Institute for Innovation and Public Purpose

Financial system interactions with drivers of nature loss

Evidence from the Brazilian Amazon and Indonesian peatlands

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Presentation at 7th MPPG Workshop: *Exploring macroprudential policy to address financial stability risks of climate change and nature degradation*

15 October 2024, Vilnius

Agenda

- Background and motivation
- Literature review
- Methods
- Results
- Conclusions and policy implications

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Background and motivation

UCL IIPP research on greening financial policy

REVIEW OF INTERNATIONAL POLITICAL ECONOMY
https://doi.org/10.1080/09692290.2024.2351838

Routledge
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Carrots with(out) sticks: credit policy and the limits of green central banking

Katie Kedward[a], Daniela Gabor[b] and J

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Business and Law, University of the West of Eng

ABSTRACT

This article considers the role of central
markets in support of decarbonization. Dr
ture, we argue that central banks are const
continued adherence to monetary domina
– and the structural demands of global m
row focus on 'market-fixing' and 'de-riskin
ing the green transition to private finance
be seen as 'climate policymakers'. Moving
cial regime remains challenging, as we ill
(ECB) tilting of its corporate asset purcha
the Post-World War II credit guidance regi
sider how these could be updated to me
finance. Such a shift would require an evo
public agency, challenging current nor
neutrality.

Comment

https://doi.org/10.1038/s41559-023-02098-6

Heavy reliance on private finance alone will not deliver conservation goals

Katie Kedward, Sophus zu Ermgassen, Josh Ryan-Collins & Sven Wunder

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The Kunming-Montreal Global Biodiversity Framework envisages an increasing reliance on large-scale private finance to fund biodiversity targets. We warn that this may

an alleged private willingness to pay for public environmental goods is difficult, given strong incentives for free-riding (reaping benefits while imposing costs on others). And second, it is not easy to achieve sufficient market scale, liquidity and efficiency for these instruments to appeal to institutional investors.

Given these challenges, successful nature-related investments arguably require more, rather than less, of a role for the public or – especially in two key areas. First, we articulate a stronger for public oversight, such as financial regulation of emerging re-related asset classes. Second, we explore the economic case edirecting underused sources of public finance to increase public stment in conservation.

CLIMATE POLICY
https://doi.org/10.1080/14693062.2022.2107475

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Biodiversity loss and climate change interactions: financial stability implications for central banks and financial supervisors

Katie Kedward[a], Josh Ryan-Collins[a] and Hugues Chenet[b,c,d]

[a]UCL Institute for Innovation and Public Purpose, London, UK; [b]UCL Institute for Sustainable Resources, London, UK; [c]IESEG School of Management, Lille, France; [d]Chair Energy and Prosperity, Paris, France

ABSTRACT

Financial risks related to climate change and biodiversity loss are currently being addressed in a largely siloed manner. Neglecting their interconnections, however, may lead to 'blind spots' and misestimations of systemic financial risk, potentially undermining progress on both climate finance policy and emerging policy on biodiversity-related financial risks (BRFR). In particular, the 'risk measurement–based' approach dominating climate finance policy, which is now being taken up to address BRFR, is poorly equipped to address the radical uncertainty that characterises both types of risks. Furthermore, many BRFR may materialise over a more immediate horizon than climate risks. In this paper, we examine how central banks and financial supervisors are approaching the topic of BRFR in relation to climate-related financial risk. We argue that policymakers should focus upon the broader concept of systemic environmental-financial risks to account for the interactions and trade-offs between both domains of biodiversity and climate change. Instead of seeking evidence of financial materiality before acting, focusing on how the financial system is actively facilitating direct drivers of environmental damage offers a way for financial policymakers to assess potential sources of such risks on the basis of information available today. In turn, policy interventions should aim to reduce harmful flows of finance that may lead to the crossing of dangerous ecological tipping points.

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KEYWORDS
Sustainable finance; financial risk; climate change; biodiversity loss; central banks; tipping points

Academic research

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Quantitative easing and nature loss:
Exploring nature-related financial risks and impacts in the European Central Bank's corporate bond portfolio

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Ecosystem tipping points: Understanding risks to the economy and financial system

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nnovation and
Public Purpose

University of Exeter
Global Systems Institute

Network for Greening the Financial System
Technical document

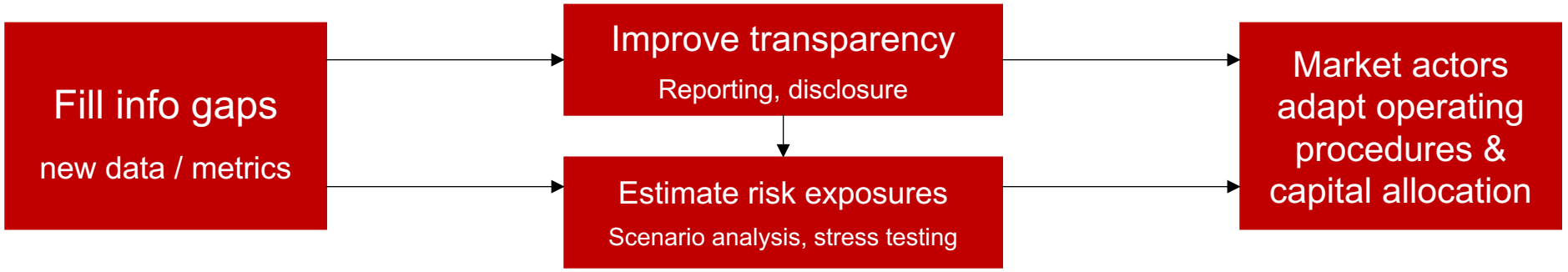
Recommendations toward the development of scenarios for assessing nature-related economic and financial risks

December 2023

Policy reports

Financial supervision: ‘risk-based’ theory of change

Market-fixing mechanism:



Assumptions:
- risks can be meaningfully estimated
- firms will act upon information by changing their capital allocation

Challenges:
- fundamental uncertainty of climate change and nature degradation
- facing possible “ruin” problem – need to *prevent* risks from emerging

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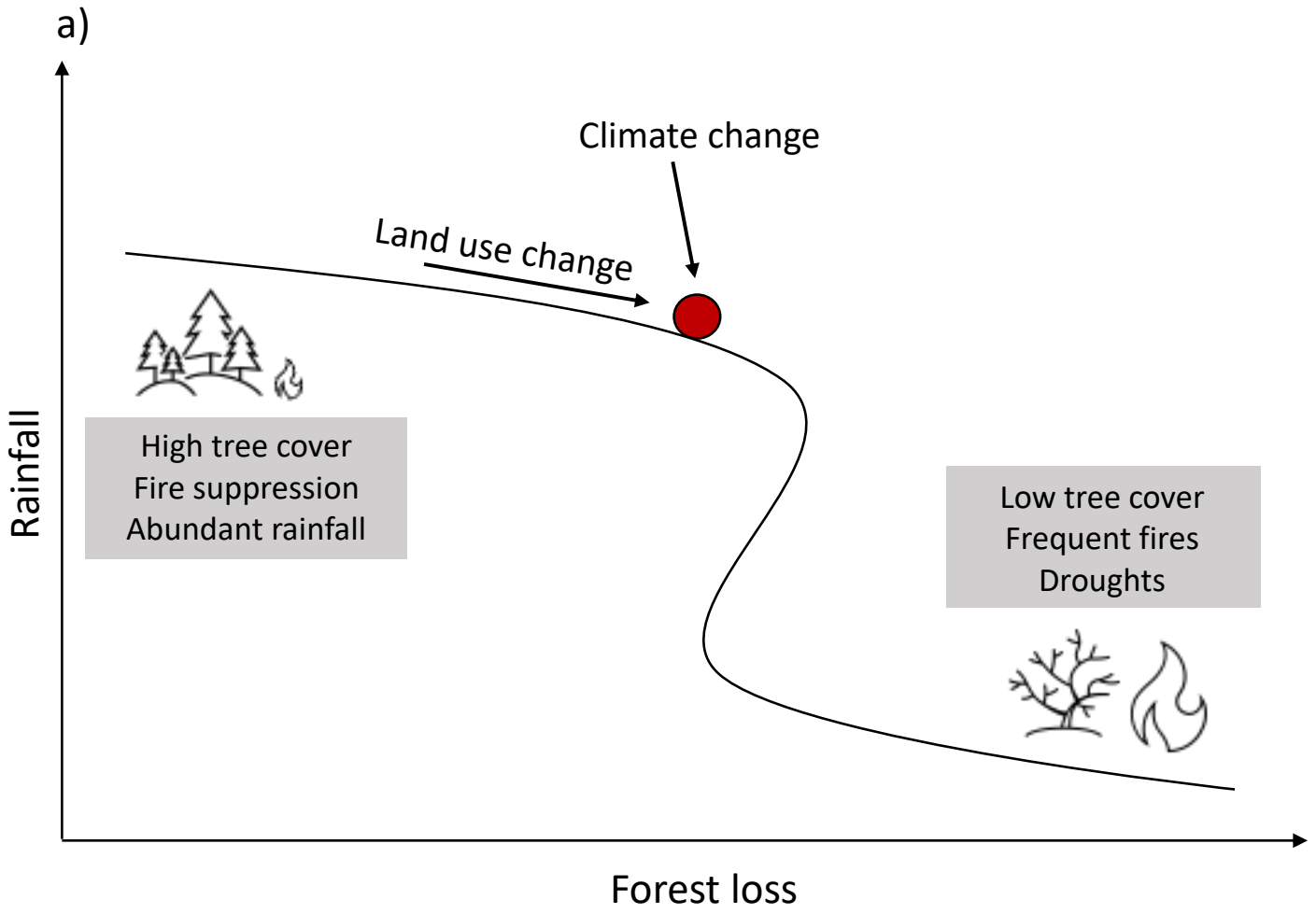
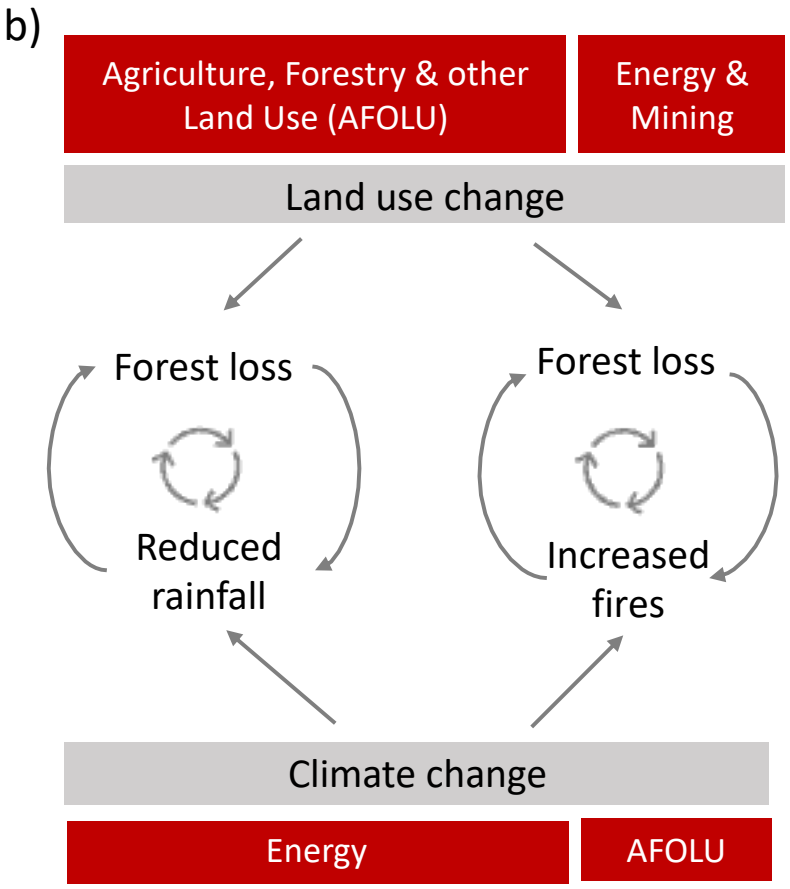
Interaction of climate change and land use / land-use change driving tipping points in key ecosystems





