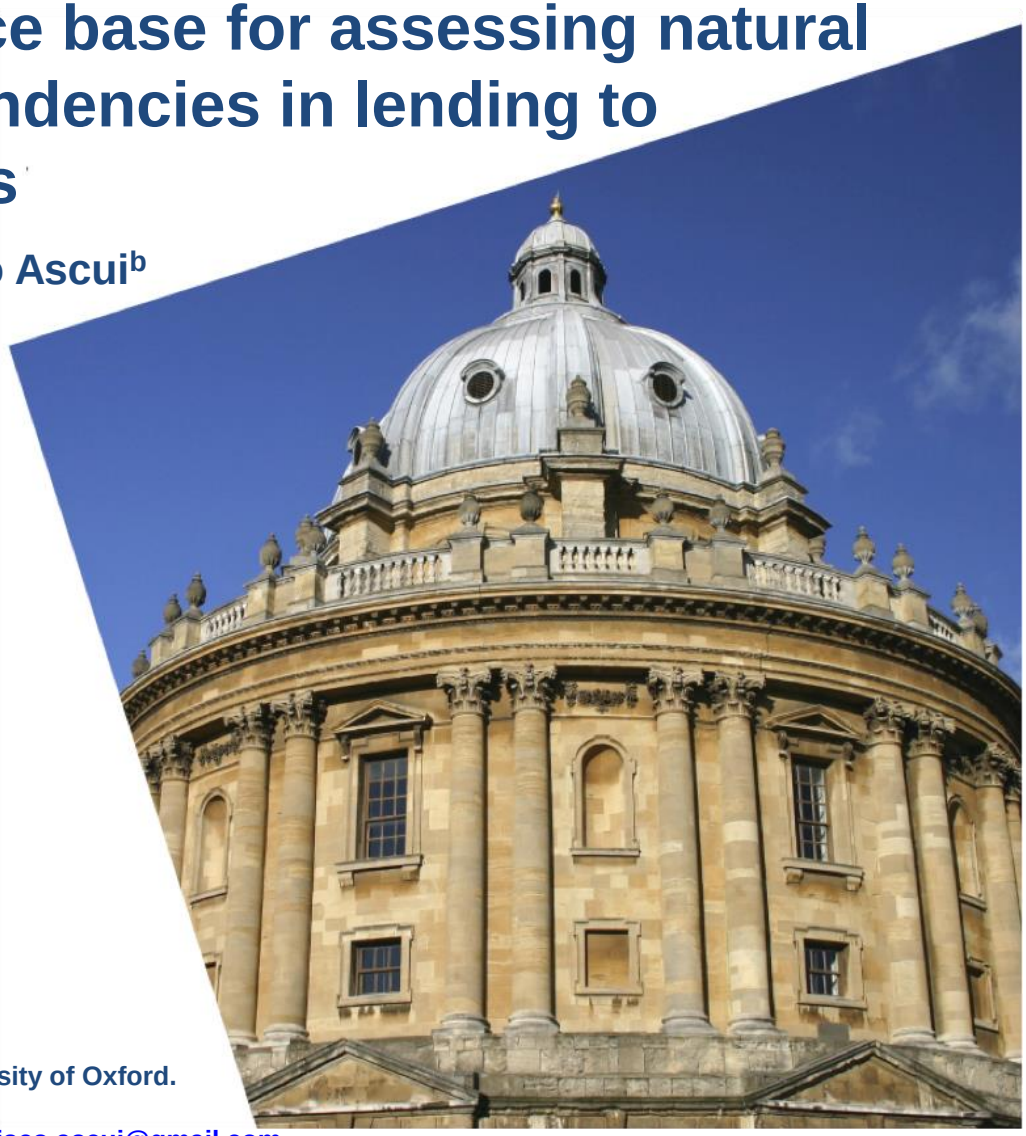
SMITH SCHOOL OF ENTERPRISE AND THE ENVIRONMENT

UNIVERSITY OF OXFORD

Developing an evidence base for assessing natural capital risks and dependencies in lending to Australian wheat farms

