reason for this could be that these indicators require more sophisticated analytical tools and datasets such as geographic information systems, and most environmental, social and governance (ESG) research providers have yet to fully incorporate these in their analyses.
- Natural capital datasets can enhance the investment process and unveil both enhanced return and risk reduction opportunities.

## Framework for methodological development

The NCD aims to help scale up the contribution of the financial sector in achieving sustainable development objectives. Part 3 of the study provides a conceptual framework for the implementation of the further stages of the project to develop effective natural capital-adjusted financial risk assessments.

This working paper will inform the work programme to develop the necessary methodologies and tools to evaluate how much of the underlying value of a financial product – such as a corporate loan, private equity, stocks, corporate bonds – is financially affected by natural resource and environmental issues to determine portfolio exposure. The NCD project to build capacity to evaluate natural capital risk at a portfolio level and incorporate relevant factors into credit risk analysis will utilise the collective expertise of its signatories as well as supporters to ensure the delivery of customised approaches for different financial instruments, e.g. corporate finance, equities and fixed income. The outcomes will enable financial institutions to monitor interactions between corporate use of natural resources, environmental impacts and credit risk in order to reflect natural capital risk in measures of corporate performance and value.

The NCD's approach to directly integrate natural capital considerations into credit risk analysis includes:

- 1. Examining the relationship between natural capital indicators and downside risk.** This will attempt to isolate and quantify evidence of causal links between natural capital metrics and corporate or project credit risk.
- 2. Recalibrating credit and investment risk modelling to assess natural capital risk.** Scenario modelling, stress testing and sensitivity analysis will be applied to develop forward-looking approaches to link natural capital risk and financial risk.
- 3. Incorporating science based information and environmental expertise.** The project will aim to incorporate evolving scientific and technological capabilities to understand natural capital issues and capture resulting data and analysis relevant to financial risk. The approach aims to put corporate performance on natural capital indicators into the context of aggregate natural resource constraints and environmental degradation.
- 4. Transferring technical advances on climate risk assessments to other areas of natural capital.** Lessons learned from emerging methodologies and frameworks to capture carbon and climate change risk linked to portfolios can be translated to other natural capital indicators.

- 5. Integrating approaches from a range of methodologies, models, tools and datasets.** The methodologies and tools developed will build on existing relevant tools and datasets drawing on resources from the environmental sector. The approach will include indicators identified in international sustainability reporting standards used to guide corporate disclosures, which therefore influence the corporate performance metrics available to the financial community. The project will also build on first-cut NCD tools and models to assess exposure to water stress through bond and equity portfolios.
- 6. Financial institutions that contribute to developing the international NCD methodology to map natural capital risks across portfolios and embedding them in credit risk assessment.** Banks, fund managers and insurers can participate in developing and testing prototype approaches to map portfolio risks and integrate natural capital factors into credit risk assessments. Financial institutions have three options to participate:
  - Become a full Project Partner to participate in project research and development, and test draft methodologies and tools in relevant selected asset classes.
  - Join a formal Technical Advisory Panel to provide input into needs analysis and methodology and tool development.
  - Join a stakeholder group to be updated and consulted on methodology developments.
- 7. Combining a global as well as country and/or region-specific approach.** The project will explore bottom up methodologies combined with a global or top down approach to incorporating natural capital risks into credit assessment. The bottom-up approach will focus on countries including Peru, Colombia, Indonesia and South Africa. This may include integrating relevant national datasets where feasible.

The NCD will establish a knowledge consortium to build on empirical studies on the financial impact of natural capital factors relevant to sectors in lending and investment portfolios.

## Project objectives

1. Map natural capital dependencies and impacts as a material risk for financial institutions, and identify the indicators needed to support this.
2. Identify methodologies and approaches for evaluating natural capital risks across sectors and regions relevant to the portfolios of financial institutions and develop tools to understand and assess these risks.
3. Develop approaches to embed natural capital considerations into lending and investment credit risk assessment and suggest practical ways to deploy these approaches in financial analysis and decision-making.

## GLOSSARY OF TERMS AND ACRONYMS

Concept	Explanation
Air pollution	“Air pollutants include sulphur dioxide (SO <sub>2</sub> ), nitrogen oxides (NO <sub>x</sub> ), particulate matter (PM), ammonia (NH <sub>3</sub> ), carbon monoxide (CO) and volatile organic compounds. Each has a set of impacts on human health and/or crop and forest yields. The economic damage caused per unit of pollutant depends on the specific location, and is driven by population and crop and forest density” (NCC;TEEB;Trucost, 2013). Air pollutants can include ozone depleting substances that catalyse the destruction of ozone in the upper atmosphere (the ozone layer), such as Chlorofluorocarbons (CFCs and Freons), Hydrochlorofluorocarbons (HCFCs).
Biodiversity	Is defined by the Convention on Biological Diversity as “the diversity of life on Earth” and is essential for the functioning of ecosystems that underpin the provisioning of ecosystem services that ultimately affect human well-being.
Ecosystem services	The Millennium Ecosystem Assessment defines ecosystem services as ‘the benefits people obtain from ecosystems’. An ecosystem is an ever-changing complex of living things interacting with the non-living environment. Human beings are integral parts of ecosystems; our actions shape ecosystems and our well-being is tied to them. For example, a forest ecosystem is more than just trees – it consists of trees, soil, water, rain, and provides fuel, fibre and food as well as water for communities and livelihoods.
GHG emissions	Greenhouse gases in the atmosphere that absorb and emit radiation within the thermal infrared range. The primary GHGs in the Earth’s atmosphere are water vapour, carbon dioxide, methane, nitrous oxide, and nitrogen trifluoride. (UN Framework Convention on Climate Change, 2013)
Land Use and Pollution	“Reduction or loss of the biological or economic productivity and complexity of land, resulting from processes, including processes arising from human activities and habitation patterns, such as (i) soil erosion caused by wind and/or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and (iii) long-term loss of natural vegetation.”(UNEP, 2013)
Natural Capital (NC)	The NCD defines natural capital as ‘the stock of ecosystems that yields a renewable flow of goods and services that underpin the economy and provide inputs and direct and indirect benefits to businesses and society’.

# INTRODUCTION

Under the NCD, 43 financial institutions have committed to understanding and embedding natural capital dependencies and impacts into financial products and services. They are working towards accounting for and reporting on material natural capital considerations in their portfolios. The NCD aims to strengthen capacity to meet these commitments by addressing four core questions:

1. What is natural capital in the context of financial institutions?
2. Why is natural capital relevant to financial institutions?
3. What needs to be taken into consideration, and what are the emerging and potential capacities to monitor and manage natural capital risks and opportunities?
4. How can natural capital dependencies and impacts be integrated into financial products and services, accounting and reporting, while at the same time safeguarding the public good benefits of many natural capital assets?

Through the NCD, UNEP FI and GCP aim to contribute to developing a more systematic and evidence-based approach to measuring, quantifying and valuing how changes in the availability or state of renewable natural resources affect companies in sectors of the real economy. We are working to determine how this in turn affects risk-return profiles, cash-flows, asset values, or other standard financial metrics used by financial professionals. The NCD is implementing several research projects to develop and test practical methodologies and tools to integrate natural capital considerations into financial products and services.

The NCD will work with financial institutions to develop the business case, approaches, and tools to integrate natural capital into operations to clarify lending and investment risks and opportunities, thereby reducing the environmental risk of portfolios while contributing to the broader agenda of resilience in the financial sector.

The Swiss State Secretariat for Economic Affairs (SECO) has made a significant commitment to support the NCD and its project to develop methodologies to map risks related to natural capital in financial institutions' portfolios and embed natural capital factors in credit and wider investment risk assessments.

## Credit risk explained

Credit risk is the potential for loss due to failure of a borrower to meet its contractual obligation to repay a debt in accordance with the agreed terms. For banks, credit risk typically resides in the assets in its banking book (loans and bonds held to maturity).<sup>3</sup>

The project aims to provide the financial sector with common approaches and guidance, models and tools to integrate natural capital into operations from a risk perspective.

The project will utilise the collective expertise of the NCD's signatories and supporters, as well as information from other experts, to ensure the delivery of coherent methodologies adapted for application in different asset classes where necessary (e.g. equities, corporate fixed income,

---

3. <http://www.garp.org/media/489989/credit%20slides.pdf>

## Project objectives

1. Map natural capital dependencies and impacts as a material risk for financial institutions, and identify the indicators needed to support this.
2. Identify methodologies and approaches for evaluating natural capital risks across sectors and regions relevant to the portfolios of financial institutions and develop tools to understand and assess these risks.
3. Develop approaches to embed natural capital considerations into lending and investment credit risk assessment and suggest practical ways to deploy these approaches in financial analysis and decision-making.

etc.), with harmonized approaches at a global level (e.g. standardised metrics). Several NCD signatories will actively participate in the project between 2015 and 2018 by providing inputs and feedback, contributing expertise and lessons learned to help develop and test coherent methodologies and guidance.

This has the potential to contribute to a systematic approach to creating a natural capital risk adjusted cost of capital as the ultimate 'price signal'. The project aims to provide a solid platform to integrate natural resource and environmental indicators into private sector decision-making. Financial institutions participating in the project can contribute to collaboratively building capacity to take account of natural capital indicators in loan and investment conditions. This could contribute to increased financial and environmental resilience and broader risk management. More than US\$340 trillion managed by banks, institutional investors and capital markets is being channelled into the rest of the economy.<sup>4</sup> Calibrating financial modelling for natural capital-related risks has the potential to enhance stability in the financial system, while contributing to the public good.

---

4. UNEP Inquiry, The Financial System We Need, Aligning the Financial System with Sustainable Development, October 2015

## What is natural capital?

The NCD defines natural capital as ‘the stock of ecosystems that yields a renewable flow of goods and services that underpin the economy and provide inputs and direct and indirect benefits to businesses and society’. These ecosystem goods and services provide natural resources and an operating environment on which businesses depend for extraction, production and consumption. Renewable natural resources provide direct and indirect benefits to businesses and society in general (see Figure 1).<sup>5</sup> Renewable natural capital is underpinned by biodiversity, defined as ‘the variability among living organisms from all sources including... terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.’<sup>6</sup> Over-exploitation, pollution and environmental degradation can inhibit ecosystems’ capacity to deliver ecosystem services.

Figure 1: Renewable vs. non-renewable natural resources

NATURAL RESOURCES	
<b>Non- renewable</b>	<b>Renewable</b>
Minerals, metals, oil, coal, gas	Stock of ecosystems that provides renewable flow of goods and services such as purifying and regulating water, soil fertility, carbon storage, habitat for species, etc

The NCD’s definition excludes non-renewable natural resources such as oil, coal, gas, mineral and metals, because the value of these resources is generally already priced by finance and capital markets, even if the total environmental costs of their extraction and refining processes are not. Greenhouse gas (GHG) emissions from fossil fuel combustion undermine the ability of ecosystem services to deliver a stable climate. Initiatives such as the UNEP FI Carbon Asset Risk Framework, UN-supported Principles for Responsible Investment Montreal Pledge, Smith School of Enterprise and Environment Stranded Assets Programme, and Carbon Tracker initiative are already working towards monitoring and addressing risks from energy-related carbon dioxide emissions. The NCD’s approach to GHG mitigation is to focus on emissions linked to renewable natural resource use, such as land-use change.

5. UN Millennium Ecosystem Assessment, 2009, Opportunities and Challenges for Business and Industry  
6. <https://www.cbd.int/convention/articles/default.shtml?a=cbd-02>

This study, "Towards Including Natural Resource Risks in Cost of Capital, State of play and the way forward", represents a working paper to inform the project's implementation. The World Bank Group contracted the ICMA Centre, Henley Business School, University of Reading and Sociovestix Labs Ltd to examine capabilities to understand natural capital risks for financial institutions and embed them in credit risk assessments. This final report has been prepared by the NCD Secretariat, based on their findings. The scoping study explores the rationale for the financial industry to map and integrate natural capital risk into credit risk management and assesses the current state of global knowledge to inform the project's implementation.

Part 1 of this Working Paper provides a business case for both banks and asset managers to incorporate natural capital factors in their lending and investment decision-making processes. It reviews the current multi-stakeholder understanding of natural capital and illustrates its economic and financial market risks.

Part 2 of the study provides an independent assessment of existing capabilities to manage natural capital risk in order to inform the research and development phase of the NCD project to map financial sector risks from natural capital dependencies and impacts. It provides the results of a survey of 36 financial institutions on their current approaches to natural capital and an assessment of the current capabilities of 26 service providers and consultancies to offer relevant natural capital data, modelling skills and other services to financial institutions.

Part 3 provides recommendations for implementation of the further stages of the project to develop effective natural capital adjusted financial risk assessments.





# PART 1: NATURAL CAPITAL IN THE ECONOMY

This section examines the relevance of natural capital factors to banks and investors in relation to lending and investment decision making processes.

## **Trends in the operating environment and sources of natural resource inputs for business**

The economic system is highly reliant on natural capital, which provides both life support mechanisms and environmental functions crucial for economic growth and development (HSBC, 2013). The total economic value of water, land use, and other natural resources supported by biodiversity that provides ecosystem goods & service is vast. Fish stocks alone are estimated to contribute goods and services valued at US\$2.5 trillion annually,<sup>7</sup> and forests provide more than US\$1.5 trillion directly through forestry and indirectly through the value of other services such as energy, food, shelter and medicine, soil and water conservation, desertification control and carbon storage.<sup>8</sup> However, at current yields there is not enough productive land and sea area available to generate renewable resources to meet today's level of growth in demand indefinitely. Net forest loss totaling 5.2 million hectares per year between 2000 and 2010<sup>9</sup> increased land degradation and undermined valuable economic assets and livelihood opportunities.<sup>10</sup>

Freshwater is valued at some US\$73.5 trillion annually.<sup>11</sup> Water availability has a statistically significant effect on annual economic growth.<sup>12</sup> Water scarcity can reduce crop yields and productivity, including power plant output, which can subsequently push up food and energy costs and disrupt businesses and their supply chains. Under current trends, water demand is expected to exceed accessible supplies by 40% in 2030.<sup>13</sup>

In 2015, the World Economic Forum flagged biodiversity loss and ecosystem collapse, failure of climate change adaptation and water crises among the top 10 risks to the global economy.<sup>14</sup> The majority of indicators of the state of natural capital show that the rate of biodiversity loss is accelerating. Natural capital is declining in 116 out of 140 countries and at current rates, these trends are expected to further erode natural wealth worldwide by over 10% by 2030.<sup>15</sup> This has profound impacts on the economy and poses systemic risk, since natural capital provides the stocks and flows of natural resources, as well as the physical operating conditions to maintain economic growth.