Source: Marsden, L., Ryan-Collins, J., Abrams, J., and Lenton, T. (2024). Ecosystem tipping points: Understanding risks to the economy and financial system. UCL Institute for Innovation and Public Purpose, Policy Report 2024/03.

Materiality of risks from ecosystem tipping points

Central banks and financial supervisors need to understand ETPs to deliver on primary mandates.

Idiosyncratic risk

- Losses to local and regional **ecosystem services**.
- **Direct economic impacts** through lower output, increased costs of inputs, reduced profits, household welfare, as well as through **value chains**.
- Materialise as **credit, market, and/or underwriting risk** for individual institutions.

Systemic risk

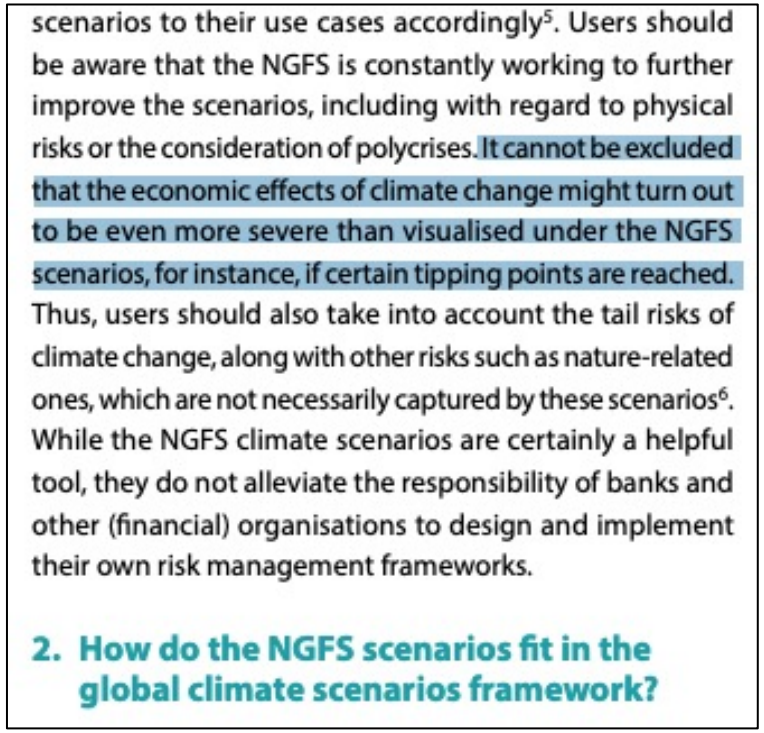
- Losses to **global ecosystem services** (e.g., carbon sequestration) amplifies other climate- and nature-related risks (inc. tipping points).
- **Compounding effects** of multiple ecosystem service losses.
- **Limited substitution possibilities** for large-scale nature degradation.
- **Feedback effects** within and between macroeconomy and financial system.

Endogenous risk

- **Financial flows towards companies** active in tipping point drivers (e.g., climate change, deforestation and forest degradation).
- Direct **acquisitions of agricultural land** as a portfolio asset.
- Role of financial actors (and norms) in **corporate governance**.

Tipping points poorly captured by existing tools / approaches

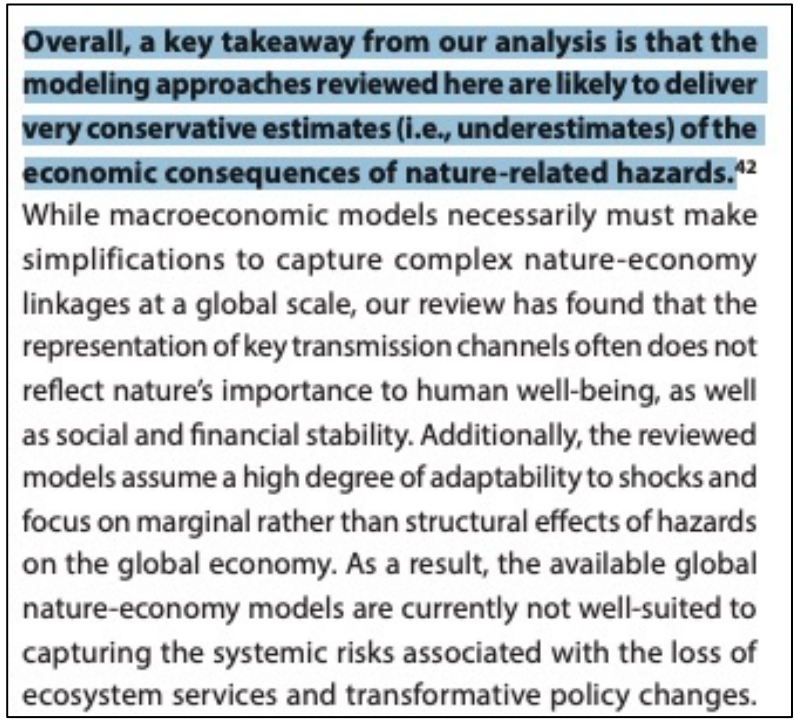
- Large-scale nature loss through tipping points poses possibly systemic risks but is difficult to model and incorporate into “risk-based” / single materiality approach based on stress testing + scenario analysis.



scenarios to their use cases accordingly[5]. Users should be aware that the NGFS is constantly working to further improve the scenarios, including with regard to physical risks or the consideration of polycrises. It cannot be excluded that the economic effects of climate change might turn out to be even more severe than visualised under the NGFS scenarios, for instance, if certain tipping points are reached. Thus, users should also take into account the tail risks of climate change, along with other risks such as nature-related ones, which are not necessarily captured by these scenarios[6]. While the NGFS climate scenarios are certainly a helpful tool, they do not alleviate the responsibility of banks and other (financial) organisations to design and implement their own risk management frameworks.

2. How do the NGFS scenarios fit in the global climate scenarios framework?

NGFS (2024)



Overall, a key takeaway from our analysis is that the modeling approaches reviewed here are likely to deliver very conservative estimates (i.e., underestimates) of the economic consequences of nature-related hazards.[42] While macroeconomic models necessarily must make simplifications to capture complex nature-economy linkages at a global scale, our review has found that the representation of key transmission channels often does not reflect nature’s importance to human well-being, as well as social and financial stability. Additionally, the reviewed models assume a high degree of adaptability to shocks and focus on marginal rather than structural effects of hazards on the global economy. As a result, the available global nature-economy models are currently not well-suited to capturing the systemic risks associated with the loss of ecosystem services and transformative policy changes.