Theodor F. Cojoianu[a] & Francisco Ascui[b]

@cojotheo



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[a] Smith School of Enterprise and the Environment, University of Oxford.
theodor.cojoianu@ouce.ox.ac.uk
[b] University of Edinburgh & University of Tasmania, francisco.ascui@gmail.com

Agenda

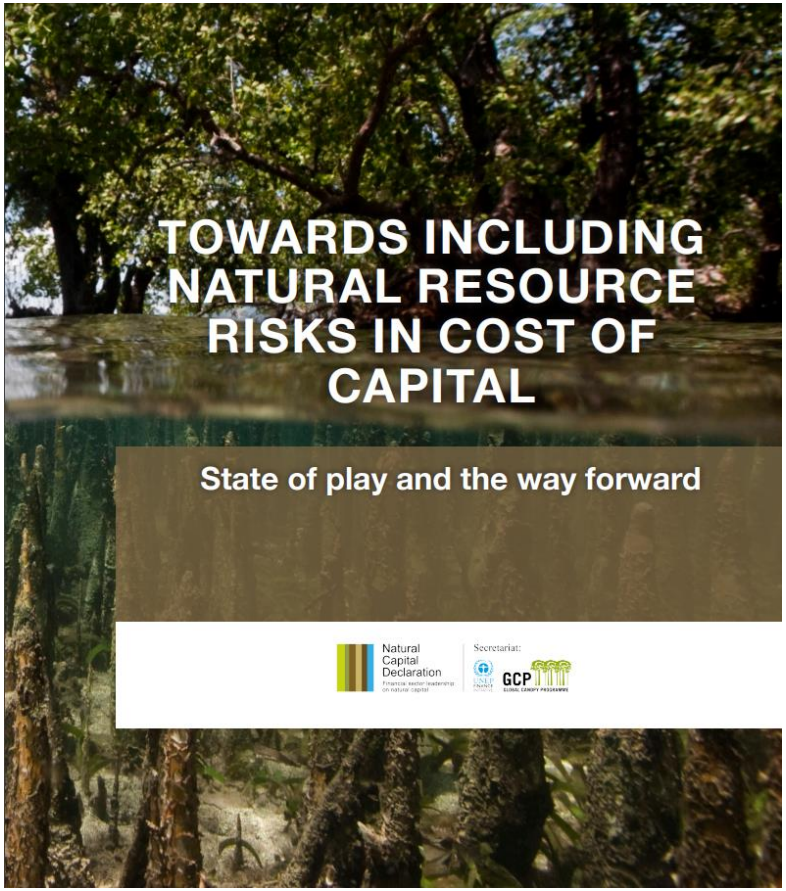
1. **Challenges of environmental risk integration in lending**

2. **The Australian wheat farming sector**

3. **Quantifying natural capital risk in lending to Australian agriculture**

4. **The hard thing about the hard things – reflection on challenges and further research**