Our continued overconsumption is undermining the earth's capacity to supply and replenish vital natural resources such as food, water and energy. These impacts contribute to a state where availability of resources changes quickly, dramatically and in a non-linear way. Earth systems scientists led by the Stockholm Resilience Centre, using the concept of planetary boundaries, warn that overusing resources such as biodiversity, land-use change or fresh water use could cause abrupt global environmental change with severe regional and global consequences.<sup>16</sup> The physical impacts of climate change can have an amplifying effect on environmental pressures.

- 
7. [http://wwf.panda.org/wwf\\_news/?244770/Ocean-wealth-valued-at-US24-trillion-but-sinking-fast](http://wwf.panda.org/wwf_news/?244770/Ocean-wealth-valued-at-US24-trillion-but-sinking-fast)
  8. <http://www.fao.org/post-2015-mdg/14-themes/forestry-and-mountains/en/>
  9. <http://www.fao.org/post-2015-mdg/14-themes/forestry-and-mountains/en/>
  10. <http://www.fao.org/post-2015-mdg/14-themes/forestry-and-mountains/en/>
  11. <http://www.bbc.com/earth/story/cost-the-earth-sources>
  12. Global Water Partnership/OECD Task Force on Water Security and Sustainable Growth, Security Water, Sustaining Growth, 2015
  13. 2030 Water Resources Group, Charting our Water Future, 2009
  14. World Economic Forum, Global Risks 2015, 10th Edition
  15. UNEP Inquiry, The Financial System We Need, Aligning the Financial System with Sustainable Development, October 2015
  16. <http://www.ecologyandsociety.org/vol14/iss2/art32/>

## Hidden environmental costs filter through the economy

Businesses depend on ecosystem functions that provide natural resources and absorb waste and pollutants. Running down natural assets is increasing constraints on production and on economic activity in general. Yet there is often a failure to put a price on external environmental costs - externalities - associated with use of resources such as land, energy and water. These externalities are often third-party costs, or 'social costs', of business transactions that are internalised by the economy, as well as by society, through increased taxation, inflation and healthcare costs. Studies such as the Millenium Ecosystem Assessment (MEA) illustrate how economic growth does not allow for sustainable regeneration of natural assets and generate numerous environmental externalities that, managed inefficiently, reduce global GDP (PRI, 2013). Government policies such as the precautionary and polluter pays principles aim to help strengthen environmental stewardship and corporate accountability for the impacts of operations and products on the environment, human health and the economy. Policy measures such as market based instruments and mandatory performance standards increasingly aim to correct market failures and redistribute the burden of environmental costs and mitigation on to those driving damages, in order to strengthen the incentive for businesses to reduce impacts.

## Sectors, locations and indicators matter to the significance of natural capital risk

The latest Global Environmental Outlook from the Convention on Biological Diversity (CBD) identifies some of the major primary sectors of the global economy - agriculture, forestry, fisheries, energy, and water and sanitation - that directly rely on the natural resource base, and also exert significant direct pressures on biodiversity.<sup>17</sup> With larger and more affluent populations increasing demand downstream in value chains, these sectors will be the key drivers of projected future losses in biodiversity and degradation of ecosystems on which they depend, under 'business as usual' scenarios. Drivers linked to agriculture account for 70 per cent of the projected loss of land-based biodiversity.

### Top high risk impact sectors (Natural Capital Declaration Roadmap, 2013)

**Land based impacts:** Sectors with significant direct impacts on natural capital through land-based operations, such as agriculture, forestry, construction, oil and gas, mining, cement and utilities. See case studies in Appendix 1.

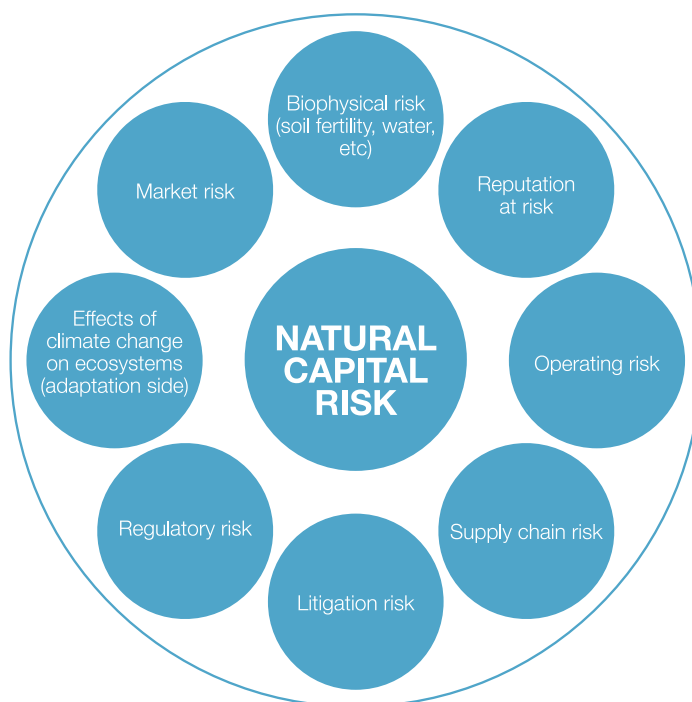
**Operational dependencies:** Sectors *dependent on biodiversity for their operations*, such as agriculture, forestry, fisheries and aquaculture, and leisure and tourism. The fisheries sector is, for example, dependent on the 'production' or 'provisioning' services of marine ecosystems. The tourism sector is, to a certain extent, dependent on the 'scenic beauty' of the environment surrounding hotels and resorts.

**Supply chain impacts:** Sectors that indirectly impact natural capital through their supply chains. All companies have varying impacts on the natural environment through their supply chain. High impacts may be expected by those companies that source raw materials from areas with pristine ecosystems, such as the food producing and processing sector when sourcing palm oil from companies that clear tropical rainforests for its production.

A study by the Natural Capital Coalition found that primary production (agriculture, forestry, fisheries, mining, oil and gas exploration, utilities) and some primary processing (cement, steel, pulp and paper, petrochemicals) sectors drive environmental external costs of some US\$7 trillion annually.<sup>18</sup> This figure is equivalent to 13% of global economic output in 2009.<sup>19</sup> The majority of these natural capital costs are for four of the six environmental key performance indicators (eKPIs) quantified - GHG emissions (US\$2.7 trillion), water use (US\$1.9 trillion), land-use change (US\$1.8 trillion) and air pollution (US\$0.5 trillion). The other two indicators analysed - waste, and land and water pollution – account for less than US\$0.4 trillion of the total natural capital costs. Pressure on natural resources in developing countries, already highly exposed to these costs, are expected to increase due to growth in primary production and processing.

Without adequate pricing of the natural capital consumed by companies or regulation to address market failure, the mounting costs of natural resource depletion and degradation are internalised sporadically through mechanisms such as regulatory risk, market risk, supply constraints, loss of productive capacity, volatile input costs, increased capital expenditure, and changes in business models and operations (see Figure 2). Economic effects of natural resource depletion and environmental degradation are likely to be localized and somewhat sector-specific initially, but can ripple rapidly through globalized supply chains and financial markets.

**Figure 2: Overview of risks linked to business impacts and dependencies on natural resources**



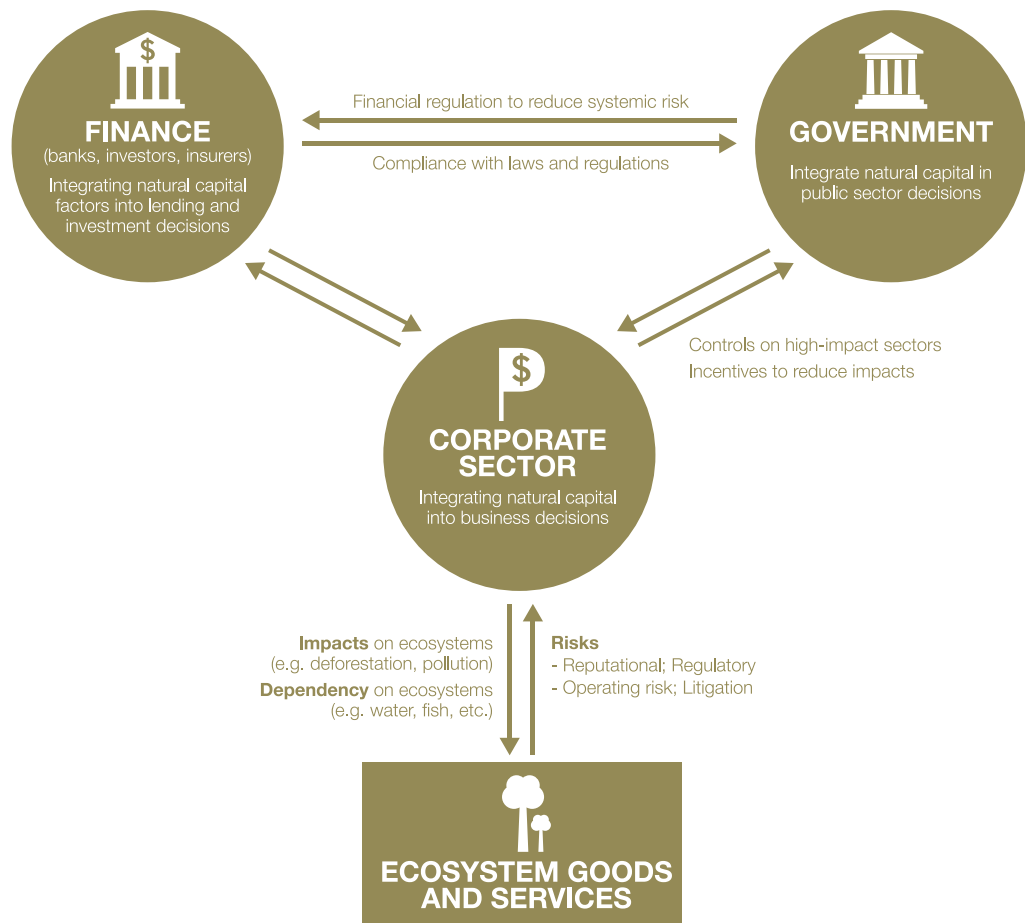
One emerging approach to catalyse change is advancing methodologies to account for natural capital in economic models in order to understand and mitigate the risks associated with natural resource depletion and degradation. Initiatives working to develop approaches to make ecosystem service functions more visible in the economy include UNEP's The Economics of Ecosystems and Biodiversity (UNEP TEEB) and the UN Statistical Commission's System of Environmental Economic Accounting (UN SEEA). The World Bank Wealth Accounting and the Valuation of Ecosystem Services (WAVES) Programme is applying the UN SEEA Framework, as well as experimental accounts for ecosystems such as watersheds and mangroves, to help to identify the economic value of ecosystem services to countries and sectors in order to mainstream natural resource indicators in development planning and national economic / statistical accounts. A parallel journey to capture the value of natural capital to businesses

18. Natural Capital Coalition and Trucost, Natural Capital At Risk: The Top 100 Externalities of Business, 2013  
 19. <http://www.naturalcapitalcoalition.org/projects/natural-capital-at-risk.html>

is under way in the corporate sector through initiatives such as the U.S.-based Natural Capital Project, a partnership between Stanford University and the University of Minnesota, The Nature Conservancy and WWF, and the Natural Capital Coalition (NCC)<sup>20</sup>, which has commissioned two consortia of consultancies and non-governmental organisations (NGOs) – led by the World Business Council for Sustainable Development (WBCSD) and the International Union for the Conservation of Nature (IUCN) respectively - to develop a Natural Capital Protocol (NCP) by mid-2016. The NCP will be a standardised global methodology for companies to understand their impacts and opportunities to sustain the natural environment, its finite natural resources and functioning ecosystems that they depend on to maintain business activities. The NCD will develop Financial Sector Guidance on Natural Capital Accounting as a supplement to the NCP.

Efforts are accelerating to develop the foundations of a new paradigm (see Figure 3). A common conceptual framework to measure the economic importance of ecological functions aims to ensure financial decisions across the public and private sectors are better informed on the value of natural assets to strengthen the security of the environment, human wellbeing and economic development.<sup>21,22</sup>

**Figure 3. Interventions across sectors to accelerate natural capital accounting and integration**



20. Formerly the TEEB for Business Coalition  
21. <http://www.bbc.com/earth/story/cost-the-earth-sources>  
22. <http://ec.europa.eu/environment/biodiversity/business/assets/pdf/b-at-b-workstream-1-natural-capital-accounting.pdf>

## Pricing nature?

The NCD does not aim to put a price on nature. Rather it aims to put a price on the risks that clients or investee companies face through high impacts or high dependency on nature. It aims to embed measures of corporate impacts and dependencies on natural capital in standard financial metrics and financial analysis. The main focus of the NCD is working in partnership with the financial industry to develop the means to enable a stable transition to a more sustainable economic model. The NCD is recognised as a biodiversity champion by the CBD, which has agreed a target for biodiversity values to be integrated into the economic and financial system by 2020. The World Bank WAVES Programme and UNEP TEEB initiative aim to advance approaches to capturing the value of natural assets to economies at a national level, the NCD has a goal of developing systematic, science-based approaches to include conversation on biodiversity and ecosystem goods and services in decision making at asset and portfolio levels.

## Implications for financial institutions

Global environmental external costs of over US\$ 2.15 trillion have been attributed to the top 3,000 public companies and flagged as potential risks to the value of large, diversified equity portfolios (UNEP FI/PRI, 2011).<sup>23</sup> These “externalities” could equate to over 50% of the combined earnings of companies in a hypothetical investor equity portfolio weighted according to the MSCI All Country World Index. Natural capital constraints may be unevenly distributed across and within sectors, with associated credit and investment risks. Given the industry and geography specific (NCC;TEEB;Trucost, 2013) significance of natural capital factors, a better understanding is needed of variation in impacts on the assets, cash flows and liabilities of companies.

A concerted effort is therefore under way to develop approaches to understand the effects of natural capital losses on price levels and investment returns, debt repayments, business models, markets and economies. This includes trying to understand the implications of natural capital risk for the provision of debt and equity to companies.

There is an urgent need to respond to environmental megatrends - those trends visible today that are expected to extend over decades, changing slowly and exerting considerable force that will influence a wide array of areas, including social, technological, economic, environmental and political dimensions.<sup>24</sup> Momentum is growing in the financial sector to capture the financial implications of natural capital risks for companies in order to become better equipped to manage these risks across portfolios.