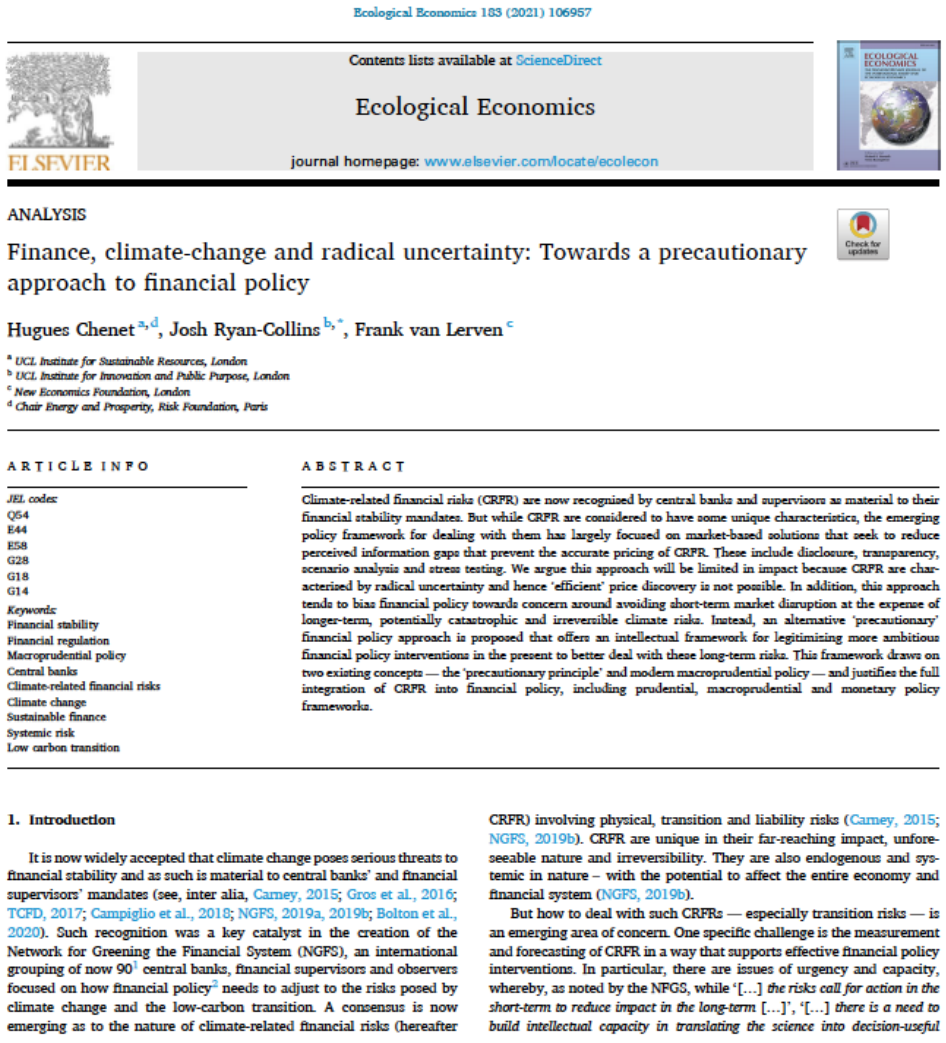
NGFS (2023)

Precautionary financial policy: avoiding tipping points, increasing resilience

- Tipping points possible in some of world's most iconic ecosystems, with globally systemic impacts if crossed.
- Big challenges in incorporating tipping points into climate/nature-related scenario analysis.

Precautionary approach:

- Focus on avoiding *worst case* scenarios, not predicting *most plausible* ones.
- Greater focus on *impacts of* finance rather than *risks to* finance.
- Focusses on **key tipping points and shaping markets** in the right direction via macroprudential policy toolkit.
- Build system resilience as superior means of managing uncertainty.



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ANALYSIS

Finance, climate-change and radical uncertainty: Towards a precautionary approach to financial policy

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Sustainable finance
Systemic risk
Low carbon transition

ABSTRACT

Climate-related financial risks (CRFR) are now recognised by central banks and supervisors as material to their financial stability mandates. But while CRFR are considered to have some unique characteristics, the emerging policy framework for dealing with them has largely focused on market-based solutions that seek to reduce perceived information gaps that prevent the accurate pricing of CRFR. These include disclosure, transparency, scenario analysis and stress testing. We argue this approach will be limited in impact because CRFR are characterised by radical uncertainty and hence 'efficient' price discovery is not possible. In addition, this approach tends to bias financial policy towards concern around avoiding short-term market disruption at the expense of longer-term, potentially catastrophic and irreversible climate risks. Instead, an alternative 'precautionary' financial policy approach is proposed that offers an intellectual framework for legitimising more ambitious financial policy interventions in the present to better deal with these long-term risks. This framework draws on two existing concepts — the 'precautionary principle' and modern macroprudential policy — and justifies the full integration of CRFR into financial policy, including prudential, macroprudential and monetary policy frameworks.

1. Introduction

It is now widely accepted that climate change poses serious threats to financial stability and as such is material to central banks' and financial supervisors' mandates (see, inter alia, Carney, 2015; Gros et al., 2016; TCFD, 2017; Campiglio et al., 2018; NGFS, 2019a, 2019b; Bolton et al., 2020). Such recognition was a key catalyst in the creation of the Network for Greening the Financial System (NGFS), an international grouping of now 90[1] central banks, financial supervisors and observers focused on how financial policy[2] needs to adjust to the risks posed by climate change and the low-carbon transition. A consensus is now emerging as to the nature of climate-related financial risks (hereafter CRFR) involving physical, transition and liability risks (Carney, 2015; NGFS, 2019b). CRFR are unique in their far-reaching impact, unforeseeable nature and irreversibility. They are also endogenous and systemic in nature – with the potential to affect the entire economy and financial system (NGFS, 2019b).

But how to deal with such CRFRs — especially transition risks — is an emerging area of concern. One specific challenge is the measurement and forecasting of CRFR in a way that supports effective financial policy interventions. In particular, there are issues of urgency and capacity, whereby, as noted by the NFGS, while '[…] *the risks call for action in the short-term to reduce impact in the long-term* […]', '[…] *there is a need to build intellectual capacity in translating the science into decision-useful*

Literature review

Previous research on nature-finance interactions

- Precautionary financial policy calls for more focused research on specific ecosystems; NGFS Nature Taskforce suggests similar “ecosystem-based” approach.
- Growing number of empirical studies exploring climate-nature-finance interactions, esp. from central banks.
- Focus on global sectors/industry classifications without location-specific information.
  - ENCORE framework – Global, France, Malaysia, Hungary.
  - ‘Global Biodiversity Score’ (GBS) – France, EU, Netherlands.
- Ecosystem-specific – focused on exposure to transition risk (single materiality).
  - Protected areas, KBAs, etc (Calice et al. 2020; van Toor et al. 2020, World Bank & BNM. 2022).
- Company-specific – very broad analyses or focus on financial **stocks** (point-in-time).
  - Global analysis of financial flows to companies in all forest-risk sectors (Global Witness, 2019; Forests & Finance, 2023; Elwin et al., 2023; Greenpeace International et al., 2024).
  - **Galaz et al. (2018, 2023)** - equity holdings associated with Amazon and boreal forests, then areas (inc. Indonesia) prone to zoonotic disease risk.
- **Flows** important to understand how company sustains and expands over time through external finance, also to cover other asset classes such as debt.
- **Research gap:** financial *flows* to companies linked to specific ecosystems.

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Research questions and case study regions

- What is the nature of the financial flows supporting companies most implicated in land use (change) in critical ecosystems subject to tipping points?

- Will macroprudential policy (e.g., changes in cost/availability of capital) be universally effective?

Brazilian Amazon (Image credit: Neil Palmer (CIAT))

Indonesian tropical peatlands (Image credit: Mankdhay Rahman)

Ecosystem importance

Tropical peatlands

- Concentrated in Southeast Asia (Indonesia, Malaysia), Congo Basin, Amazon Basin (Peru).
- Store c. 105 Gt C (385 Gt CO2e) globally, including c. 69 Gt C (253 Gt CO2e) in Southeast Asia (Page et al., 2022) – much of this is irrecoverable on timescales relevant to mitigate climate impacts (Goldstein et al. 2020).
- Important for freshwater quantity (storage during dry seasons) and quality (Page et al. 2022).
- Increase resilience to and moderate extreme events such as fires, floods and storms (Nechita-Banda et al., 2018; Evers et al., 2020).
- High levels of biodiversity that reduces risk of zoonotic disease emergence (Posa et al., 2011; Harrison et al., 2020).
- Source of food and support local livelihoods (CongoPeat Consortium, 2023)

Amazon rainforest

- Largest portion within Brazil, but also Peru, Bolivia, Colombia, Venezuela, and other LatAm countries.
- Stores c. 150-200 Gt C (550-730 Gt CO2e) (Flores et al. 2024), forming a large part of the global irrecoverable carbon pool (Goldstein et al. 2020).
- Contributes up to 50% of rainfall in the Amazon and is critical for water cycling across South America and hydropower (Staal et al. 2018).
- Tree cover modulates floods, soil erosion and prevents fires (Lima et al. 2014; Drüke et al. 2023).
- Globally important store of biodiversity (Moraes et al. 2021), supporting pollinators and other important species.
- Home to more than 40 million people, including many Indigenous groups (Science Panel for the Amazon, 2021).