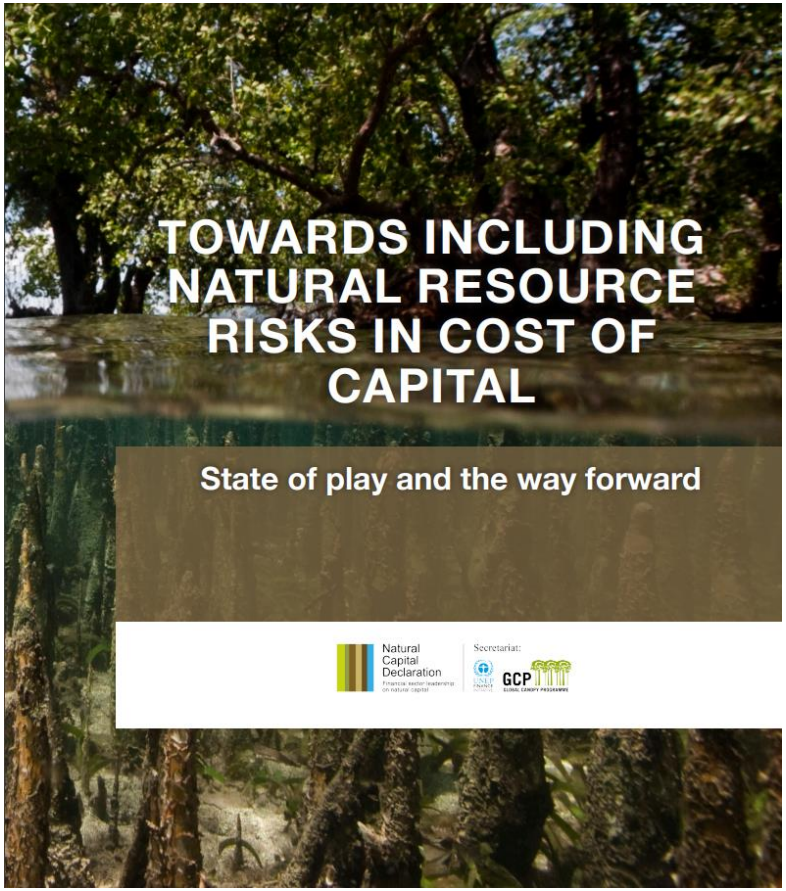
Challenges of environmental risk integration in lending



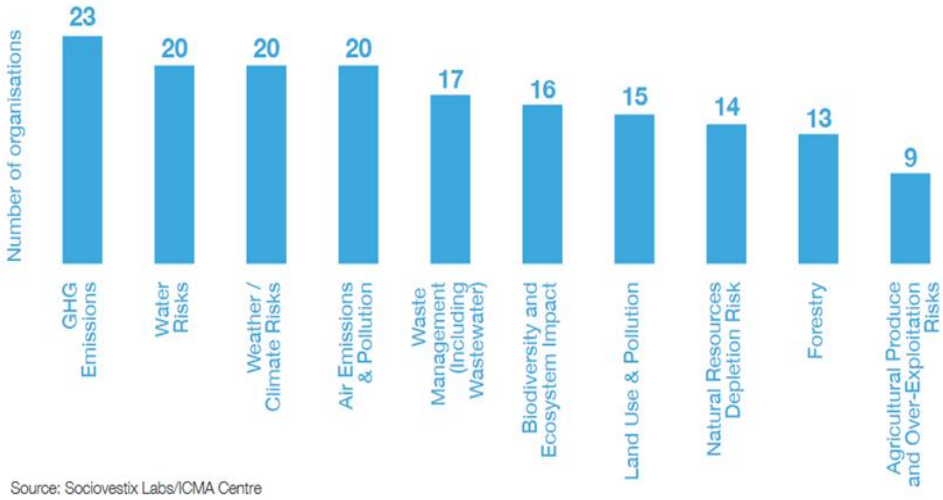
Natural Capital Finance Alliance (2015) - Cojoianu, Hoepner, Rajagopalan & Borth

- Surveyed 36 large financial institutions regarding the use of environmental datasets in lending decision making.
- Beyond carbon and water risks, no financial institution had the capability to systematically analyse broader environmental risks. The reasons for this include:
  - Limited IT budgets and personnel
  - Lack of awareness around environmental issues
  - Lack of access to robust environmental information and data
  - Complexity of environmental risks
  - Difficulty in linking long term environmental risks to short-term business decisions

Challenges of environmental risk integration in lending



- Analysed 66 ESG research providers on their capability to provide environmental risk research to financial institutions. Only 26 of these had some methodological or data capability across different environmental indicators.