Financial institutions need to quantify ways in which resource related trends can affect the competitive dynamics of sectors, shape returns and create new economic risks in order for asset managers and banks to monitor how the costs of resource depletion and environmental degradation filter through the operations and supply chains of companies in lending and investment portfolios. Information used in financial markets does not currently capture the value of ecosystem services to the economic sectors that depend on their accessibility. It is yet to take account of data and analytics on drivers of biodiversity loss and sectoral exposure to a diminished asset base.

23. UNEP FI/PRI, Universal Ownership, Why environmental externalities matter to institutional investors, 2011

24. Definition by the European Environment Agency Knowledge base for Forward-Looking Information and Services (FLIS) network

## Enabling sustainable finance

The UNEP established an Inquiry into the Design of a Sustainable Financial System in 2014 to advance design options that would deliver a step change in the financial system's effectiveness in mobilizing capital towards a green and inclusive economy. With investment of US\$5-7 trillion per year needed between now and 2030,<sup>25</sup> aligning the financial system with international Sustainable Development Goals finalised in 2015 is at the core of the Inquiry's work.

Policy innovation and market standards are emerging to ensure that the financial system supports inclusive, environmentally sustainable economic development to create a nexus between rules governing the financial system and sustainable development.<sup>26</sup> Capital flows need to be redirected towards critical priorities and away from assets that deplete natural capital. Progress to date to integrate environmental factors into financial decision making along with the allocation of capital to renewable energy and environmental technologies has not halted the contribution of economic activity to continuing environmental degradation.

Measures taken by central banks and financial regulators to put the brakes on systemic risk include a requirement for banks to have an environmental and social risk management system and financial institutions to implement social and environmental responsibility policies in their activities (Brazil), green credit guidelines requiring banks to report on environment related credit risk in their main portfolios (China), introducing environmental stress testing (European Union) and clarifying fiduciary duties to include ESG issues (South Africa).<sup>27</sup> A green finance task force co-sponsored by the Research Bureau of the People's Bank of China (PBC) and the Inquiry delivered 14 recommendations to establish China's green finance systems, including proposals to create discounted green loans, environmental liabilities for lenders and an environmental cost analysis system.<sup>28</sup>

The Inquiry is working with central banks, financial regulators, finance ministries and financial market standard setters, such as accounting standards, credit rating and indexes and voluntary initiatives to develop a coherent framework to advance policy options that would deliver a step change in capital allocations towards sustainable development that meets the needs of the present without compromising the needs of future generations. The Inquiry's global report (October, 2015) highlights the critical role of market actors in developing a sustainable financial system, with the potential for banks, pension funds and analysts to contribute through leadership, knowledge development and expert guidance, coalition building and advocacy.

The Inquiry recommends building resilience and addressing system risk from issues such as natural disasters, air pollution, resource security and climate change. Reasons to advance environmental risk management – with or without adequate policy frameworks – include overcoming asymmetric information, misaligned incentives, short-termism and associated accountability failures, addressing systemic risk such as mis-priced assets and catalysing innovation.<sup>29</sup>

---

25. UNEP Inquiry, The Financial System We Need, Aligning the Financial System with Sustainable Development, October 2015  
26. UNEP Inquiry, The Financial System We Need, Aligning the Financial System with Sustainable Development, October 2015  
27. UNEP Inquiry, The Financial System We Need, Aligning the Financial System with Sustainable Development, October 2015  
28. <https://www.cbd.int/financial/privatesector/china-Green%20Task%20Force%20Report.pdf>  
29. UNEP Inquiry, The Financial System We Need, Aligning the Financial System with Sustainable Development, October 2015

## CASE STUDY: South Africa - Investment Governance

The fiduciary duty of pension fund trustees in South Africa includes a requirement to consider material sustainability factors under Regulation 28 of the Pension Funds Act. Institutional investors and their service providers must also adhere to a Code for Responsible Investment in South Africa (CRISA) on a comply or explain basis.<sup>30</sup> This aims to catalyse integration of environmental, social and governance (ESG) issues into investment decisions.<sup>31</sup> As a result, a growing number of institutional investors are integrating responsible investment principles into investment practices.<sup>32</sup> The CRISA Committee issued a model mandate in 2014 for institutional investors including asset owners such as pension funds and insurance companies with respect to asset managers and consultants. Based on model contract terms suggested by the International Corporate Governance Network (ICGN),<sup>33</sup> it states that investment mandates should incorporate risk management practices relating to ESG and systemic concerns into asset managers' ongoing obligations. They should also include voting guidelines so that institutional investors may influence companies in which they invest to improve environmental and social performance in line with Regulation 28.

## CASE STUDY: Brazil – Banking Regulations

Brazil's National Monetary Council introduced the first regulations on Environmental and Social Risk Assessment for Brazilian banks in 2008, with Resolution 3545 prohibiting loans in rural credit lines to companies which are not in compliance with environmental regulations in the Amazon area. In 2010, Resolution 3876 prohibited loans in rural credit to companies which are included in the "Dirty List" of slavery labour, extended by the Ministry of Labor across the whole country. In 2014, Resolution 4327 was introduced, requiring banks to have a policy on Environmental and Social Responsibility (ESR), as well as making environmental and social risk assessments part of the routine procedures of the Credit Risk Department, and requiring banks to keep an accountancy register identifying which defaults were caused primarily by environmental or social risks. This new resolution recognises each bank may have its own policy, according to the principles of relevance and proportionality, which means that the assessment can be applied to loans and specific types of finance, based on values, industries and the risk exposure of bank portfolios. The new rule entered into force for large banks in February 2015, and for small and medium-sized banks in July 31<sup>st</sup> 2015. Additional obligations of financial institutions include demonstrating the inclusion of environmental and social exposures into their Internal Capital Adequacy Assessment Process (ICAAP); and managing direct environmental and social impacts.

The rules are subject to enforcement by the Central Bank of Brazil, which must verify each bank's policy and procedures and assess their adequacy, and has the authority to initiate administrative procedures and apply penalties when necessary. The rule does not clearly define which transactions or clients are to be assessed. Regarding big banks, which already had policies on environmental and social risk assessments, these definitions are made based on values of transactions and industry (in case of transactions) and on annual revenues or credit limits and industry (in the case of clients).

The Central Bank sees environmental and social risks as drivers of systemic risk, therefore their effective management is part of the efficiency and soundness of the financial system and enhancement of policy prudential tools. Environmental and social risks materialise as new components of different types of risks (credit, operational, reputational, etc.) for capital channeling, financing and incentive systems. It considers that the lack of market-driven incentives affects stability.

However, for Brazilian banks, environmental and social risk level is not reflected in the pricing of credit, because interest rates, terms and deadlines are usually the same no matter the degree of risks. So, banks are still missing an opportunity for both reducing risks and creating incentives for better environmental, social and governance performance, and, as a consequence, better macroeconomic performance.

*Source: Luciane Moessa, PhD, currently Post-doctoral researcher (USP), presentation on Financial Regulation and Environmental and Social Governance: risks and opportunities at the Banking System*

---

30. WWF South Africa and Trucost, Carbon and Water Risk for South Africa's Top Companies, Bonds and Equity Funds, 2012  
31. <http://www.iodsa.co.za/?page=CRISACode>  
32. Institute of Directors in Southern Africa, Adaptation of the ICGN Model Mandate Initiative for South Africa July 2014  
33. [http://c.ymcdn.com/sites/www.iodsa.co.za/resource/collection/2BB91484-C408-4372-A045-FAF4E98560F5/Position\\_Paper\\_\\_Model\\_Mandate.pdf](http://c.ymcdn.com/sites/www.iodsa.co.za/resource/collection/2BB91484-C408-4372-A045-FAF4E98560F5/Position_Paper__Model_Mandate.pdf)



## **Business case for financial sector action to address risks and catalyse opportunities**

Capital market efficiency can be improved by considering natural resource constraints and environmental degradation that can lead to “hidden” risks such as potential devaluation of assets and lower than anticipated cash flows. A shared methodology and tools to identify and map risks associated with natural capital across portfolios would provide measurable natural capital performance indicators - harmonized among financial institutions and meaningfully linked to credit risk. Integrating the value of natural capital factors into credit risk assessments aims to develop a more systematic approach to embed consideration of natural assets at the heart of the financial system in order to catalyse a shift in business models towards sustainable production and consumption.<sup>34</sup>

Emerging approaches to integrate environmental risk into credit procedures include longer payback periods and interest rate adjustments linked to environmental risk management systems, to provide loan pricing incentives. Financial institutions can use a more systematic approach to incentivise companies to reduce impacts and dependencies on the natural environment, recognizing that they are mitigating costs and strengthening business models. Understanding how to embed key natural capital performance indicators into credit risk assessments across industry sectors (and geographies), can facilitate opportunities to create a performance based cost of capital for investees and increase investment in green infrastructure and technologies. This can drive down the cost of capital and improve return on investment for companies and industries that are well positioned for the transition to a resource efficient, low polluting economy.

## **Transitioning to a more resilient economy and sustainable growth**

A Global Environment Facility financial mechanism has leveraged US\$65 billion in co-financing since 1991 to build capacity to mainstream biodiversity conservation and sustainable use in the context of wider economic development.<sup>35</sup> This is dwarfed by the trillions in financial capital that has been allocated to activities that contribute to over-use of resources and pollution over the past 24 years.

Reducing business drivers of over exploitation and damages could have a significant impact on maintaining natural capital stocks. More efficient use of natural capital in the economy is vital to avert resource constraints along with increased volatility and potentially irreversible environmental damage. Research by the CBD indicates that it is feasible to simultaneously protect biodiversity and achieve food security while also meeting climate mitigation and other socioeconomic objectives. However, this requires transformational change.<sup>36</sup> The benefits of ecosystem goods and services provided by biodiversity are valued at three times the estimated opportunity costs. This is not to say that nature should be privatised and commoditised. It is however, a way of recognising nature’s contribution to economic benefits, in addition to its fundamental intrinsic value.<sup>37</sup>

The CBD highlights knowledge management and capacity building as critical to catalyse the fundamental changes in the operation of the primary sectors needed for sustainable development, such as much more efficient use of land, water, energy and materials, and major transformations of the way food systems operate worldwide. This involves rethinking production and consumption of food, energy and wood, as well as management of inland waters and oceans.

Mapping natural capital risks in portfolios and integrating relevant factors into credit analysis can help ensure a more stable economy under rapidly changing and uncertain physical conditions in which businesses operate (environmental degradation and

---

34. [http://www.mckinsey.com/insights/energy\\_resources\\_materials/mobilizing\\_for\\_a\\_resource\\_revolution](http://www.mckinsey.com/insights/energy_resources_materials/mobilizing_for_a_resource_revolution)

35. [http://www.thegef.org/gef/sites/thegef.org/files/documents/document/GEF-5\\_Bio\\_strategy.pdf](http://www.thegef.org/gef/sites/thegef.org/files/documents/document/GEF-5_Bio_strategy.pdf)

36. UNEP, CBD, World Health Organization, 2015, Connecting Global Priorities, Biodiversity and Human Health, A State of Knowledge Review

37. [http://www.conservation.org/publications/Documents/Turner-et-al\\_2012\\_Conservation-and-poverty-alleviation.pdf](http://www.conservation.org/publications/Documents/Turner-et-al_2012_Conservation-and-poverty-alleviation.pdf)

resource constraints). Incentivising companies to manage natural resources that underpin the economy can help position financial institutions for the US\$5-7 trillion a year needed in green financial product development to realise the Sustainable Development Goals.<sup>38</sup> Developing approaches to support smart use of natural capital by clients and investee companies offers financial institutions the potential to develop new green revenue streams and more resilient risk return profiles, as clients' expectations increasingly demand responsible investment and lending practices. Financial institutions that address the downside risks of natural capital factors will be better positioned to attract the growing assets seeking sustainable financial products and services.

---

38. UNCTAD (2014), World Investment Report 2014 - Investing in SDGs. Geneva: UNCTAD

# PART 2: NATURAL RESOURCE AND ENVIRONMENTAL ANALYSIS TO INFORM RISK ASSESSMENTS

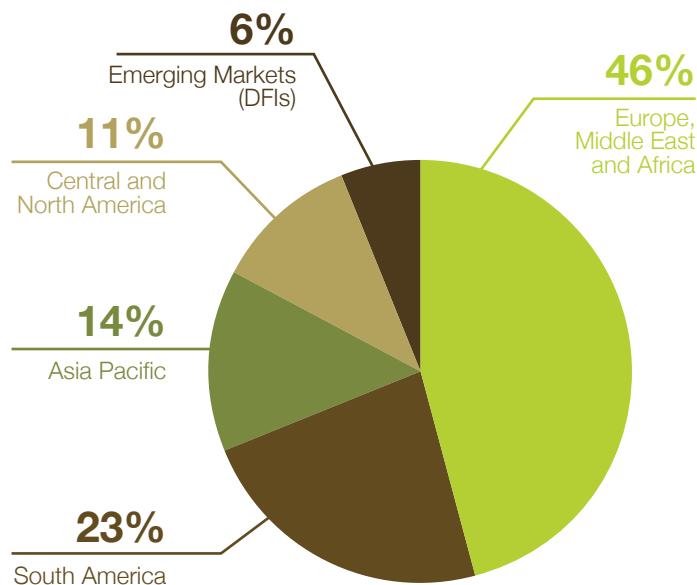
There is currently low competition in the asset management space in applying sophisticated natural capital investment strategies. Natural capital datasets can therefore enhance the investment process and unveil both enhanced return and risk reduction opportunities (Hoepner, 2013). Competitive advantage and financial resilience provide a rationale for financial institutions to begin integrating natural capital factors into risk management practices.