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Methodology

Methodology and data

An LSEG Business

1. **Identify company links to land use (change)**

   Source: Trase Supply Chains (TSC)

   - Aggregated data to corporate group level, include those with minimum 1% of total → "**ETP risk companies**".
   - Average over most recent years of data.
   - **Caveat:** focus on traders, not always directly involved in upstream activities but still important.

2. **Trace financial flows - firm-level data**

   Source: LSEG (formerly Refinitiv)

   - Harmonise TSC data to legal entities in LSEG.
   - Pull financial flows (2014-23) for entire hierarchy, excl. govt. ultimate parent.
   - Parse flows based on deal role and aggregate to ultimate parent excl. govt. ultimate parent.
   - **Caveat:** focus on aggregate flows, not necessarily tied to specific ecosystem.

3. **Financial ratio analysis – firm-level data**

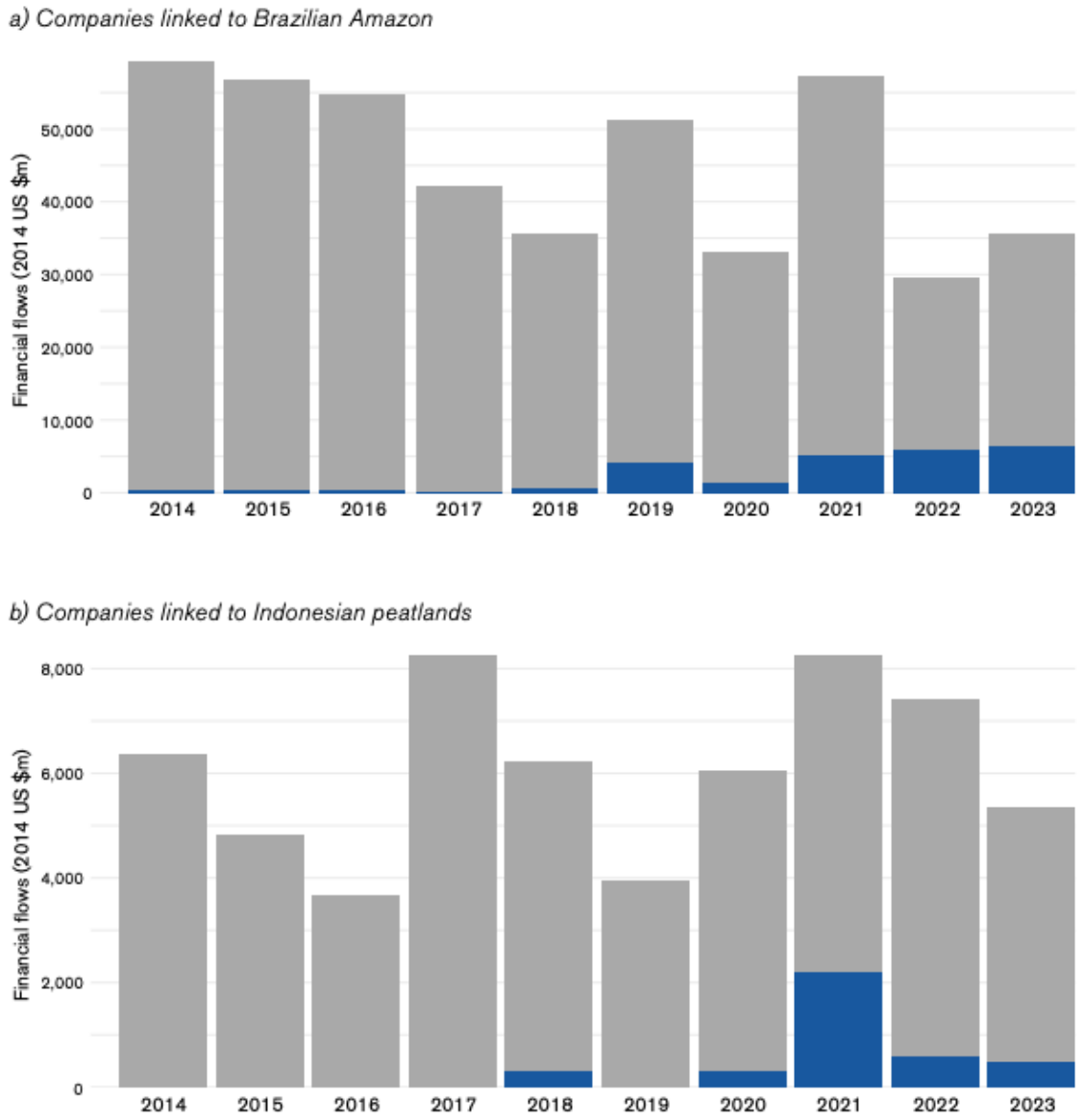
   Source: LSEG (formerly Refinitiv)

   - Balance sheet data available for subset of ETP risk companies.
   - Explore debt-to-assets, retained earnings-to-assets, interest coverage ratios.
   - **Caveat:** strategic choice; only one of several factors.

Results

Results I

- US $455.5 billion and US $60.2 billion to ETP risk companies in Brazilian Amazon and Indonesian peatlands over study period, adj. to 2014 US dollars.
- >90% of external finance through debt (loans and bonds).
- Largely no restrictions on use of proceeds.
- Increasing no. of “sustainable finance” transactions, most not strictly restricted to green uses.



9 This encompasses explicitly labelled sustainable financial instruments such as green bonds and sustainability-linked financing, as well as general corporate purpose finance to companies included in LSEG's list of sustainable industry classifications.

