



# **Tipping towards climate stability – the role of the global and Japanese financial sector**

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Global Economic Dynamics and the Biosphere  
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## NEWS &amp; VIEWS

## COMPLEX SYSTEMS

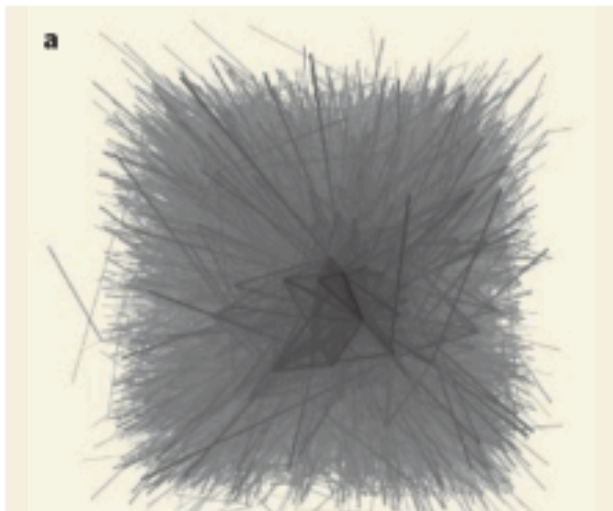
# Ecology for bankers

Robert M. May, Simon A. Levin and George Sugihara

**There is common ground in analysing financial systems and ecosystems, especially in the need to identify conditions that dispose a system to be knocked from seeming stability into another, less happy state.**

‘Tipping points’, ‘thresholds and breakpoints’, ‘regime shifts’ — all are terms that describe the flip of a complex dynamical system from one state to another. For banking and other financial institutions, the Wall Street Crash of 1929 and the Great Depression epitomize such an event. These days, the increasingly complicated and globally interlinked financial markets are no less immune to such system-wide (systemic) threats. Who knows, for instance, how the present concern over sub-prime loans will pan out?

Well before this recent crisis emerged, the



spent on studying systemic risk as compared with that spent on conventional risk management in individual firms? Second, how expensive is a systemic-risk event to a national or global economy (examples being the stock market crash of 1987, or the turmoil of 1998 associated with the Russian loan default, and the subsequent collapse of the hedge fund Long-Term Capital Management)? The answer to the first question is “comparatively very little”; to the second, “hugely expensive”.

An analogous situation exists within fisheries management. For the past half-century,