## Financial Institutions' views on natural capital – a survey

The study reached out to 100+ Financial Institutions – both signatories to the NCD and other financial institutions - to complete a survey designed by Sociovestix Labs / ICMA Centre in order to find the views of financial institutions on the NCD initiative, the relevance of natural capital risks to their business models, their current capabilities in mapping natural capital risks and the barriers these organisations face in incorporating natural capital considerations in decision making processes. Thirty six financial institutions answered the survey. Results and insights include:

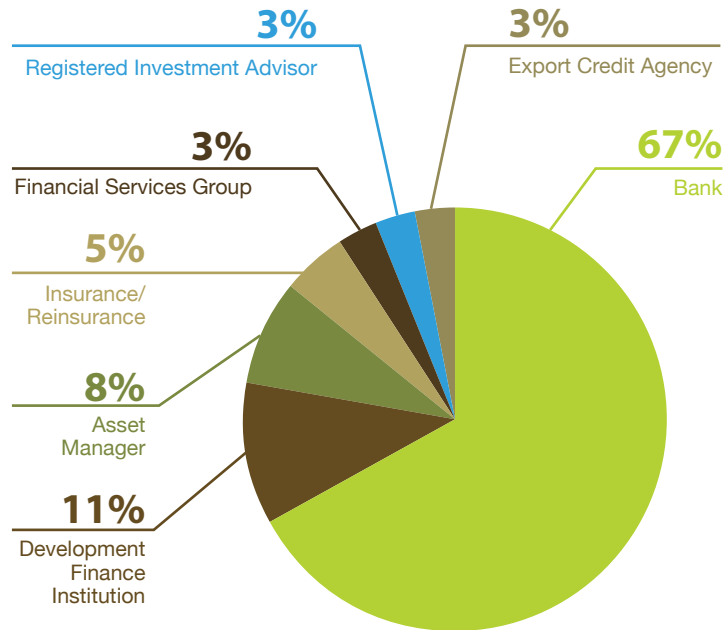
- 69% of responses were from financial institutions in Europe, Africa and South America. 13 of the 36 responses were from financial institutions in Brazil, Colombia, Ecuador, Indonesia and South Africa, reflecting the concentration of natural capital in these countries as well as local initiatives to strengthen financial sector governance and oversight of environmental and social issues linked to financial instruments.

Figure 4: Financial institution responses by region



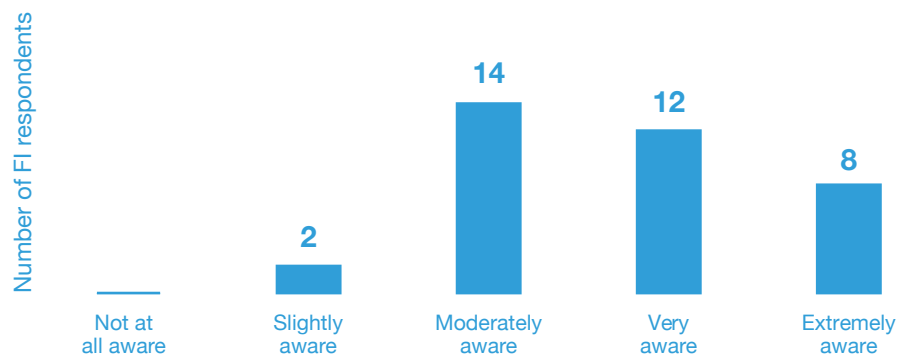
- The highest proportion of respondents were banks (67%) followed by development finance institutions (11%), asset managers (8%) and insurance/reinsurance (5%). The breakdown of respondents helps place into context the survey questions results, which will be biased towards banking institutions' transactions and practices in the area of natural capital.

Figure 5: Survey respondents – financial institution profiles



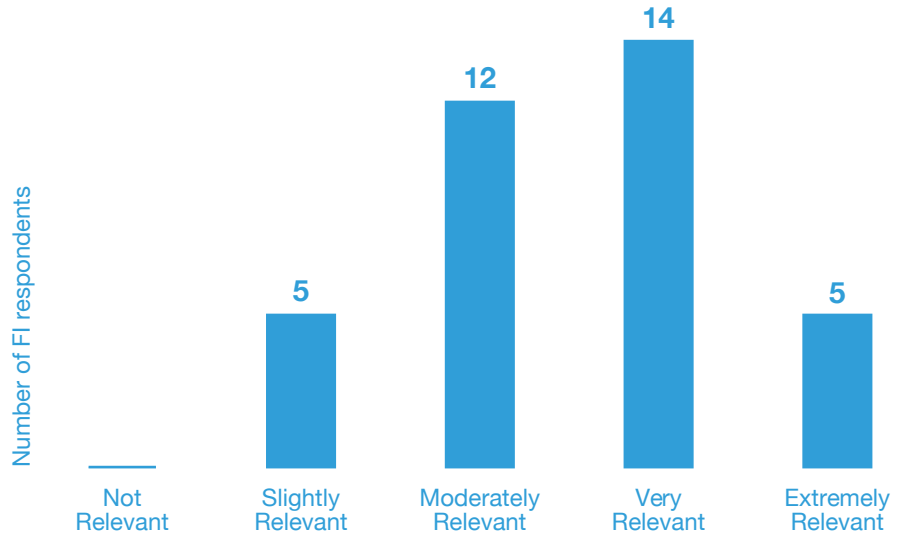
- 94% of respondents said that relevant departments were moderately, very or extremely aware of natural capital risks. This may reflect the heightened level of awareness amongst finance professionals responding to the survey, as well as the growing profile of water and climate related risks.

Figure 6: Level of departmental awareness of natural capital risks



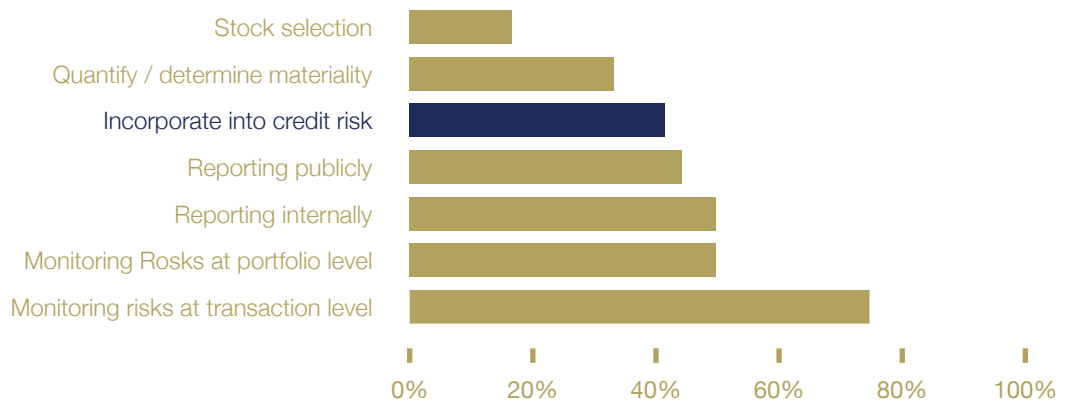
- 47% of respondents see natural capital as very or extremely relevant to their core business strategy and/or portfolio risk management. A further one-third see it as moderately relevant. Survey respondents are likely to be more interested in the topic of natural capital than financial institutions that did not respond to the survey. This reflects the methodological limitation of self-selection, as well as the potential bias towards responding positively to the questions.

**Figure 7: Relevance of natural capital to financial institutions core business strategy and/or portfolios risk management**



- The most common implementation of natural capital considerations among respondents is to monitor risks at a transaction level (75%), reflecting the fact that the majority of respondents were banking institutions. Twelve said that they quantify/determine the materiality of natural capital risk, 42% of respondents said that they already take natural capital factors into account in credit risk assessments.<sup>39</sup> However, further questioning by the NCD revealed that many of these institutions were not systematically quantifying natural capital-related credit risks.

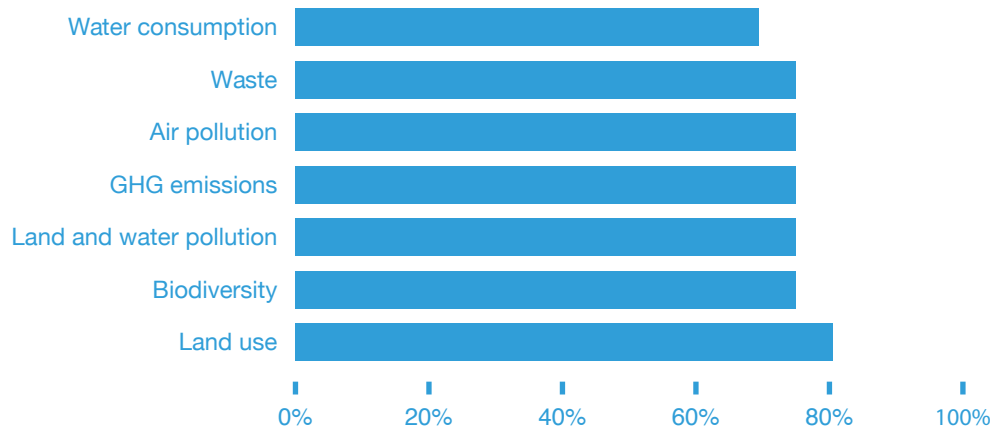
**Figure 8: Percentage of financial institutions undertaking approaches to natural capital risk in due diligence/lending/investment processes**



39. Multiple responses could be selected for the question on approaches to natural capital risk.

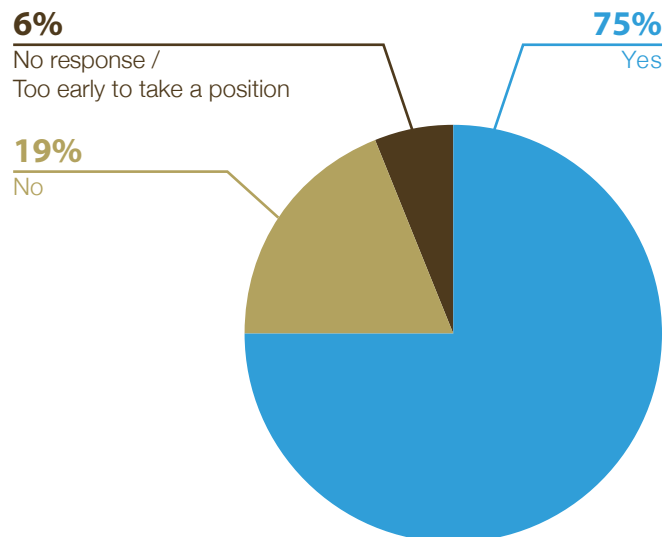
- All seven of the natural capital indicators identified were seen as important to lending or investment processes by more than 60% of respondents, while over 80% of responses rated land use as a significant issue. In order to identify key natural capital risk indicators across both industry and academia, Sociovestix and the ICMA Centre conducted a risk indicator mapping exercise across 32 studies. The survey focused on the seven top level natural capital risk indicators that dominated. Measuring relevant indicators can increase visibility and accountability for risks linked to natural capital impacts and dependencies across companies, sectors and geographies.

**Figure 9: Main types of natural capital risk indicators considered important in due diligence/lending/investment processes**



- 81% of respondents see the NCD project as an important and viable step towards more practical management of environmental risk for financial institutions that is aligned with the financial institutions' core business. 75% are interested in exploring, testing or adopting natural capital risk methodologies in the near future.

**Figure 10: Percentage of respondents interested in exploring, testing or adopting natural capital risk methodologies in the near future**



The financial institutions surveyed highlighted several challenges in incorporating natural capital risks in decision-making processes, including:

- Limited IT budgets and personnel
- Lack of awareness around natural capital issues
- Lack of access to robust natural capital information and data
- Lack of suitable and contextual methodologies
- Lack of standards around the quantification of natural capital risks
- Vagueness of regulatory requirements around natural capital issues
- Complexity of natural capital definition
- Short-term performance maximisation mindset in the investment world
- Difficulty in relating long-term data to short-term materiality.

## **Bridging the information gap in factoring environmental risk management into investment/credit risk**

Some 80 representatives of financial institutions and other organizations from 30+ countries – banks, fund managers, Export Credit Agencies and Development Finance Institutions – provided further feedback on the development of practical methodologies and tools for managing investment and lending risks related to natural capital, to inform the project’s implementation, during international workshops held by the NCD and World Bank Group in South Africa and the United States. The workshops revealed that even leading financial institutions are at the early stages of taking natural capital issues into account. Overall, feedback highlighted the need for clear information and practical tools to build understanding and the ability to incorporate natural capital considerations into the operations of banks and asset managers to manage natural capital risks in lending and investment portfolios. Some banks recognised the consideration of localised information as key for understanding natural resource risk, compared with global approaches to understanding carbon risks.

The financial sector needs common approaches with standardised, relevant data and risk measures to evaluate natural capital and inform decision making. This requires widespread and consistent corporate disclosure on standardised, relevant indicators in corporate reporting focusing on a few material indicators, which can be sector- and/or region-specific. Several initiatives, including the Global Reporting Initiative (GRI), Climate Disclosure Standards Board, Organisation for Economic Co-operation and Development (OECD) and Sustainability Accounting Standards Board provide guidance on environmental reporting. The Sustainable Stock Exchanges Initiative promotes sustainability reporting by listed companies. As of October 2015, the World Federation of Exchanges recommends that its member stock exchanges include material environmental, social and governance (ESG) metrics in their disclosure guidance to companies listed on their markets. Suggested key performance indicators include energy consumption, GHG emissions, water management, environmental impacts, and waste management.<sup>40</sup>

### **International voluntary guidelines for corporate sustainability disclosure**

Banks and investors rely extensively on company disclosures to evaluate environment related financial risk. Company quantification of natural resource use and pollution impacts are largely guided by the GRI sustainability reporting guidelines. The GRI “has been assessing opportunities to translate emerging thinking around ES [ecosystem services] into sustainability reporting indicators and approaches that can be used as a starting point by organizations in all sectors.” Current “G4” guidelines’ environmental dimension concerns the organization’s impact on living and non-living natural systems, including land, air, water and ecosystems. It covers impacts related to inputs (such as energy and water) and outputs (such as emissions, effluents and waste). In addition, it covers biodiversity, transport, and product and service-related impacts, as well as environmental compliance and expenditures. However, understanding risks linked to companies in banks’ loan books and fund managers’ investment funds requires an understanding of the local context of natural resource constraints and the state of the environments in which companies operate in order to implement more structured, quantitative and meaningful approaches to assess company risk profiles.

40. <http://www.world-exchanges.org/home/index.php/news/world-exchange-news/world-exchanges-agree-enhanced-sustainability-guidance>.





## Integration of natural capital factors into lending and investment decisions

Financial institutions' consideration of natural capital factors is currently limited, with varied levels of analysis and due diligence across different types of financial products and services. Banks generally consider natural capital issues to some extent as part of environmental & social (E&S) risk management in lending, while investors can see natural capital as a subset of environmental, social and governance (ESG) issues in responsible investment. Natural capital can be seen as a subset of E&S or ESG factors that can be material to financial institutions, mainly through their allocations of capital to companies through loans and investments or premiums as part of insurance contracts.