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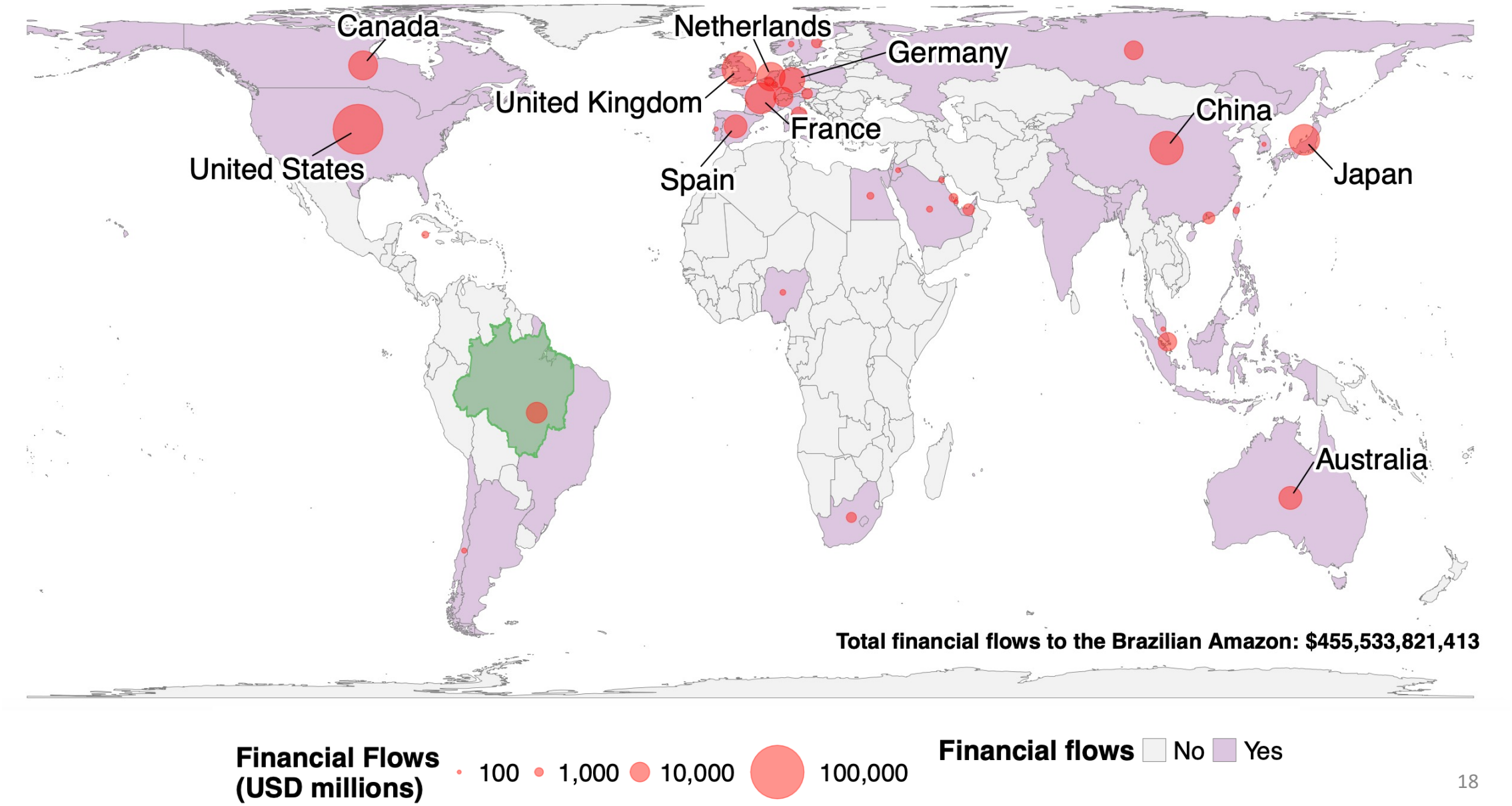
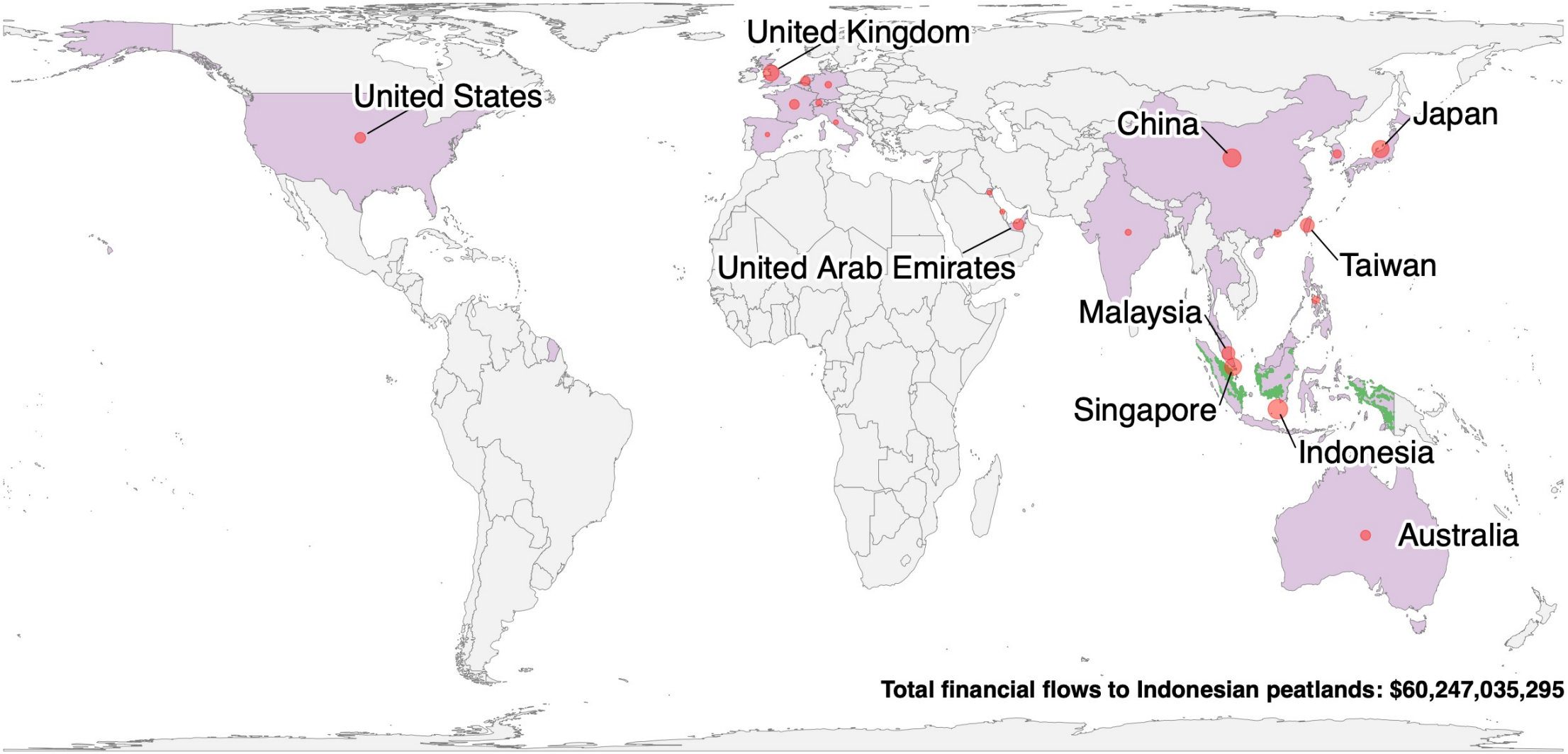
Results II - Financial flows to companies linked to Brazilian Amazon, by country

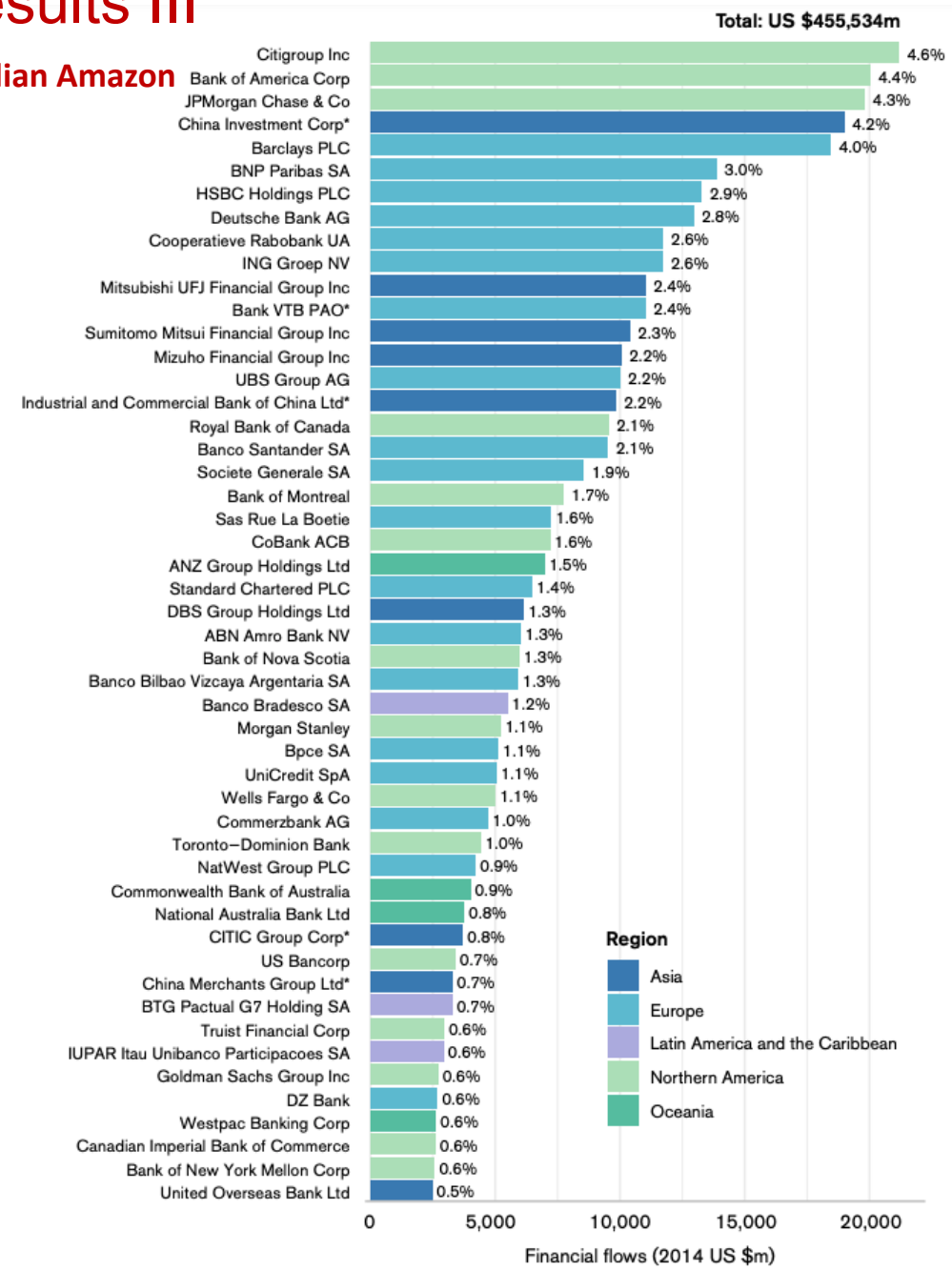


Results II - Financial flows to companies linked to Indonesian peatlands, by country