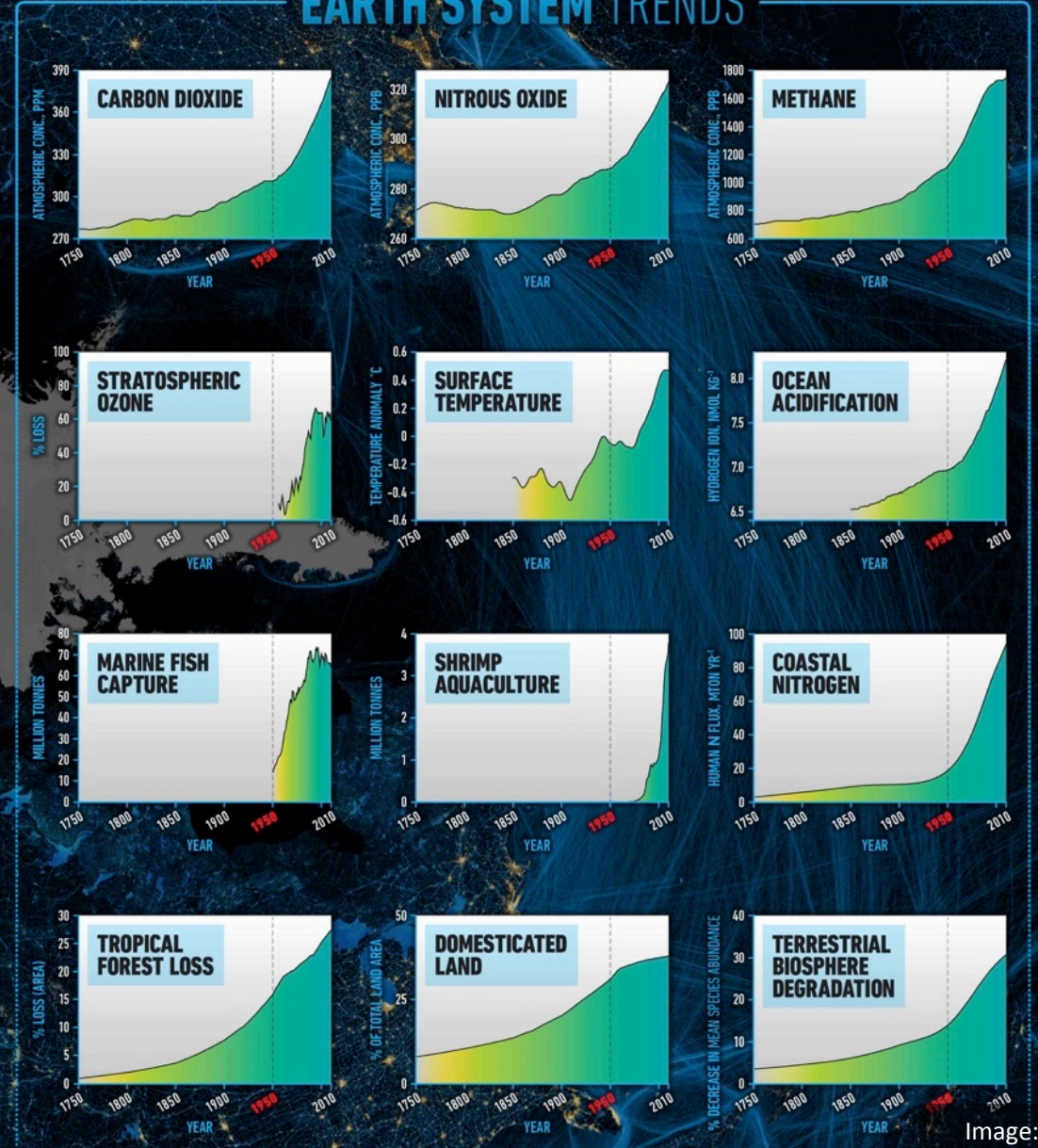


# "the Great Acceleration"

## SOCIO-ECONOMIC TRENDS



## EARTH SYSTEM TRENDS





A satellite image of Earth from space, showing the western coast of South America and the eastern coast of Africa. The image is dark, with the landmasses appearing as lighter, textured shapes against the deep blue of the oceans. A thin green line is visible in the upper left corner, possibly a satellite track or a cursor.

**Financial dynamics are not part of existing climate/  
Earth system models**

**There is a large gap in understanding between  
finance economists, ecologists and climate  
scientists**

**Where do we even start?**



- 
- A wide-angle photograph of a massive industrial excavation site. In the foreground and middle ground, a deep, wide pit has been dug into the earth, revealing distinct horizontal layers of soil and rock. The walls of the pit are steep and show signs of erosion and excavation. To the left, a large piece of heavy machinery, possibly a crane or a drilling rig, stands on a flat area. In the far background, a line of wind turbines is visible against a hazy, overcast sky. The overall scene conveys a sense of large-scale industrial activity and land alteration.
- **Extractive activities need funding and owners**
  - **Ownership and direct investments can be used as leverage**
  - **Weak international and national institutions**



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Glencore

## Glencore to li pressure from

Church of England and la  
among shareholders who

Rob Davies

@ByRobDavies

Wed 20 Feb 2019 12:59 GMT



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## Central bankers plan for disruption caused by climate change

More freak weather and rising temperatures threaten more economic shocks



Save



Mark Carney, Bank of England governor © Bloomberg





A climate stress-test of the financial system

**Reputational risk**

**Material risk**

**Core values**

**Direct and indirect exposure**

**Traditional risk analysis  
methods inadequate**

**Late climate action = abrupt  
price adjustments, rapid  
portfolio losses**

Assessing the impact of climate risks and climate policies on the financial system is currently seen as one of the most urgent and prominent policy issues<sup>1,2</sup>. In particular, there is a debate on whether the implementation of climate policies to meet the 2°C target generates systemic risk or, instead, opportunities for low-carbon investments and economic growth. However, data are