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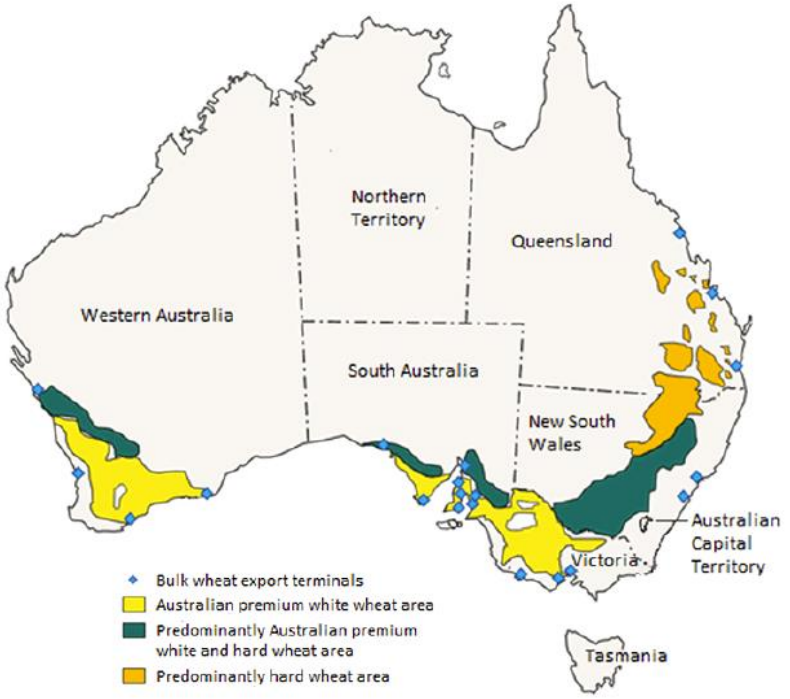
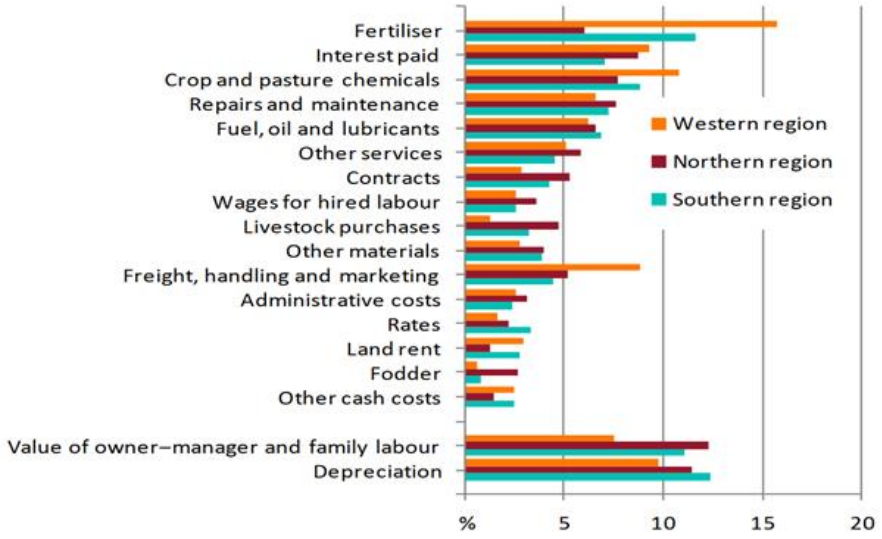
Developing a natural capital risk evidence base for lending to Australian wheat farms



Source: Land Commodities (2012)



Average cash costs of Australian grain farms (2012 to 2015)
Source: ABARES (2015)