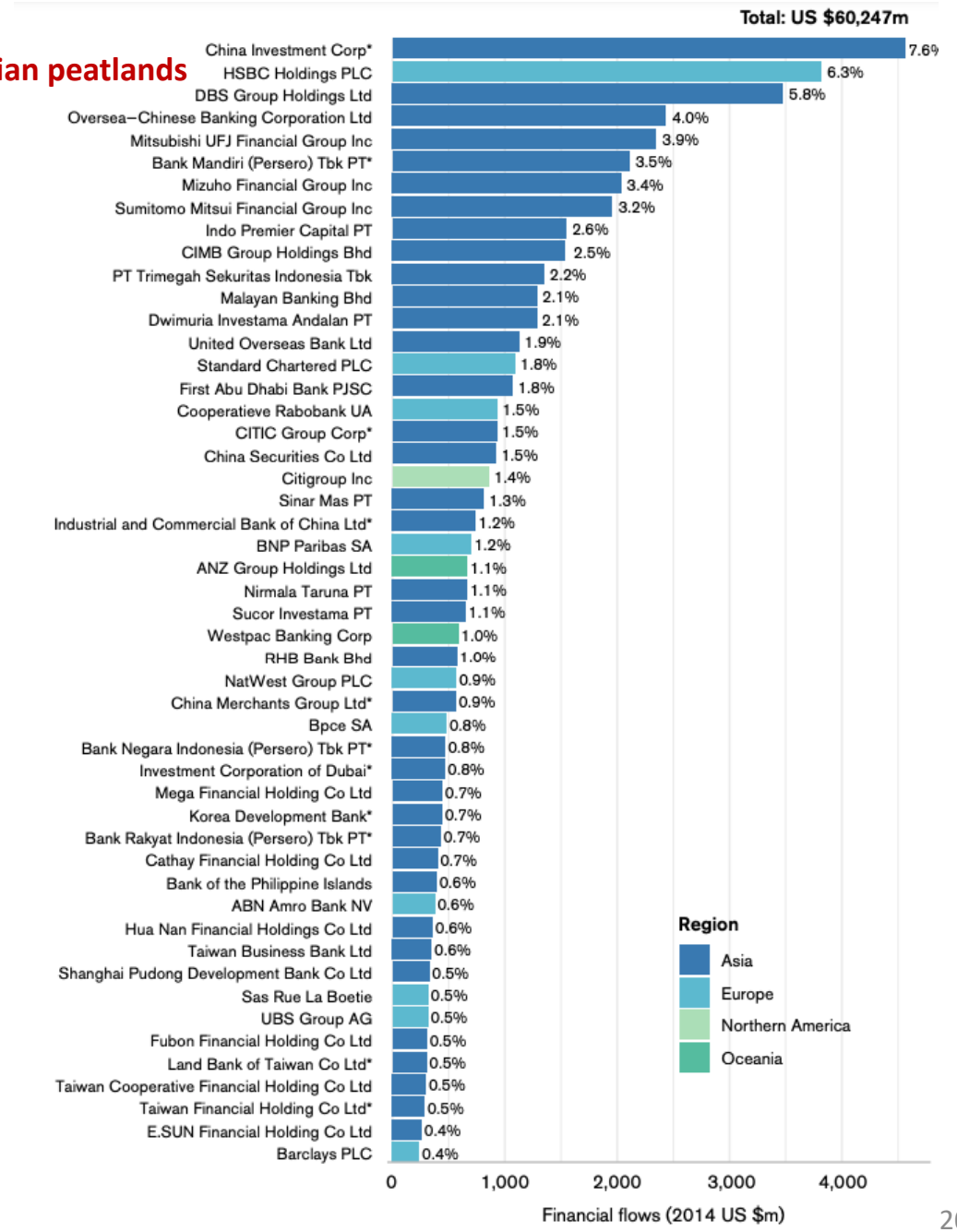


Results III

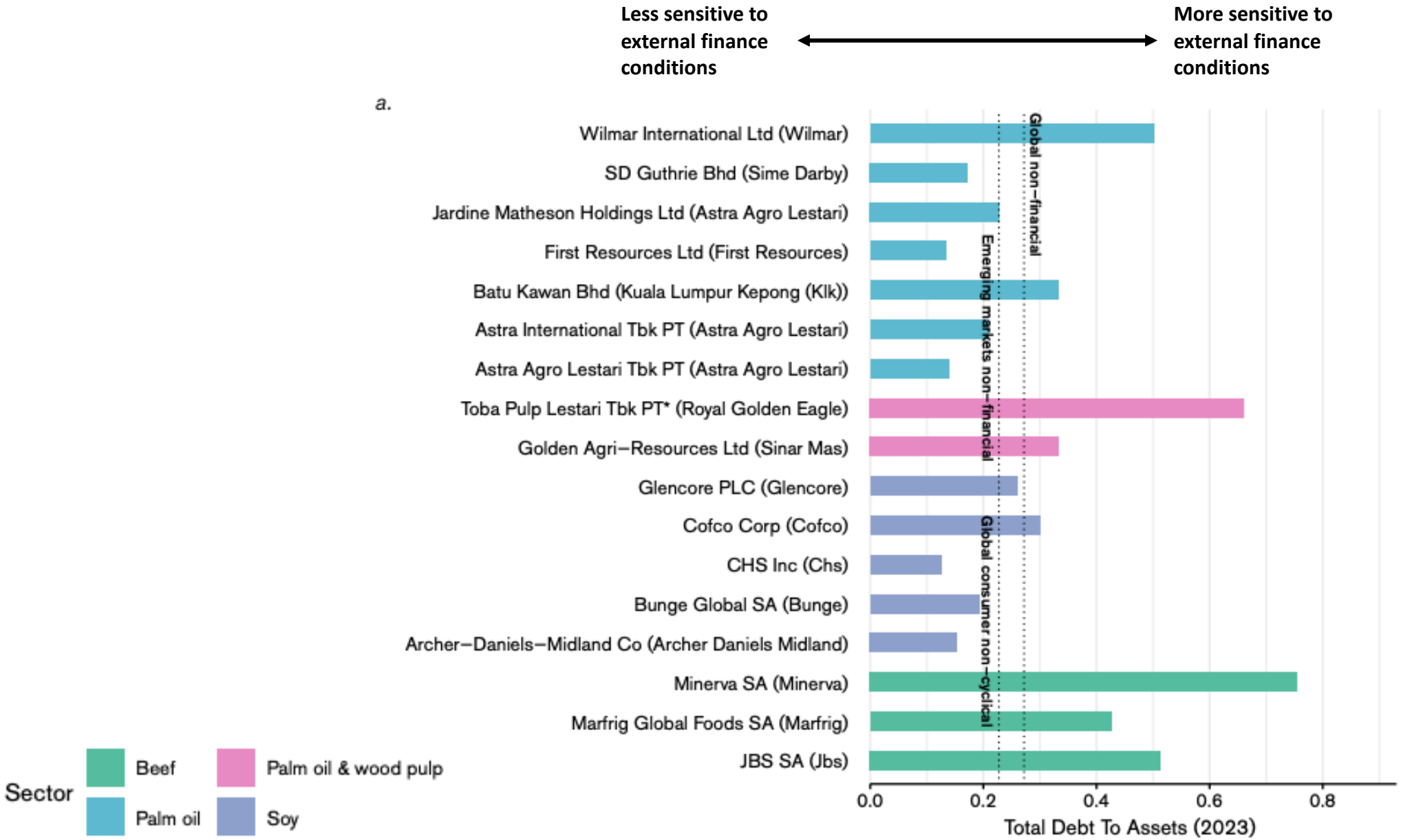
a) Brazilian Amazon



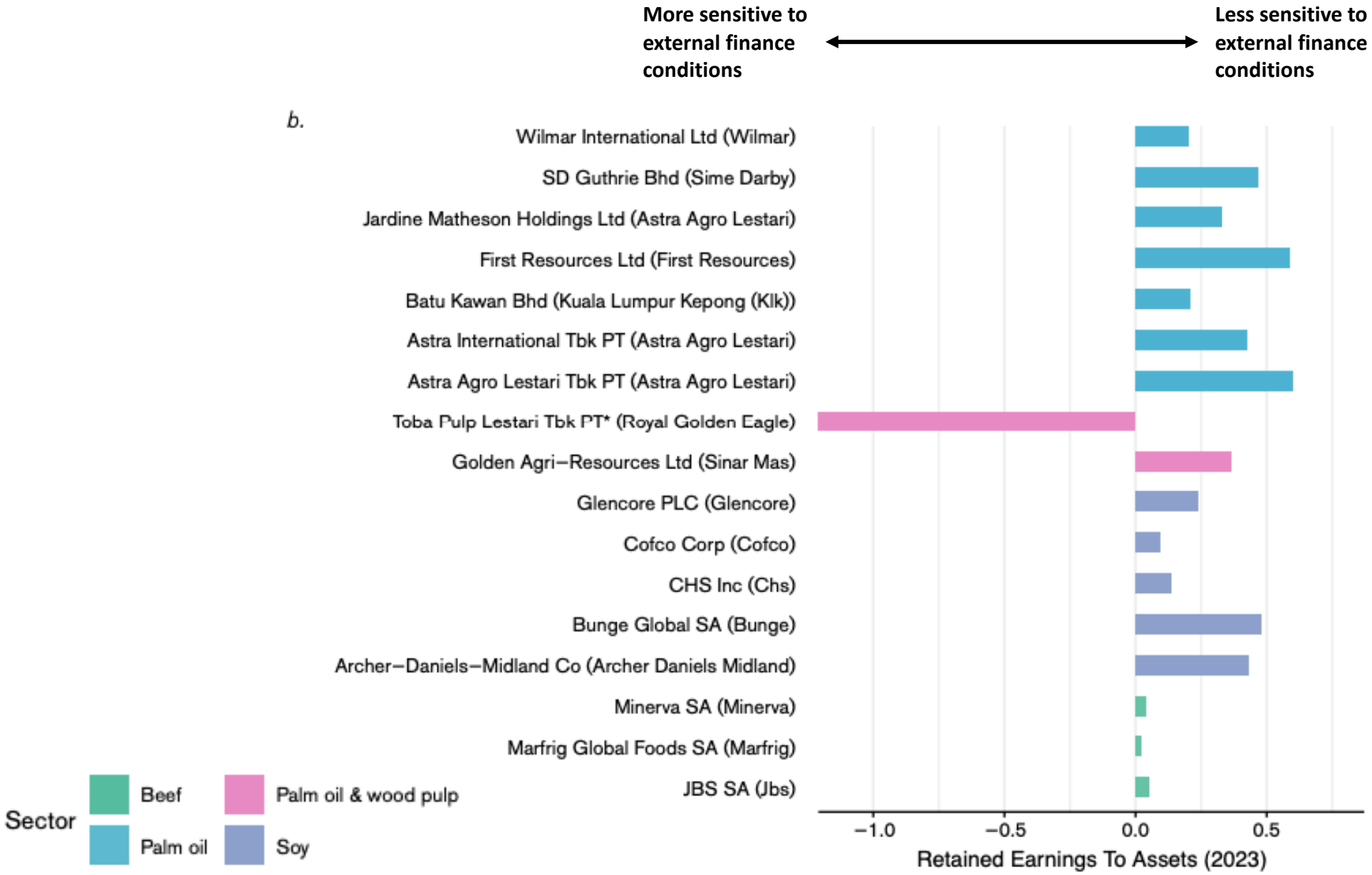
b) Indonesian peatlands



Results IV


Less sensitive to external finance conditions
More sensitive to external finance conditions
a.
Wilmar International Ltd (Wilmar)
SD Guthrie Bhd (Sime Darby)
Jardine Matheson Holdings Ltd (Astra Agro Lestari)
First Resources Ltd (First Resources)
Batu Kawan Bhd (Kuala Lumpur Kepong (Klk))
Astra International Tbk PT (Astra Agro Lestari)
Astra Agro Lestari Tbk PT (Astra Agro Lestari)
Toba Pulp Lestari Tbk PT* (Royal Golden Eagle)
Golden Agri−Resources Ltd (Sinar Mas)
Glencore PLC (Glencore)
Cofco Corp (Cofco)
CHS Inc (Chs)
Bunge Global SA (Bunge)
Archer−Daniels−Midland Co (Archer Daniels Midland)
Minerva SA (Minerva)
Marfrig Global Foods SA (Marfrig)
JBS SA (Jbs)
Global non−financial
Emerging markets non−financial
Global consumer non−cyclical
0.0
0.2
0.4
0.6
0.8
Total Debt To Assets (2023)
Sector
Beef
Palm oil
Palm oil & wood pulp
Soy

Results IV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CHS Inc (Chs)
Bunge Global SA (Bunge)
Archer−Daniels−Midland Co (Archer Daniels Midland)
Minerva SA (Minerva)
Marfrig Global Foods SA (Marfrig)
JBS SA (Jbs)
−1.0
−0.5
0.0
0.5
Retained Earnings To Assets (2023)
Sector
Beef
Palm oil
Palm oil & wood pulp
Soy

Discussion and conclusions

Key findings

- Significant and concentrated financial flows to companies implicated in ecosystem tipping points over past decade.
- Debt matters and bond issuance growing – need to consider facilitation + non-banks.
- Dif. geographies to trade patterns with governance implications (e.g., EU policy coherence).
- Transparency issues: most “ETP risk companies” highly diversified, large firms with complex subsidiary structures and internal financing mechanisms, limiting causality claims on tracing specific “negative” flows.