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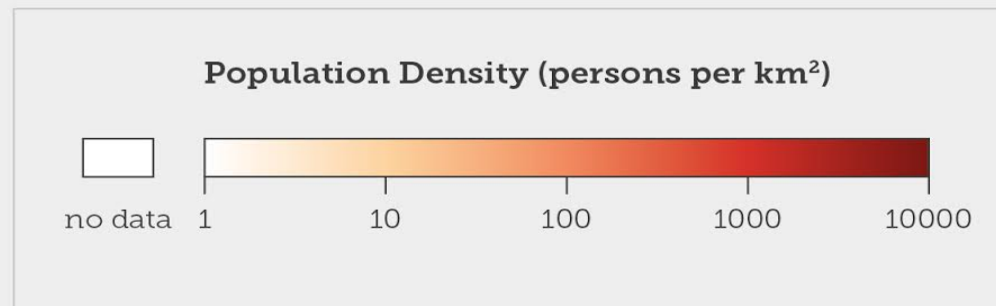
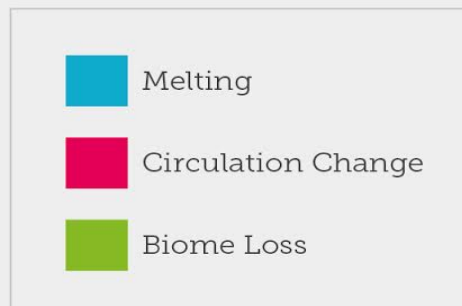


# Tipping Elements in the Earth System



Also known as "sleeping giants"

*Huber, Lenton, and Schellnhuber, in Richardson et al. 2011*

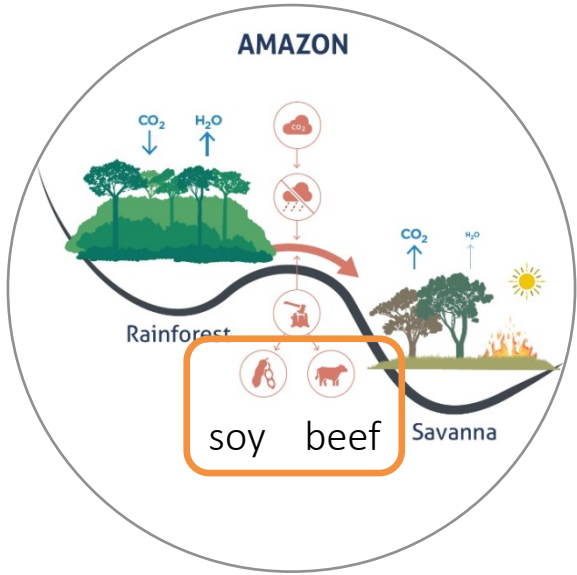




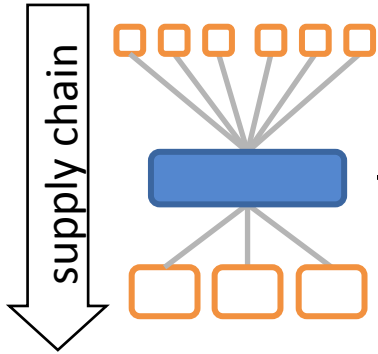
Step 1: Geographical scope



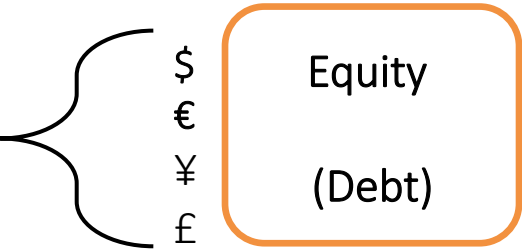
Step 2: Key economic sectors



Step 3: Key economic actors



Step 4: Key financial sources



Step 5: Key financial actors

1	
2	
3	
...	