UNEP FI's guidance on Sustainable Banking recommends that risk departments in financial institutions consider introducing environmental and social risk management (ESRM) systems and measure the environmental footprints of operations. The IFC's ESRM program supports financial institutions in emerging markets in improving their E&S risk management practices, and aims to ensure that their lending to economic activities does not come at the cost of human well-being, natural resources, and vital ecosystems.<sup>41</sup> Meanwhile, banking associations in countries such as Mexico and Brazil have established sustainability platforms to share good practice in E&S management. The OECD is developing guidance to clarify potential approaches for applying due diligence for responsible business conduct in the financial sector.

However, only project finance transactions have an international standard for minimum E&S due diligence, set by the Equator Principles Association. Some 80 financial institutions worldwide voluntarily apply the Equator Principles for projects of US\$10 million or more, and to project-related corporate finance of US\$100 million or more. The Equator Principles, updated to version III in 4 June 2013, are based on the IFC's s Performance Standards for Environmental and Social Sustainability (see box).<sup>42</sup> Each year, some US\$240 billion (€200 billion) is lent through project finance worldwide,<sup>43</sup> a relatively small proportion of international financing, compared with global financial assets.

### Equator Principles and the IFC Performance Standards

Equator Principles Financial Institutions (EPFIs) require clients seeking finance for projects adverse environmental and social risks and/or impacts to conduct an assessment process to address relevant environmental and social risks and impacts of the proposed project. The assessment process should address compliance with relevant host country laws, regulations and permits covering environmental and social issues. In countries with evolving technical and institutional capacity to manage environmental and social issues, the assessment process should evaluate compliance with the then applicable IFC Performance Standards on Environmental and Social Sustainability (Performance Standards) and the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines).<sup>44</sup> The IFC Performance Standards on Environmental and Social Sustainability were revised in 2012, with Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources emerging as the global finance industry benchmark for biodiversity and ecosystem services (BES) management. This addresses on-the-ground physical management of BES in projects, rather than company-wide environmental impacts and dependencies on natural resources. Under the Equator Principles, quantification of environmental impacts is only required for GHG emissions.

41. <http://www.ifc.org/wps/wcm/connect/cd2f00004fd331498d69ef0098cb14b9/ESRM-Factsheet-Final.pdf?MOD=AJPERES>

42. <http://www.equator-principles.com/index.php/members-reporting>

43. JP Morgan Asset Management, Guide to Infrastructure Investing

44. [http://www.equator-principles.com/resources/equator\\_principles\\_III.pdf](http://www.equator-principles.com/resources/equator_principles_III.pdf)

Drivers for incorporating ESG factors in investment management include a broader interpretation of fiduciary duty.<sup>45</sup> However, progress has been limited since UNEP FI's "Freshfields report (2005)<sup>46</sup> found that '...integrating ESG considerations into an investment analysis so as to more reliably predict financial performance is clearly permissible and is arguably required in all jurisdictions" and Fiduciary II (2009)<sup>47</sup> called for trustees to integrate ESG issues into their decision-making, and into the legal contract between asset owners and asset managers. Policymakers and regulators are now being urged to step in and clarify that fiduciary duty requires investors to take account of ESG issues in their investment processes, in their active ownership activities, and in their public policy engagement.<sup>48</sup>

Voluntary codes/initiatives are an integral part of advancing the frontrunners and scaling up ESG integration. Some 60 leading insurers, insurance market bodies and international organisations representing 20% of the global insurance market have embraced six principles to strengthen the insurance industry's resilience by addressing ESG issues, including climate change and environmental degradation, under the UNEP FI Principles for Sustainable Insurance. Investment owners and asset managers which represent combined assets of US\$59 trillion have signed the UN-supported Principles for Responsible Investment (PRI) which promotes ESG integration – taking account of ESG data and information in investment research and decision-making processes. The PRI's 2015 Report on Progress by PRI signatories found that systematic integration of issues from across the ESG spectrum into company valuation is rare, and few managers are documenting how ESG considerations have affected decisions. There is strong growth in responsible investment activity in fixed income. UNEP FI is developing a methodology for Environmental Risk Integration in Sovereign Credit Analysis (E-RISC) to assess the materiality of natural resource related risks in the context of sovereign credit risk.<sup>49</sup>

## Top level service provider assessment statistics

More than 190 PRI signatories are professional service providers, many of which provide research to institutional investors and banks. They are a potential source of natural capital datasets and expertise to integrate their application across banking and investment processes to enhance the financial risk management and unveil enhanced risk reduction opportunities if sophisticated methods are used (Hoepner, 2013). Natural capital datasets can be used to assess the performance of companies and sectors, to evaluate potential financial risks in specific industries with significant impacts and dependencies on natural capital. Sociovestix Labs/ICMA Centre therefore assessed the current state of play and the capabilities of 66 service providers to offer relevant natural capital data, modelling skills and other services to financial institutions. The aim was to understand the capacities of 66 research providers and consultancies to provide natural capital-related services to both banking and investment institutions. The full list of organisations considered can be found in Appendix 3: Research Providers Evaluated.

Twenty-six of the 66 organisations had detailed natural capital related methodologies on their website or provided them upon request during the consultation process. In order to differentiate between the current methodologies used, a comprehensive in-depth assessment of the 26 organisations was conducted during the research process to confirm their natural capital capability profiles. Ten criteria were selected, based on a literature review as well as the team's experience in designing assessment methodologies (Hoepner, 2013; Novethic, 2013; SustainAbility, 2013), to assess the capabilities of research providers (see box).

---

45. [http://2xjmlj8428u1a2k5o3411m71.wpengine.netdna-cdn.com/wp-content/uploads/2014\\_report\\_on\\_progress.pdf](http://2xjmlj8428u1a2k5o3411m71.wpengine.netdna-cdn.com/wp-content/uploads/2014_report_on_progress.pdf)

46. <http://www.unepfi.org/publications/investment/>

47. UNEP FI, 2009, Fiduciary responsibility – Legal and practical aspects of integrating environmental, social and governance issues into institutional investment

48. UNEP FI/PRI, 2015, Fiduciary Duty in the 21<sup>st</sup> Century

49. [http://www.unepfi.org/fileadmin/documents/ERISC\\_Phase\\_1.pdf](http://www.unepfi.org/fileadmin/documents/ERISC_Phase_1.pdf)

## Assessment criteria for research providers

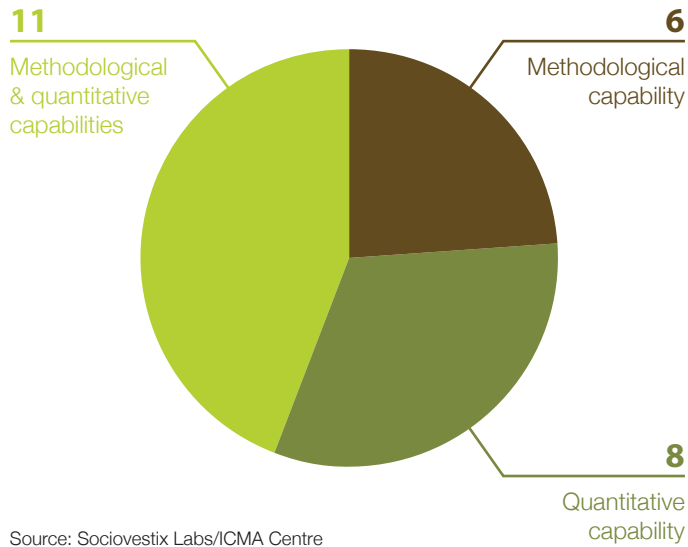
1. Quality of underlying research processes underpinning the research provider methodology (number of companies researched / year number of analysts & ability to continuously monitor companies and sectors on a continuous basis)
2.
  - Accuracy in the conceptual definitions for natural capital.
  - Breadth, depth and originality of methodology and natural capital risk output indicators.
3. Adaptability of methods for both the banking and investment sectors.
4. Breadth, depth and originality of datasets used as inputs for methodology (usage of sectoral specific datasets, usage of cross-country datasets and usage of both public and private datasets).
5. Data quality issues in methodology (robustness of data quality assurance processes & precision of alignment between conceptual definitions and data collected to proxy for these definitions).
6. Methodological approach to disclosure biases and non-disclosure patterns of companies.
7. Ability of methodology to demonstrate financial materiality.
8. Adaptability of methodology to specific issues (adaptability of methodology to sector specific issues, adaptability of methodology to country specific issues and ability to identify different impact time frames).
9. Scalability of methodological approach (scalability across investments/lending decisions, scalability across asset classes & scalability along expanding definitions of natural capital).
10. Resource effectiveness of methodological approach.

## Overview of natural capital data, modelling and other services from service providers

The assessment of the 26 service providers provides a representative part of the financial services industry capability to provide natural capital risk related products and services. Findings include:

- Ten organisations that had detailed methodologies available publicly and displayed both methodological and quantitative capabilities related to natural capital. Out of the 26 organisations, only 12 (circa 46%) have a definition or acknowledge the notion of natural capital on their websites or methodological materials. This illustrates the relatively recent emergence of natural capital as a theme in the financial sector, although many of the providers consider relevant indicators such as water risks, biodiversity etc.
- 8 of the 26 organisations evaluated have quantitative capabilities (including maintaining and collecting natural capital related datasets), while 6 have capabilities to provide inputs into methodological developments related to natural capital risks.

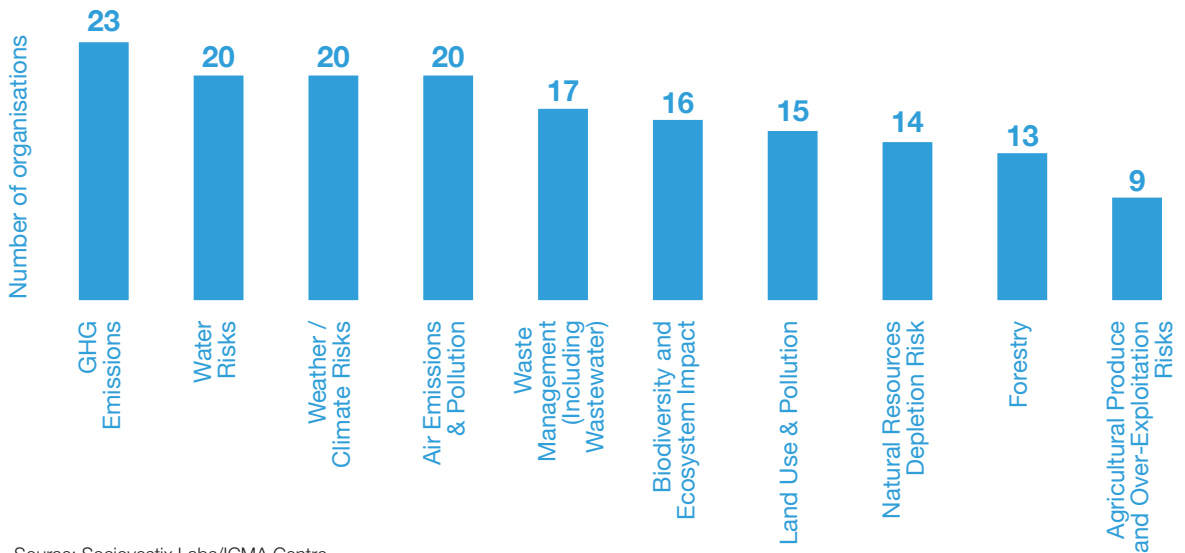
Figure 11: Natural capital capabilities among the 26 organisations evaluated



Source: Sociovestix Labs/ICMA Centre

The most common indicators on which research providers and consultants focus on are: GHG emissions, water risks, climate risks and air pollution. At the other end of the spectrum, fewer methodologies focus on indicators such as agricultural produce and over-exploitation risks, forestry and land use and pollution. This is despite the significant contribution of land-use change to ecosystem loss and GHG emissions, and the agriculture sector’s dependence on natural capital and climate security to maintain productivity. One reason for this could be that these indicators require more sophisticated analytical tools and datasets such as GIS tools, and traditional ESG rating providers are yet to fully incorporate these in their research processes.

Figure 12: Identified capability among the 26 organisations by top level natural capital indicator



Source: Sociovestix Labs/ICMA Centre

The survey results and evaluation of research providers will inform the implementation of the project to map natural capital risks and integrate relevant factors into credit risk assessments and valuations. Understanding portfolio exposure to natural capital risk requires knowledge of how companies and sectors are exposed to material financial impacts from natural resource depletion and degradation. Isolating, and quantifying and analysing the contribution of natural capital to economic activity has been difficult, mainly due to limited data and lack of consistent methodologies (HSBC, 2013). A survey conducted by Schroders (2013) with the chief economists of six of the largest investment banks revealed that there are numerous shortcomings in existing economic modelling tools and their readiness to incorporate natural capital considerations. There is a lack of conceptual models and data able to link financial systems and instruments to ecosystem change.<sup>50</sup> Most models used for financial analysis are yet to systematically factor in the scale and variation in exposure to natural capital risks across commodities, sectors, companies and geographies. Strategies are still nascent to integrate renewable natural capital within financial models. Demand is increasing for new ways to advance technical capabilities to evaluate exposure to natural capital risk in portfolios.

---

50. Galaz, V. et al, Why Ecologists Should Care about Financial Markets, Trends in Ecology & Evolution, Volume 30, Issue 10, October 2015, pp 571-580

# PART 3: FRAMEWORK FOR METHODOLOGICAL DEVELOPMENT

The NCD project ‘Advancing Environmental Risk Management’ to strengthen the financial sector’s capabilities to evaluate natural resource use and impacts linked to loans and investments aims to raise the bar in quantifying the financial implications of physical resource constraints and environmental pressures. The aim is to develop common practical frameworks, methodologies and tools to provide a systematic approach to monitor and integrate natural capital factors into credit and investment risk assessments. This would provide the means to strengthen resilience and accelerate sustainable lending and investment. The NCD has developed a work programme to integrate natural capital considerations directly in credit risk analysis to strengthen processes and risk modelling to capture exposure to natural capital-related financial risks. Regular briefings will be produced during the project’s implementation to help engage financial institutions and other stakeholders in research, insights and methodological developments. The NCD’s approach to implementing the project includes:

- 1. Examining the relationship between natural capital indicators and downside risk.** The project will build on many studies that find that firms with better ESG ratings have lower firm-specific risk (Bouslah, Kryzanowski, & M’Zali, 2013). Causal links have been made between eco-efficiency, ESG or sustainability factors and investment returns (Hoepner, Yu & Ferguson, 2010; Eccles, Ioannou, & Serafeim, 2013; Kempf & Osthoff, 2007; Statman, 2008). A study by Deutsche Bank (2012)<sup>51</sup> found correlations between ESG factors and risk-adjusted returns. It found that environmental factors “demonstrated strong correlation to reduced cost of debt and equity capital”, and this is expected to increase as recognition grows of the materiality of environmental concerns. Further evidence is needed on the causal relationship using direct (i.e. raw) natural capital indicator data – rather than corporate environmental responsibility ratings – and downside risk.