- Heterogeneity in if/how firms interact with financial system.

Policy implications

- Illustrate potential sources/drivers of transition/systemic risk respectively – potential useful way forward that does not rely on climate scenarios to calibrate instruments.
- Require disclosure of how capital is distributed across subsidiary structure OR classify any financial flow to holding co. as potentially (systemically) risky using more qualitative approach.
- Microprudential rationale possibly difficult; macroprudential policy– international coordination.
- Causality issues / financial resilience suggest inter-institutional coord. needed to fully mitigate risk build-up.

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More information

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Marsden, L., Ryan-Collins, J., Abrams, J., and Lenton, T. (2024). Financial interactions with ecosystem tipping points: evidence from the Brazilian Amazon and Indonesian peatlands. *UCL Institute for Innovation and Public Purpose, Working Paper Series*. https://www.ucl.ac.uk/bartlett/public-purpose/publications/WP-2024-11

Marsden, L., Ryan-Collins, J., Abrams, J., and Lenton, T. (2024). Ecosystem tipping points: Understanding risks to the economy and financial system. *UCL Institute for Innovation and Public Purpose, Policy Report 2024/03.* https://www.ucl.ac.uk/bartlett/public-purpose/2024/apr/ecosystem-tipping-points

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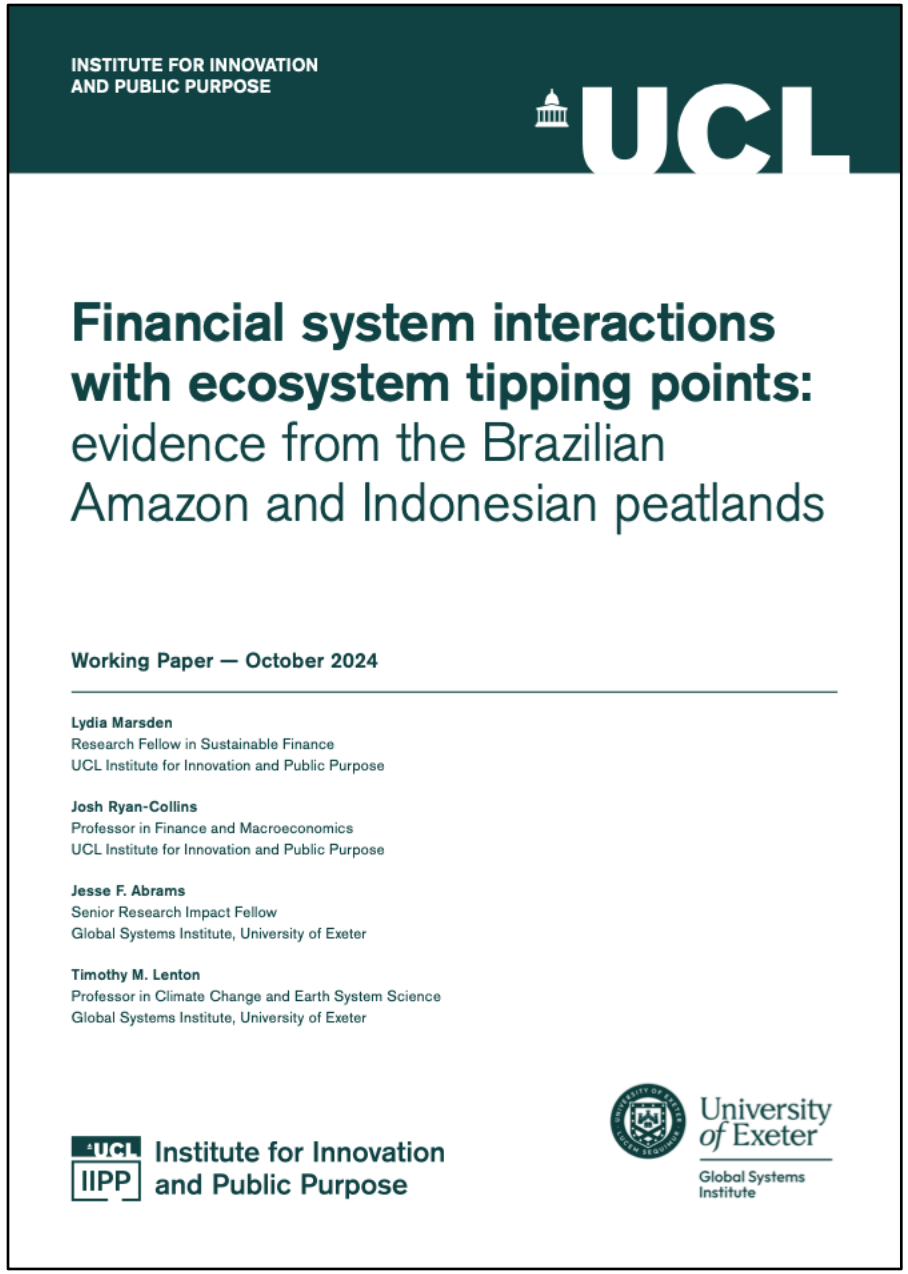
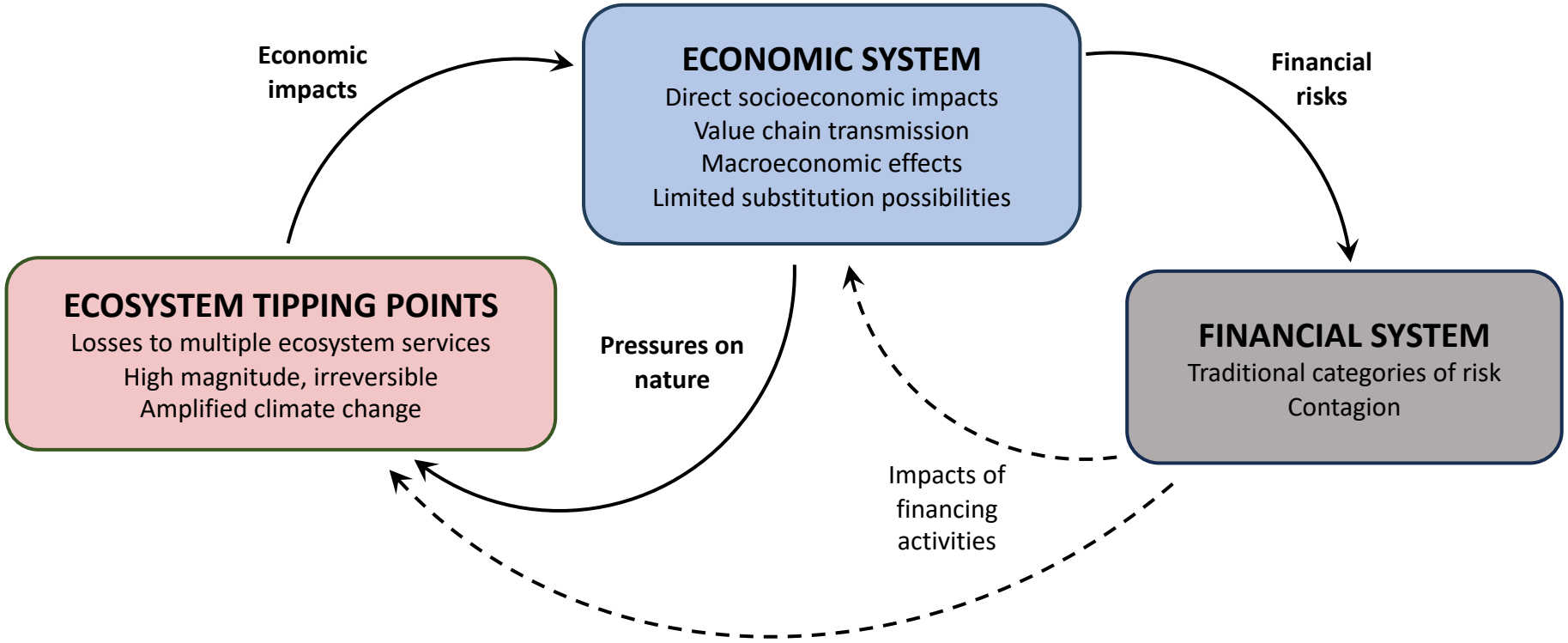
Chenet, H., Ryan-Collins, J., van Lerven, F. (2021). Finance, climate-change and radical uncertainty: Towards a precautionary approach to financial policy. *Ecological Economics* 183, 106957. https://doi.org/10.1016/j.ecolecon.2021.106957