Top Level Risk	Sub-Level Risk Factor	Sub-Level Physical Risk
Water	Annual Rainfall	Annual Average Rainfall
	Growing Season Rainfall	Growing Season Rainfall Amount
		Growing Season Rainfall Variability
	Excessive Rainfall	Excessive Rainfall in Early Growing Season
		Excessive Rainfall in Harvesting Season
	Water Use Efficiency	Average 3 Year Water Use Efficiency - Peer Benchmarking
	Water Use Efficiency	Farm % of Maximum Yield per Water Unit Used
Frost Damage and Heat Stress	Frost Damage	Frost Days
	Heat Stress	High Degree Hours
Extreme Weather Events	Bushfires, hailstorms, cyclones and floods	Incidents in the past 10 years
Soil Health	Soil Acidification	pH Topsoil
		pH Subsoil
	Soil Organic Carbon	Average SOC in Topsoil
	Soil Salinity	Average 3 Year Soil Salinity
	Surface Water Erosion	Ground Cover Percentage
Fertiliser Use	Fertiliser Quantity and Cost	Peer Benchmarking 3 Year Average Fertiliser Use
		Percentage of Farm Cost Structure of Fertiliser Input
	Appropriate Application of Fertiliser	Partial Nutrient Balance
		Farm Partial Factor Productivity
	Fertiliser Run-Off	Water Contamination Incidents (Past 5 Years)
Pests, Diseases and Weeds	Pests	Average 3 Year Economic Cost to the Farm
	Diseases	Average 3 Year Economic Cost to the Farm
	Weeds	Average 3 Year Economic Cost to the Farm
Biodiversity	Biodiversity Risk	Farm Level Biodiversity Risk
Energy and GHG Emissions	Energy Use	Total On-Farm Energy Consumption (MJ/t)
		Percentage of Farm Cost Structure of Energy Consumption
	GHG Emissions	Farm Normalised GHG Emissions
		Stress Test $15/tCO2-e
		Stress Test $30/tCO2-e

Fertiliser Use Risk Example

Risk Factor	Timeframe	Scale	Information Need	Data Sources
Fertiliser quantity and cost	Short term	Farm	Fertiliser quantity (absolute or kg/ha) and percentage of total annual farm cash costs. Farmer's ability to balance fertiliser purchasing decisions with weather dependent fertiliser requirements	Farmer questionnaire
	Long term	National	Predicted fertiliser price trends	Market analysts
Fertiliser production and transport energy use and GHG emissions	Short and long term	National	Energy and GHG emissions per kg fertiliser	Life-cycle assessment studies, fertiliser manufacturer disclosure and/or farmer questionnaire
Appropriate application of fertiliser	Short term	Farm	Farmer's ability to optimise fertiliser application	Farmer and peer questionnaire (peer with similar rainfall profile)
	Long term	Farm	Impact of fertiliser application on soil quality (e.g. monitoring Partial Nutrient Balance)	Soil samples (for nutrient removal rate); farmer questionnaire (for fertiliser applied)
Fertiliser run-off	Short and long term	Farm and surrounding area	Adjacent water and soil contamination from fertiliser run-off	Farmer questionnaire; environmental regulator data

$$PNB = \frac{kg\ nutrient\ removed}{kg\ nutrient\ supplied}$$

$ratio > 1\ indicates\ soil\ is\ mined\ for\ short\ term\ productivity\ at\ the\ expense\ of\ long - term\ degradation$

Remarks on and challenges in quantifying material environmental risks

- There are numerous challenges in trying to answer the simple question "is this loan an acceptable risk?" and the complexity, uncertainty and heterogeneity of the reality on the ground.
- Natural processes are often characterised by complexity and interconnectedness. While it is relatively easy to identify high-level natural capital risk categories, we discovered that most of these are in fact multi-dimensional.
- Some risks are less challenging to evaluate than others. For example, energy use and GHG emissions are relatively easy to monitor and to price with a shadow cost of carbon. Soil health risk factors are at the other end of the spectrum, being highly complex and interconnected.
- Many sources of useful quantitative data to assess natural capital risk factors exist – at least in a developed country such as Australia – but qualitative data will almost always also be required to obtain a view of how able the borrower is to manage a particular risk.

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Thank you for your attention!