A general approach to assessing creditworthiness is credit scoring, which takes account of the potential effects of adverse events and economic conditions that could put creditors’ returns at risk. Research to develop methodologies under the project will propose options to integrate natural capital factors building on existing approaches to integrate ESG factors into corporate credit risk, provide opinions on relative credit risk, and downgrades when rating agencies lower the rating on a company or bond. Ratings take account of indicators such as GHG emissions where relevant to company and industry “event” risk to the ability of companies to pay dividends and repay debt obligations on time, with risks such as failure to anticipate shifts in the company’s markets, rising raw materials costs and regulations (see box).

---

51. Deutsche Bank, Sustainable Investing: Establishing Long-term Value and Performance, 2012

## How rating agencies view environmental risk

Standard and Poor's (S&P) analyses environmental and climate risk factors, including those related to issues such as water scarcity, in its corporate ratings methodology across all sectors. S&P assesses the relationship between cash flows and financial obligations, with criteria using cash flow/leverage analysis to determine a corporate issuer's financial risk profile assessment.<sup>52</sup> Business risks evaluated include peer group comparisons of profitability, as well as financial risk such as cash flow adequacy, liquidity and margin stability – the average percentage change in profit margins. The assessment can take account of environmental liabilities that could affect competitive positioning.

Moody's ratings and research of issuers and sectors consider ESG risks such as carbon factors with material credit implications when they could affect the probability of default of a debt issuer or expected credit loss in the event of default.<sup>53</sup> Moody's assesses the impact of environmental risk on credit quality and ratings by considering environmental risk in two categories: Adverse effects of direct environmental hazards, such as pollution, drought or severe natural or man-made disasters; and regulatory and other policy initiatives that seek to mitigate or prevent direct environmental hazards or perceived hazards.

Research will be conducted into the potential impact of natural capital on the cash flows of companies in specific industries, as well as their profitability, loan repayment abilities and collateral. Assets may become 'stranded' due to unanticipated or premature write-downs. Lower than anticipated cash flows would require adjustments to financial risk indicators used to predict credit risk, including return on assets (ROA), debt to earnings and interest coverage. Barriers included limited transparency on the effects of natural capital factors on business performance, such as lower productivity and increased expenditure, liabilities or write-downs. Forward-looking information on exposure to rising natural capital costs is missing in corporate disclosures and therefore of limited consideration in environmental risk assessments across portfolio companies. This makes dependence on modelling the relationship a likely option to identify causal links between natural capital constraints causes financial risk.

- 2. Recalibrating credit and investment risk modelling to assess natural capital risk.** Methodologies and tools that can be used to link natural capital risk and financial risk will need to consider changes in natural capital themes such as land use and water availability over different time scales through scenario modelling. They will need to take account of variations in scale and time horizons across different indicators, with some economic risks internalised relatively rapidly in certain locations and sectors, and others accumulated over the longer term. The approach will aim to estimate financial implications under a range of scenarios and probability levels. Methodologies will attempt to incorporate leading indicators from datasets such as projected land use change to forecast future risk for water-or land-intensive companies/sectors to inform risk modelling/materiality assessments. Approaches such as stress testing/sensitivity analysis will be applied to develop methodologies to calibrate risk assessments for the potential effects of natural capital depletion on business performance.
- 3. Incorporating science-based information and environmental expertise.** A systematic, evidence-based approach will be used to take account of geospatial data and relevant information on earth sciences focusing on indicators such as biodiversity loss, global freshwater use and land-use change – three of the quantifiable planetary boundaries. Implementation will seek to apply emerging datasets and analytics to inform monitoring of exposure to global trends in natural resources and pollution through companies in loan books and investment portfolios. Challenges will

52. Standard & Poor's Ratings Services, McGraw Hill Financial, RatingsDirect, Corporate Methodology, 2013  
53. Moody's Approach to Assessing ESG Risks in Ratings and Research, September 2015

include reconciling country and sub-national geographical information with corporate information. Connecting corporate dependence and impacts on natural capital to financial performance can provide a framework to evaluate how changes in natural systems translate into a changing resource base for business to identify potentially material issues and sectors to focus on. The project will seek to put corporate resource use and impacts into the context of resource constraints and the state of the environment using information from geographic information systems and remote sensing to evaluate exposure to spatially-explicit risk.

The NCD will explore the potential to harness statistical data on biodiversity and ecosystems, environmental economics and natural assets. Incorporating data from national natural capital accounts where available could improve the efficiency of information to strengthen the functioning of capital markets and natural resource resilience.

- 4. Transferring technical advances on climate risk assessments to other areas of natural capital.** At a time when financial institutions are starting to consider carbon risks embedded in portfolios, other natural capital factors are a logical next step to address broader natural resource constraints and related financial risk. GHG emissions are the first natural capital indicator to be quantified in investment portfolios (see box).<sup>54,55</sup> Lessons learned from efforts to understand potential financial risks from changing conditions such as constraints on GHG emissions and exposure to climate change impacts can be transferred to natural capital indicators such as water use and deforestation impacts.

The Financial Stability Board, the G20-backed international body chaired by Bank of England Governor Mark Carney, recommended in November 2015 that the G20 support the establishment of a climate disclosure task force.<sup>56</sup> The Bank of England has identified three broad channels through which climate change can affect financial stability:<sup>57</sup>

- Physical risks: The impacts on liabilities and the value of financial assets;
- Liability risks: The impacts that could arise if parties who suffer loss or damage seek compensation from those they hold responsible.
- Transition risks: The financial risks which could result from the process of adjustment towards a more sustainable economy.

The speed at which changes in policy, technology and physical risks could prompt re-pricing of assets is uncertain and could determine impacts on financial stability.<sup>58</sup> The Bank also identified an upward trend in indirect losses arising through second-order events such as disruption of global supply chains. It notes that the insurance industry recognizes that the tail risks of today may signal the more volatile norms of the future if business continues as usual.

The NCD project will explore whether similar mechanisms can be modelled to understand how changes in natural capital, such as a declining natural resource base and a degraded environment, can affect credit risk and asset values. The project will share knowledge across fields such as insurance/reinsurance and stress testing portfolios in the financial system. For instance, testing the application of approaches in the insurance industry to strengthen risk monitoring and management. Empirical studies may be undertaken to provide insights into links between natural capital risks and lending and investment decisions.

---

54. [http://www.unepfi.org/fileadmin/documents/UNEP\\_FI\\_Investor\\_Briefing\\_Portfolio\\_Carbon.pdf](http://www.unepfi.org/fileadmin/documents/UNEP_FI_Investor_Briefing_Portfolio_Carbon.pdf)

55. <http://www.ghgprotocol.org/>

56. <http://www.financialstabilityboard.org/wp-content/uploads/FSB-Chairs-letter-to-G20-Leaders-9-Nov.pdf>

57. <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/844.aspx>

58. <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/844.aspx>



## Advances on carbon risk

A study by Mercer investment consultants identifies climate change as a “new return variable” and warns that a 4 degree scenario could hit emerging market equities, real estate, timber and agriculture. It calls for risk assessments by institutional investors at the portfolio level.<sup>59</sup>

UNEP FI and the World Resources Institute have developed A Carbon Asset Risk Discussion Framework<sup>60</sup> that aims to help banks and investors systematically identify, assess and manage carbon asset risk. The framework focuses on policy, market and technology risks associated with carbon and climate change, rather than physical climate risks.<sup>61</sup> Policy implementation will be framed by an international agreement under the UN Framework Convention on Climate Change (UNFCCC), to be reached at the 21<sup>st</sup> session of the Conference of the Parties (COP 21) in December 2015 to agree crucial new targets for all countries to mitigate GHG emissions from 2020 to 2025-30.

The Discussion Framework highlights financial regulatory frameworks and voluntary action that could impact decision-making on carbon assets. These include two initiatives launched in 2014 to step up investor action by the time of the COP 21. The multi-stakeholder Portfolio Decarbonization Coalition, coordinated by UNEP FI,<sup>62</sup> set goals to mainstream measurement and disclosure of institutional investors' carbon exposure (or 'footprint'), and to decarbonize at least USD 100 billion of combined institutional equity investment by December 2015. The PRI is coordinating the Montreal Carbon Pledge, with a goal of attracting US\$3 trillion of institutional investor commitments to measure and publicly disclose the carbon footprints of investment portfolios annually.

### 5. Integrating approaches from a range of methodologies, models, tools and datasets:

The research phase will investigate available tools and approaches that could inform the development of the methodologies to map and integrate natural capital risks and evaluate corporate resource use and environmental performance. Socioinvest has put together a list of relevant tools and datasets related to natural capital as potential sources of insightful data and methods which can be leveraged to build a holistic natural capital risk methodology. This draws on research by BSR's Ecosystem Services Working Group<sup>63</sup> and the underlying datasets used in the InVEST software developed by the Natural Capital Project (BSR, 2014a; Natural Capital Project, 2014). The tool developers have used similar analytical approaches to quantifying natural capital impacts (BSR, 2014a). Further evaluation will be conducted into relevant tools and datasets collected in the research process, to ensure alignment with the type of natural capital methodologies that the NCD project will choose to go forward with.

The approach will include a focus on indicators included in the GRI G4 Sustainability Reporting Guidelines, which many companies adhere to. This can build on emerging capabilities among research providers, consultants, ESG teams and credit risk specialists. The potential for private sector application of outcomes of public sector initiatives on environmental economics, such as the World Bank's WAVES programme, the inter-governmental initiative led by the World Bank to account for natural capital at a national level, will be evaluated. The project will incorporate knowledge emerging from related projects, such as the UNEP FI project “Environmental Risk Integration in Sovereign Credit” (E-RISC).

59. Mercer, Investing in a Time of Climate Change, 2015  
60. [http://www.unepfi.org/fileadmin/documents/carbon\\_asset\\_risk.pdf](http://www.unepfi.org/fileadmin/documents/carbon_asset_risk.pdf)  
61. <http://www.ghgprotocol.org/files/ghgp/Chapter15.pdf>  
62. <http://www.unepfi.org/fileadmin/documents/PortfolioDecarbonizationCoalition.pdf>  
63. BSR, Analytical Tools for Assessing Business Impacts & Dependencies Upon Ecosystem Services, 2014

The project will explore options to build on first-cut NCD tools and models released or in development to integrate natural capital data into financial analysis. Existing tools are available as open resources online and include:

- Water Risk Valuation Tool (WRVT) to evaluate the implications of water stress for equities valuations in the mining sector.<sup>64</sup> This practical tool was created through a collaboration between Bloomberg LP and the NCD, with support from Bloomberg Philanthropies. The WRVT illustrates how water risk can be incorporated into company valuation in the mining sector using familiar financial modelling techniques.
- Corporate Bonds Water Credit Risk Tool to quantify and integrate water stress into corporate bond credit analysis in water-intensive industries, such as mining, power and beverages industries. Finance professionals can use the tool to quantify the potential impact of water stress on creditworthiness and benchmark companies and their assets on exposure to water stress.<sup>65</sup> Seven financial institutions tested the tool and took part in its development: Bancolombia, Banorte, Calvert Investments, Pax World, Robeco, J Safra Sarasin and UBS AG. The tool was co-developed with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the German Association for Environmental Management and Sustainability in Financial Institutions (VfU), funded by the German Federal Ministry for Economic Cooperation and Development (BMZ). It is also available in Chinese and uptake is supported by service providers including Maplecroft, Syntao and Trucost.

**6. Financial institutions contributing to developing the international NCD methodology to map natural capital risks across portfolios and embedding them in credit risk assessment.** Financial institutions participating in this project will have a unique opportunity to lead innovation in what will transform the way the financial sector assesses and manages environmental risks and makes investment decisions. Banks and fund managers may inform prototype approaches for international peer-reviewed methodologies to map portfolio risks and integrate natural capital factors into credit risk assessments.

---

64. <http://www.bloomberg.com/bcause/new-tool-integrates-water-risk-considerations-in-equity-valuation-process>  
65. <http://www.naturalcapitaldeclaration.org/bonds-water-scarcity/>

## How banks and fund managers can participate in the NCD project to map and embed natural capital risk

The financial sector has an opportunity to collaborate to address portfolio risks from exposure to environmental challenges such as depleting stocks of natural resources and increasing pollution loads.<sup>66</sup> Financial institutions can participate in the project to inform the development of methodologies to strengthen integration of natural capital indicators within credit and investment risk assessments. Banks, institutional investors and insurers can select their level of involvement in the methodology development, depending on their capacity to provide input and test approaches. There are three options to participate, with different levels of commitment of time and resources to provide flexibility:

### **Level 1: Become a full Project Partner to participate in project research & development and test draft methodologies/tools in relevant selected asset classes.**

Collaborate fully and engage relevant experts internally to build capacity within relevant departments. Project Partners will have a unique opportunity to lead innovation in approaches to help transform the way the financial sector assesses and manages environmental risks and makes investment decisions. Project Partners will provide inputs and feedback and, as well as share aggregated results and learning from methodology testing to enable global knowledge creation and gain insight into their portfolio resilience to natural capital risks.

### **Level 2: Join a formal Technical Advisory Panel to provide input into needs analysis and methodology and tool development.**

Nominations for Financial Institution participants will be put forward to Project Partners and selected by the project team in 2015/16. Contribute to the project at key stages and enable methodology developments to take account of existing approaches, systems and priorities to ensure the project outcomes reflect needs, and enables two-way learning and knowledge sharing.

### **Level 3: Join a stakeholder group to be updated and consulted on methodology developments.**

Broad stakeholder engagement for consultation on interim reports and draft outputs. This will build awareness and preparedness for uptake of the methodologies in the medium to long-term.