Thank you! Questions?

Appendices

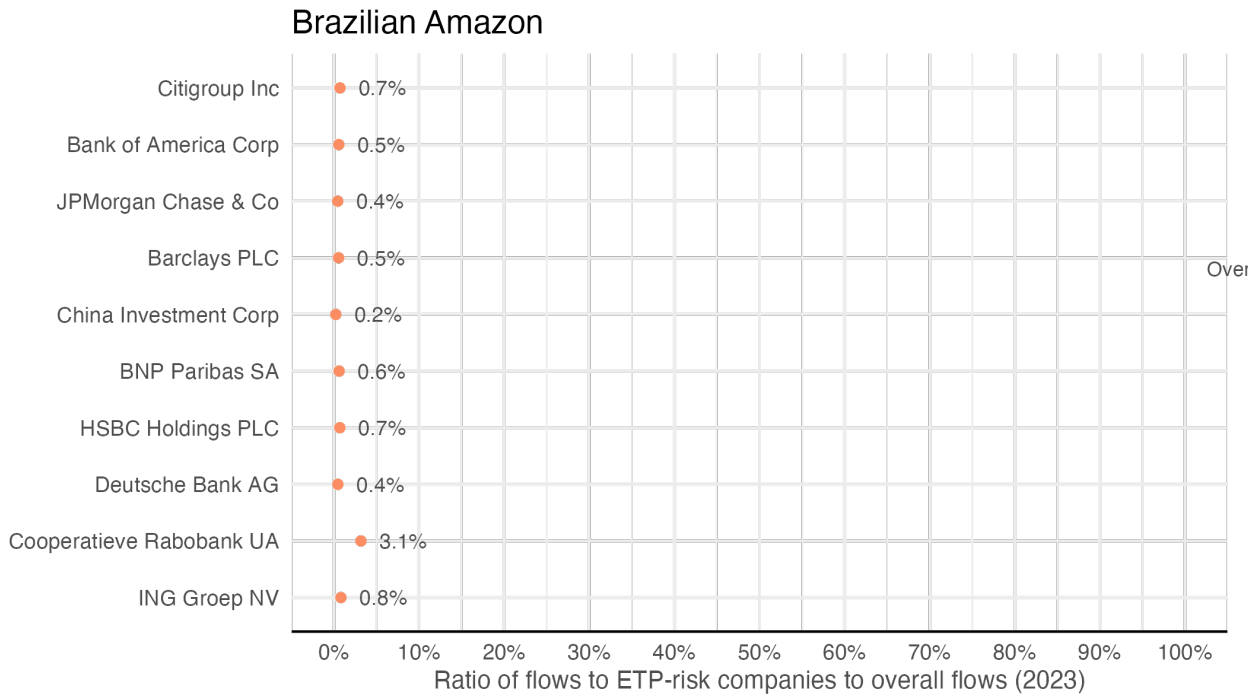
Central banks and financial supervisors focused on financial risks to institutions (single materiality) not on impact of flows on ecosystems (double materiality)

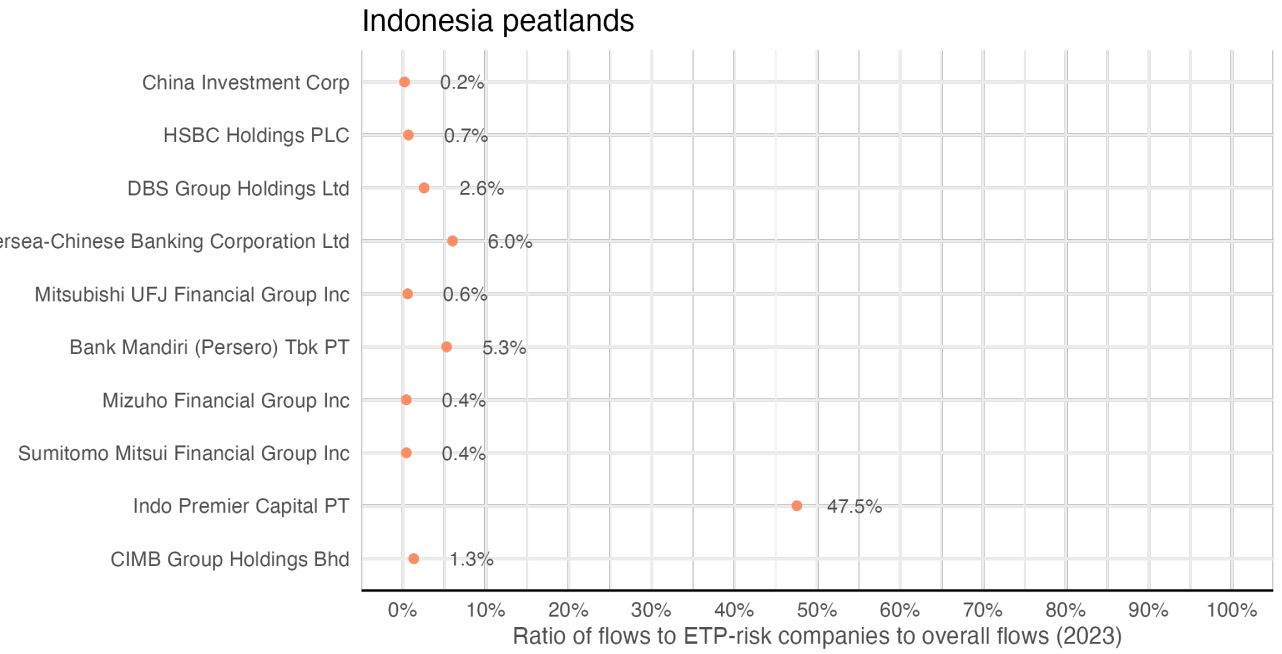


Other ecosystems as possible tipping points

	Amazon rainforest	Boreal forests	Coral reefs	Mangroves	Tropical peatlands
Transition	Rainforest to degraded forest, non-forested savannah or grassland	Tundra afforestation in north, dieback to grassland in south	Coral die-off to algae-dominated reef	Forest dieback to salt marsh ecosystem	Transition from accumulation to peat decay
Drivers	Climate change Land use change	Climate change Invasive species Land use change	Climate change Overexploitation Pollution	Land use change Climate change Pollution	Land use change Climate change
Impacts	Regional & global climate regulation; pollinator decline; disease + erosion control; flood, storm + fire protection…	Provisioning services; regional & global climate regulation; pest control…	Provisioning services; flood + storm protection; erosion control; tourism…	Global climate regulation; provisioning services; flood + storm protection; erosion control; tourism…	Global climate regulation; provisioning services; flood, storm + fire protection; disease control…

ETP-risk financial flows are largely small relative to annual flows – microprudential rationale?





UCL IIPP research on greening financial policy

Academic research

Policy reports

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