# Selection of companies

## Soybean processing

5 companies representing



Export value of  
soy products

## Beef processing

3 companies representing



Export value of  
beef products

**AMAZON**

## Wood, pulp and paper sector

### Revenue

4 companies representing



Total revenue of top 50  
companies in the sector  
in Russia

### Forestry concessions

18 companies representing



Industrial forest  
tenure area in  
Canada

**BOREAL FORESTS**



# 'Financial Giants'

Financial institutions with  
influence in several "tipping  
elements" *at the same time.*





# **Top 5 Financial Giants** **(stock ownership in million USD, 2016)**

**BlackRock**  
**8,0 billion USD**

**State Street**  
**4,8 billion USD**

**Norwegian Funds**  
**2,1 billion USD**

**Vanguard**  
**6,8 billion USD**

**Dimensional Fund Adv**  
**1,1 billion USD**





# 'Big Three'

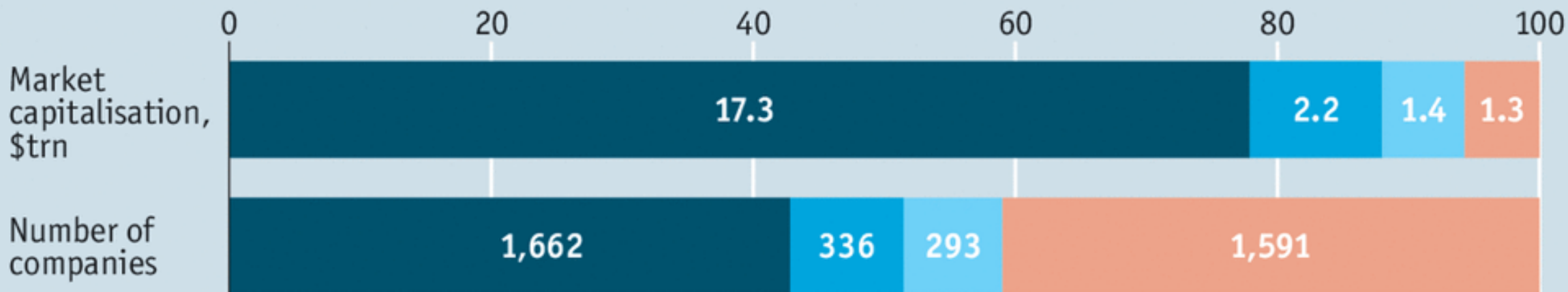
## Blackrock, Vanguard, State Street

### Powers of concentration

Ownership of US listed companies\*, %

Where the shareholding of the Big Three investment firms† is the:

■ largest ■ second largest ■ third largest ■ Big Three not among the largest shareholders



Source: "Hidden Power of the Big Three?",  
Fichtner, Heemskerk and Garcia-Bernardo, 2016