66. European Environment Agency, 2012, Global Megatrends assessment, State of Environment and Outlook Report 2010

## Expected inputs from NCD financial institutions as Project Partners

Financial institutions participating as Project Partners will:

- Drive the selection of asset classes for which methodologies are developed.
- Communicate expectations and outputs internally within their institutions and engage relevant internal departments and experts (e.g. credit risk teams).
- Provide adequate human resources/ time/ expertise to participate in selecting service providers /knowledge centres that will be tasked with producing the key project deliverables and provide guidance for their work.
- Provide inputs and feedback at every stage and collaborate to develop the relevant methodologies.
- Test the application of methodologies on a subset of portfolios, with the option to focus on specific sectors, natural capital indicators and geographies based on priorities. Test results and/ or lessons learned will be shared (as appropriate) to shape the project outputs.

The actual application of these approaches and methodologies to the operations of each participating financial institution depends on the decisions taken internally by each institution and is, therefore, outside the scope of the pilot project. To find out more about taking part, contact [secretariat@naturalcapitaldeclaration.org](mailto:secretariat@naturalcapitaldeclaration.org)

- 7. Combining a global as well as country and/or region-specific approach.** Specific countries such as Colombia, Peru, South Africa and Indonesia will be covered in more detail due to the exposure of project partners, better information, more significant risks and opportunities, or as recommended by donors. The methodology will be developed for application by banks and investors globally, but testing of its applications by financial institutions may use resources most efficiently by focusing on certain sector/region pairs that are likely to be more exposed than others to natural capital impacts and dependencies and more relevant to lending and investment portfolios.

The global approach is to engage banks and institutional investors to develop a more systematic approach to incorporating natural capital considerations into their operations, products and services. The country-focused approach will enable close engagement of leading financial institutions in specific economic and environmental contexts and ensure that considerations of natural capital may also be applied in more detail at a localised scale, where more granular information is available. In Colombia, the NCD will explore the technical feasibility of bringing information from the public sector through initiatives such as the World Bank's WAVES programme into financial information systems.

It is envisaged that more in-depth country-level information will be incorporated into the analysis where feasible in these countries, as well as other countries that are focal areas for project partners to bring additional value to the project in areas including expanding outreach and engagement; incorporating local knowledge /data; raising awareness and direct and practical lessons learned at a national level.

## Outline of the project work programme

The work programme for the project to develop methodologies to map natural capital risks across portfolios and integrate into credit risk assessments was developed together with the seven financial institutions participating in the project, with input from NCD supporters and other experts. Existing Project Partners have provided inputs into project design and have committed to participating in R&D and testing during the project's implementation. The NCD Steering Committee approved the project plan for implementation in 2013.

The NCD will establish a knowledge consortium which can assist with building natural capital risk methodologies through expertise in areas including natural capital data analytics and credit risk. The consortium will be constructed to bring natural resource and environmental specialists, geospatial data/statistics, environmental economics and credit risk specialists together to catalyse innovation in advancing environmental risk management. This will include delivery partners and a project Technical Advisory Panel to provide independent technical guidance, inputs, and feedback on project outputs. The proposed process to implement the project is highlighted below.

### ***Governance and Management***

The NCD Secretariat plays an active role in project design, fundraising, management, implementation, consolidation of project results, publishing and disseminating the outcomes. Third-party service providers/academia/consultants will be engaged at various stages to help deliver concrete outputs.

### ***Project Partners***

Two work streams (banks and investors) will be established to enable the development of customised approaches for different asset classes.

Work stream 1: Commercial banks and development finance institutions

Work stream 2: Institutional Investors

### ***Estimated period for implementation***

The project will be implemented over 2.5 years from November 2015-2018 – including allowing time for project start-up and the dissemination of outputs.

### ***Project structure***

The project consists of two inter-connected phases that support the objectives of NCD Working Groups 1 (understanding) and 2 (integrating into financial products & services). Financial institutions that chair these groups will help oversee implementation.

**Phase 1 (Working Group 1, Understanding)** will develop and test a methodology for mapping of risks associated with natural capital impacts and dependencies across Fls' portfolios.

**Phase 2 (Working Group 2, Embedding)** will develop methodologies and guidance to embed natural capital considerations into credit and investment risk assessments.

### ***Core outcomes***

#### **Phase 1**

Financial institutions are now more aware of the materiality of natural capital risks they are or may be exposed to in their loans and investments – as a result of natural capital impacts and dependencies of their customers/investee companies – and have adequate tools to understand and assess these risks.

#### **Phase 2**

Financial institutions understand how the natural capital performance of customers/investee companies translates into credit risk. Financial institutions have access to approaches and methodologies to embed natural capital parameters into credit risk assessments.

This scoping study represents component 1 of Phase 1 in the Figure 13 on page 46.

Figure 13: Key project objectives, components and outputs

**OBJECTIVES:**

(1) Provide tested methodologies and approaches for identifying natural capital risks for Financial Institutions; (2) Develop evidence-supported business case for natural capital as a material risk for Financial Institutions; (3) Develop approaches to embed natural capital considerations into credit risk assessment and suggest practical ways to design risk-adjusted premiums for well-performing customers / investee companies.

**OUTCOME 1**

(Phase 1-Working Group 1): Financial institutions are more aware of the materiality of natural capital risks for their loans and investments – as a result of natural capital impacts and dependencies of their customers/investee companies – and have adequate tools to understand and assess these risks.

**COMPONENT 1:**

Scoping study on current approaches for FIs to understand and assess natural capital risks in portfolios.

**OUTPUT 1:**

Scoping study report.

**COMPONENT 2:**

Development of a shared approach and methodology for natural capital risk mapping in FIs' portfolios.

**OUTPUT 2:**

Draft methodology ready for testing by participating FIs.

**COMPONENT 3:**

Testing of the shared methodology by participating financial institutions.

**OUTPUT 3:**

Mapping of risks associated with impacts and dependencies across asset classes and industries of priority for participating FIs. Confidential report for participating FIs.

**COMPONENT 4:**

Sharing, aggregating, and analysing outcomes of the mapping exercise, including building the business case for materiality of natural capital risks for FIs.

**OUTPUT 4:**

Interim note on lessons learned and the business case for why customers'/investee companies' impacts and dependencies are a risk for financial institutions.

**COMPONENT 5:**

Development of final natural capital risk mapping methodology for FIs.

**OUTPUT 5:**

Final methodology (methodology document and consultation/ peer review).

**COMPONENT 6:**

Aggregation of results into a final output (report).

**OUTPUT 6:**

Publication on mapping impacts and dependencies including the methodology, guidance, business case, case studies, and lessons learned.

**OUTCOME 2 (PHASE 2 - WORKING GROUP 2):**

(a) Financial institutions understand how key natural capital performance translates into credit risk; (b) financial institutions have access to approaches and methodologies to embed natural capital parameters into credit risk assessment, as well as to create risk-adjusted premiums (performance-based cost of capital for investees).

**COMPONENT 1:**

Scoping study and feasibility assessment based on existing approaches and practices for embedding natural capital considerations in investment risk analysis for different asset classes.

**OUTPUT 1:**

Note / short interim report on existing approaches / best practices.

**COMPONENT 2:**

Linking natural capital risks to credit / investment risk: Development of a framework of core indicators for natural capital risk tailored to financial institutions and estimating their impact on credit risk.

**OUTPUT 2:**

A system of indicators and corresponding industry-asset class-geographic benchmarks with demonstrable links to credit risk impacts.

**COMPONENT 3:**

Analyzing current credit risk assessment models by asset class; developing initial approach, recommendations, and guidance to embed natural capital considerations in credit risk assessment process; optional testing by participating FIs.

**OUTPUT 3:**

Interim note for discussion by participating FIs with results of the analysis and a preliminary approach accompanied by a set of recommendations and guidance.

**COMPONENT 4:**

Development of the final methodology to embed natural capital considerations into credit risk assessment, with potential recommendation to design risk-adjusted premiums for customers/investee companies.

**OUTPUT 4:**

Final methodology and recommendations/ guidance

**OUTPUT 5:**

Final report, including existing approaches and the newly developed common methodology and recommendations.

**CROSS-CUTTING ACTIVITIES:**

Project management, dissemination of results (e.g. at workshops, conferences, through consultations, discussion papers), peer reviews by NCD Advisory Network and other stakeholders.

# APPENDICES

## APPENDIX 1: CASE STUDIES – SECTOR-SPECIFIC NATURAL CAPITAL IMPACTS AND DEPENDENCIES

Since natural capital risks impacting companies' cash flows are industry specific, business impacts and dependencies on natural capital are highlighted in the following sectors: Forestry and Paper Food Production, Electric Utilities and Mining.

### **Case study 1: Forestry and Paper sectors**

The main risks and impacts associated with timber, paper and pulp production are related to land use change leading to carbon dioxide emissions from deforestation and degradation, the loss of biodiversity, impacts on the hydrological cycle, and displacement of local and indigenous communities (WWF, 2012). Global tropical deforestation rates amount to 13 million hectares per year. Timber logging is the second largest driver of deforestation (10%) globally and in Latin America and South East Asia it is the largest driver of forest degradation (70%). Forest conversion for timber or pulp and paper is often used as a measure to fund other agricultural developments, such as palm oil.

The latest Intergovernmental Panel on Climate Change 5th Assessment Report estimates that emissions from the forestry and land use sector accounts for 10-15% of global GHG emissions. Deforestation and forest degradation is second largest sector source of emissions, after fossil fuel combustion.

Risks to Forestry and Paper companies that do not manage these impacts adequately include loss of license to operate or changes in license conditions, fines and penalties, loss of market share and competitive advantage, a depleted asset base and capital constraints. For instance, over 100 customers of Asia Pulp and Paper (APP) stopped buying paper and packaging from the world's biggest pulp and paper company following a three-year campaign by the non-governmental organization Greenpeace which raised awareness of concerns about its supplier's rainforest deforestation in Indonesia. Two of the companies operating under the APP brand are PT Indah Kiat Pulp & Paper Tbk and PT. Pabrik Kertas Tjiwi Kimia Tbk. A drop in demand led to a 59% fall in Indah Kiat's operating income between 2010 and 2011 (Annual Report 2011). Tjiwi Kimia saw revenue decrease by 7.5% and operating income fall 22% between 2012 and 2013 (Annual Report, 2013). Tjiwi Kimia's decrease of cash and cash equivalents, trade receivables and current assets were the main cause of a decline in its liquidity, as its ratio of current assets to short-term liabilities dropped from 240.8% to 232.6% during the same period. In 2013, the company introduced a Forest Conservation Policy with an immediate moratorium on all further forest clearance by all of its Indonesian suppliers and a target to eliminate all natural forest derived products in its supply chain by 2020.

### **Case study 2: Electric Utilities**

Electric Utilities which generates, transmits and distributes electricity are highly exposed to natural capital risk due to a high sector dependence water resources, as well as on ecosystem services to absorb greenhouse gas emissions and air pollution impacts. The next 20 years is likely to see a significant increase in prices for fossil fuel-based power utilities to reflect the full cost of their production, including the cost of environmental impacts.

Electricity generation is water intensive and accounts for about 15% of global freshwater withdrawals and as much as 40% in developed countries (UNEP, 2013). Electric utilities use fresh water to cool thermal (coal, gas, nuclear) generation plants, drive steam turbines and run hydroelectric dams. In China the industrial sector consumes well over 80% of energy supply and nearly 45% of the country's GDP is produced in water scarce provinces (HSBC, 2012). Water scarcity is a real issue not just for power generation but also for the overall economy. China plans to add more than the total installed power capacity of the US, the UK and Australia by 2030. However, this does not match the availability of water resources and there is a real risk of national energy shortages due to increased water scarcity (*ibid*).

Drought has serious repercussions for power generation. For example, severe drought in the southeast US in 2007-2008 brought several power plants within days of being forced to shut down due to a lack of water for cooling, while drought in California in 2014 led to a significant decline in hydropower production (U.S. Energy Information Administration). In China's Yunnan Province, where 70% of electricity generation is hydropower, droughts in 2009 severely impacted the output of metal producers and lead and aluminium smelters in the region.

Electric power generation is also dependent on a relatively steady climate. The financial implications of damage to electric generation facilities due to increased temperatures and weather extremes can be considerable. For example, during the 2003 European heat wave, 17 nuclear reactors in France had to reduce power output because of the high temperatures of cooling water. Extreme weather events such as floods and storms, or rising sea levels can also have a significant impact on infrastructure such as generation, transmission, and distribution facilities and may result in stranded assets (UNEP, 2013). For example, the 2005 Hurricane Katrina in the US caused losses to one local utility company of over US\$ 1.5 billion in repair and restoration costs of 75,000 miles of transmission lines and distribution circuits and a relocation of headquarters (*ibid*).

Fossil-fuel based power generation also has impacts on ecosystems through emissions of GHGs and other air pollutants such as sulphur dioxide and nitrogen oxides. Based on the costs of damage to human health, crops and buildings, air pollution from power plants in 27 EU member states contributed up to €112 billion (US\$132 bn) in external costs from industrial emissions in Europe in 2009. Potentially significant negative effects on ecosystems include damage to soils and water quality. (UNECE, 2012).

### **Case study 3: Food Production**

Financial institutions are linked to land degradation, including deforestation, soil erosion and contamination, through direct financing of agribusinesses as well as financing of companies that buy goods such as soft commodities from primary producers. Agriculture has the largest global footprint on water use, land use and deforestation (WWF, 2012). It is also the largest user of chemicals and the greatest source of water pollution (Clay, 2011). According to the Global Environmental Outlook for Business study (Novethic, 2013; UNEP, 2013) the food and beverage sector is highly dependent on a range of ecosystem services. Changes to water provision, soil quality, the availability of phosphate and other nutrients and climate pose significant risks and opportunities to the sector. It is also closely tied to other sectors such as extractives and transport and is therefore exposed to rising energy costs, price volatility and disruption in these sectors. The financial implications of extreme losses of natural capital could double the value at risk in agricultural investments from current US\$ 6.3 trillion to US\$ 11.2 trillion, which could result in significant stranding of agricultural assets (Caldecott, 2013).

Agriculture is by far the most water dependent sector, making the food and beverage sector highly vulnerable to water scarcity. Water scarcity can significantly affect yields and supply, and thus input prices. Restricted access and supply is also likely to increase competition and potentially conflict with other users, such as local communities, and this represents an additional risk to operations in terms of reputational risk and potential loss of water rights.



In places like India this is particularly relevant where 10% of large farms consume 90% of groundwater resources.

Agriculture commodity shortages due to drought can lead to significant price volatility on the global market (Barton, 2010). Water shortages contributed to sharp rises in global food prices between 2005 and 2008, with knock-on effects on many Food Producers and Retailers' profit margins. In the US in early 2009, a state of emergency was declared in California as it entered its third year of drought with agricultural revenue losses estimated to reach almost USD 2 billion in 2015 (Howitt et al., 2015).

#### **Case study 4: Mining sector**

Water is a crucial input to all mining activities (International Council on Mining and Metals (ICMM), 2013). This high dependency presents the sector with a range of challenges. Any impact such as flooding, scarcity or pollution will have implications for efficiency, cost and operating licences. Water scarcity is more likely to be an issue in areas already under stress, or, where regulation could limit usage.

“A changing climate presents physical risks to mining and metals operations because these industries are often located in challenging geographies, rely on fixed assets with long lifetimes, involve global supply chains, manage climate-sensitive water and energy resources, and balance the interests of various stakeholders” (ICMM, 2013; Novethic, 2013).

The mining industry spent nearly \$10 billion on water in 2013, up from \$12 billion in 2012, according to Global Water Intelligence (Financial Times, 14 July 2014). The 2012 CDP water information request revealed that almost 64% of mining sector respondents had experienced detrimental water-related business impacts in the previous five years, with water stress being the primary cause, followed by flooding. Another internal bank study found that although companies recorded financial impacts in their annual reports, these seemed to be poorly understood and in general the approach to managing water risk was limited.

There are important linkages between energy and water inputs and the mining industry is particularly vulnerable to climate change and reduced capacity of conventional power facilities, also sensitive to climate change and resource scarcity. Shifts in seasonal precipitation patterns or earlier and more rapid glacier melt can affect river flow and hydroelectric power production – a main source of energy for many mining operations – which will affect output and ability to operate (International Council on Mining and Metals (ICMM), 2013).

Concerns about water scarcity may spur stricter regulation. For example, in Chile a large copper mine was asked to reduce its water usage by more than half by regulators (Miranda, 2010). Water stress can result in conflict with local communities. Water related conflict is known to have caused severe disruptions of multi-billion dollar projects in developing countries in the past. The risk of losing license to operate is particularly high in relation to competing water usage, and, in relation to pollution risks.

Pollution of water sources could cause significant fiscal and reputational risk. Mining requires high amounts of water and chemicals that are used to separate the mineral from the ore body. The potential contamination of ground water supplies and soils carries high costs resulting from clean-up and long-term reclamation liabilities, fines, and penalties. Social and environmental impacts can lead to losses due to damaged reputation. A good example is the divestment of large scale pension funds such as the Norwegian pension fund from mining companies Freeport McMoran and Rio Tinto (as a result of a joint venture with Freeport McMoran) in Indonesia (Malkenes and Lande 2006) This often leads to further divestment by other funds (e.g. Sweden and New Zealand State pension funds followed the Norwegian example).

## APPENDIX 2: RESEARCH PROVIDERS EVALUATED

### Company name and type

AccountAbility	Consultancy
AMEE	Specialised Research Provider
Bloomberg LP	Non-Financial Data Provider
CAER	Regional Research Provider
CAMRADATA Analytical Services	Specialised Research Provider
Carbon Tracker Initiative	Specialised Research Provider
CDP	International Rating Agency
Climate Counts	Specialised Research Provider
Compagnie Benjamin de Rothschild (CBR)	Consultancy
Cornerstone Capital Group	Consultancy
Corporate Knights Capital	Specialised Research Provider
COVALENCE	Regional Research Provider
CRD Analytics	Regional Research Provider
CSR Hub	International Rating Agency
Deloitte	Consultancy
Didas Research	Specialised Research Provider
Earth Security Initiative	Regional Research Provider
Ecosystem Return	Consultancy
EcoVadis	Specialised Research Provider
ECPI	Regional Research Provider
EIRIS	International Rating Agency
Emerging Markets ESG	Consultancy
Environmental Investment Organization	Specialised Research Provider
ERM	Consultancy
Ethibel	Consultancy
Ethical Screening	Regional Research Provider
EthiFinance	Specialised Research Provider
Ethikos	Regional Research Provider
Ethix	Specialised Research Provider
Ethos - Swiss Foundation for Sustainable Development	Local Agency
EY (formerly Ernst & Young)	Consultancy
Fitch	International Rating Agency
FTSE	International Rating Agency
GES	Specialised Research Provider
GMI Ratings (acquired by MSCI)	International Rating Agency
Greeneye	Regional Research Provider
GRESB	Specialist
INRATE	International Rating Agency
KO-CSR	Regional Research Provider
KPMG	Consultancy
Maplecroft	Specialised Research Provider
McKinsey	Consultancy
Mirador	Consultancy
Moody's	International Rating Agency

MSCI ESG Research	International Rating Agency
Oekom Research	International Rating Agency
Oliver Wyman	Consultancy
Profundo	Consultancy
PwC Sustainability and Climate Change	Consultancy
Rep Risk	Non-Financial Data Provider
RobecoSAM / S&P Dow Jones	International Rating Agency
S&P Capital IQ / McGraw Hill Financial	International Rating Agency
Solability	Regional Research Provider
Solaron	Specialised Research Provider
SouthPole Group	Consultancy
SUST Invest	Regional Research Provider
SustainAbility	Consultancy
Sustainalytics	International Rating Agency
Syn Tao	Regional Research Provider
Thomson Reuters (Asset 4)	Non-Financial Data Provider
Tomorrow's Value Ratings	Consultancy
Triple-e Consulting	Consultancy
Trucost	Specialised Research Provider
TruPrice	Specialised Research Provider
Verdantix	Specialised Research Provider
Vigeo	International Rating Agency

## APPENDIX 3: BIBLIOGRAPHY

- 2030 Water Resource Group. (2012). Charting our Water Future
- ACCA; KPMG & FFI. (2012). Is natural capital a material issue?
- Anielski, M., Wilson, S.J. (2003). Counting Canada's natural capital: assessing the real value of Canada's boreal ecosystems: Canadian Boreal Initiative.
- AXXA IM. (2013). Sovereign Debt Investing: ESG Framework and Applications. Available upon request.
- Barton, B. (2010). Murky Waters? Corporate reporting on water risk. Report by Ceres.
- Berkes, F., & Folke, C. (1992). A systems perspective on the interrelations between natural, human-made and cultural capital. *Ecological Economics*, 5(1): 1-8.
- Bouslah, K., Kryzanowski, L., & M'Zali, B. (2013). The impact of the dimensions of social performance on firm risk. *Journal of Banking & Finance*, 37(4): 1258-1273.
- BSR. (2012). Trends in ESG Integration in Investments. [https://www.bsr.org/reports/BSR\\_Trends\\_in\\_ESG\\_Integration.pdf](https://www.bsr.org/reports/BSR_Trends_in_ESG_Integration.pdf), accessed 3 November 2015
- BSR. (2014a). Analytical Tools for Assessing Business Impacts & Dependencies Upon Ecosystem Services. [http://www.bsr.org/reports/BSR\\_Analytical\\_Tools\\_for\\_Ecosystem\\_Services\\_2014.pdf](http://www.bsr.org/reports/BSR_Analytical_Tools_for_Ecosystem_Services_2014.pdf).
- BSR. (2014b). Integrating Ecosystem Services into Investor Due Diligence & Corporate Management.

Caldecott, B., Howarth, N. and P. McSharry. (2013). Stranded assets in agriculture: protecting value from environment related risks. Oxford University - Smith School for Enterprise and the Environment.

Chava, S., Livdan, D., & Purnanandam, A. (2009). Do shareholder rights affect the cost of bank loans? *Review of Financial Studies*, 22(8), 2973-3004.

CIMA. (2014). Accounting for Natural Capital.

Clay, J. (2011). Freeze the footprint of food. *Nature*, 475(7356), 287-289. doi: 10.1038/475287a

Conservation Economy.Net. (2006). The Patterns of a Conservation Economy.

Costanza, R., Daly, H., Bartholomew, J. (1991). Goals, agenda and policy recommendations for ecological economics. In N. Y. *Ecological Economics: The Science and Management of Sustainability*. Columbia University Press, NY, pp. 1–15. (Ed.).

Eccles, R. G., Ioannou, I., & Serafeim, G. (2013). The impact of corporate sustainability on organizational processes and performance. *Management Science*.

Ekins, P., Simon, S., Deutsch, L., Folke, C., & De Groot, R. (2003). A framework for the practical application of the concepts of critical natural capital and strong sustainability. *Ecological Economics*, 44(2–3), 165-185.

F&C. (2004). Is biodiversity a material risk for companies?

FFI, A. K. (2013). Identifying natural capital risk and materiality.

GHG Protocol. (2011). Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

Gilpin, R. (2001). *The Challenge of Global Capitalism: The World Economy in the 21st Century*. Princeton, NJ: Princeton University Press, 2000. 373p. . *American Political Science Review*, 95(01), 257-258.

Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking & Finance*, 35(7), 1794-1810.

Government of Canada. (2007). Economic Concepts: Natural Capital.

GreenBiz. (2014). The State of Green Business. Available upon request.

Grossman, S. J., & Stiglitz, J. E. (1980). On the impossibility of informationally efficient markets. *The American economic review*, 393-408.

Hawken, P., Lovins, A. B., & Lovins, L. H. (1999). *Natural capitalism : creating the next industrial revolution* / Paul Hawken, Amory Lovins, and L. Hunter Lovins: London : Earthscan, [1999], ©1999.

Hoepner, A. (2013). ESG Investments – a breath of fresh air for the portfolio.

Hoepner, A. (2014). Returns with Responsibility - Nordea Interview. <https://www.youtube.com/watch?v=mbymtARu72Y&feature=youtu.be>.

Hoepner, A. G., Rezac, M., & Siegl, K. (2011). Does pension funds fiduciary duty prohibit the integration of environmental responsibility criteria in investment processes?: a realistic prudent investment test. A realistic prudent investment test. Retrieved May, 21, 2012.

Howitt, R. MacEwan, D., Medellín-Azuara, J., Lund, J. and Sumner, D. (2015). Economic Analysis of the 2015 Drought For California Agriculture [http://news.ucdavis.edu/search/news\\_detail.lasso?id=11281](http://news.ucdavis.edu/search/news_detail.lasso?id=11281)

HSBC. (2012). No water no power? Is there enough water to fuel China's power expansion?

HSBC. (2013). Natural Capital: Identifying implications for economies.

IFC; Grigoryeva. (2012). Natural Capital Valuation in the Private Sector: Overview of Trends and Key Initiatives

International Institute for Sustainable Development. (2008). The Natural Capital Approach.

International Council on Mining and Metals (ICMM). (2013). Adapting to changing climate: implications for the mining and metals industry.

Kempf, A., & Osthoff, P. (2007). The Effect of Socially Responsible Investing on Portfolio Performance. *European Financial Management*, 13(5), 908-922.

Liesen, A., Hoepner, A.G.F., Patten, D.M., Figge, F. (2014). Corporate Disclosure of Greenhouse Gas Emissions in the Context of Stakeholder Pressures: An Empirical Analysis of Reporting Activity and Completeness. Available at SSRN: <http://ssrn.com/abstract=2307876>

Malkenes, R. and Lande, A. (2006). Two companies - Wal-Mart and Freeport - are being excluded from the Norwegian Government Pension Fund – Global's investment universe <https://www.regjeringen.no/no/aktuelt/two-companies---wal-mart-and-freeport---/id104396/>

Mercer. (2011a). Climate Change Scenarios – Implications for Strategic Asset Allocation.

Mercer. (2011b). Responsible Investment's second decade: Summary report of the state of ESG integration, policy and reporting. <http://www.calpers.ca.gov/eip-docs/investments/video-center/view-video/mercer-report-second-decade.pdf>.

Mercer. (2015). Investing in a time of climate change.

Millennium Ecosystem Assessment (MEA). Ecosystems and Human Well-being: Opportunities and Challenges for Business and Industry.

Miranda, M. (2010). Mine the Gap. World Resources Institute. [http://pdf.wri.org/working\\_papers/mine\\_the\\_gap.pdf](http://pdf.wri.org/working_papers/mine_the_gap.pdf).

Nandy, M., & Lodh, S. (2012). Do banks value the eco-friendliness of firms in their corporate lending decision? Some empirical evidence. *International Review of Financial Analysis*, 25(0), 83-93.

Natural Capital Coalition. (2014). Towards a Harmonised Protocol.

Natural Capital Project. (2014). InVEST. <http://www.naturalcapitalproject.org/models/models.html>.

NCC;TEEB;Trucost. (2013). Natural Capital At Risk: The Top 100 Externalities of Business.

Novethic. (2013). Overview of ESG Rating Agencies. [http://www.novethic.com/fileadmin/user\\_upload/tx\\_ausynovethicetudes/pdf\\_complets/2013\\_overview\\_ESG\\_rating\\_agencies.pdf](http://www.novethic.com/fileadmin/user_upload/tx_ausynovethicetudes/pdf_complets/2013_overview_ESG_rating_agencies.pdf).

Olewiler, N. D. (2004). The Value of Natural Capital in Settled Areas of Canada: Ducks Unlimited Canada.


Oxford University - Smith School of Enterprise and the Environment. (2014). Financial Dynamics of the Environment: Risks, Impacts, and Barriers to Resilience. <http://www.smithschool.ox.ac.uk/research/stranded-assets/UNEP-SSEE%20Working%20Paper%20-%20Financial%20Dynamics%20of%20the%20Environment.pdf>.

Pearce, D. (1988). Economics, equity and sustainable development. *Futures*, 20(6), 598-605.

Porter, M. E., & Kramer, M. R. (2006). Strategy & Society: The Link Between Competitive Advantage and Corporate Social Responsibility. [Article]. *Harvard Business Review*, 84(12), 78-92.

Postel, S. (1996). Natural capital and human economic survival: Thomas Prugh, with Robert Costanza, John H. Cumberland, Herman Daly, Robert Goodland and Richard B. Norgaard, ISEE Press, Solomons Island, MD, USA, 1995, 198 pp. *Ecological Economics*, 19(2), 189.

UNEP Inquiry. (2015). The Financial System We Need: Aligning the Financial System with Sustainable Development



**For more information, contact:**

UNEP Finance Initiative  
15, Chemin des Anémones  
CH-1219 Chatelaine, Geneva  
Switzerland  
Tel: +41 (0) 22 917 8178  
Fax: +41 (0) 22 796 9240  
E-mail: [fi@unep.ch](mailto:fi@unep.ch)  
[www.unepfi.org](http://www.unepfi.org)

Global Canopy Programme  
23 Park End Street, Oxford  
OX1 1HU  
United Kingdom  
Tel: +44 (0) 1865 724333  
[www.globalcanopy.org](http://www.globalcanopy.org)