\*June 1st 2016 †BlackRock, Vanguard, State Street

## The architecture of power: Patterns of disruption and stability in the global ownership network

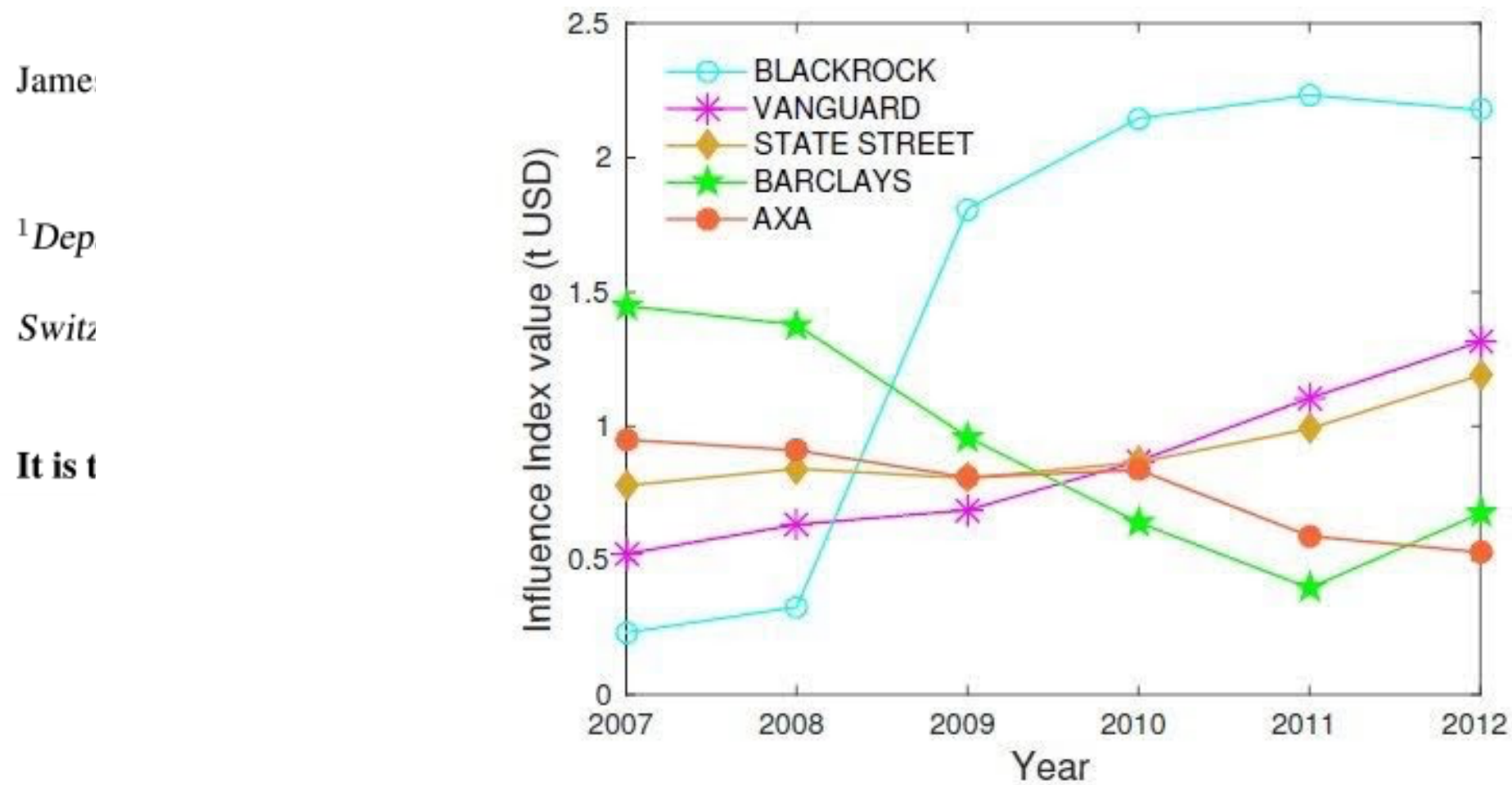


Figure S16. Evolution of a selection of top influencers. BlackRock is seen rising while the former number one, Barclays, is in decline.



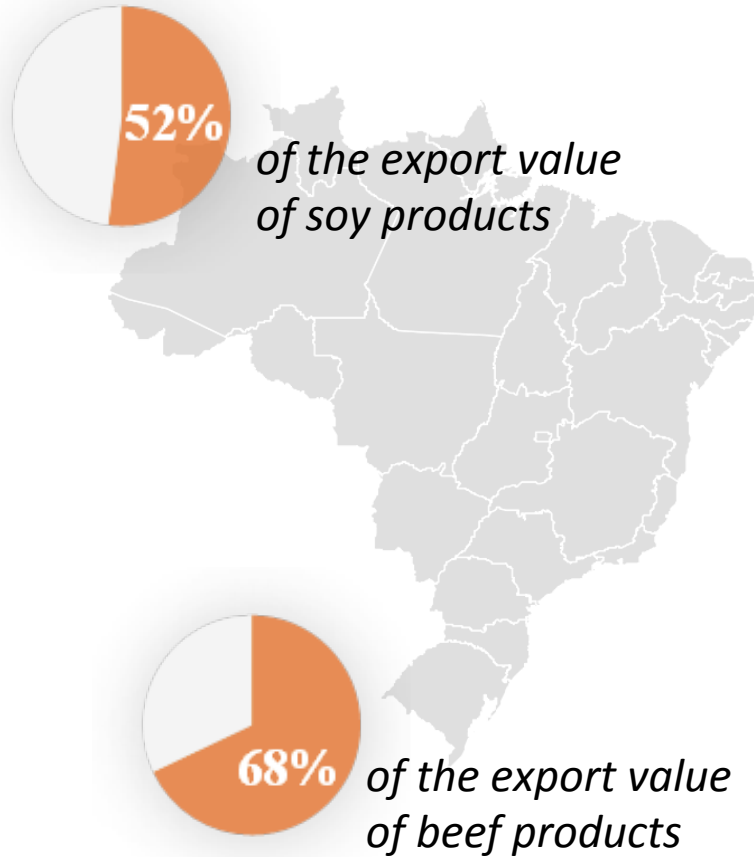


**This can be downscaled to get an even more detailed picture of financial ‘telecoupling’**

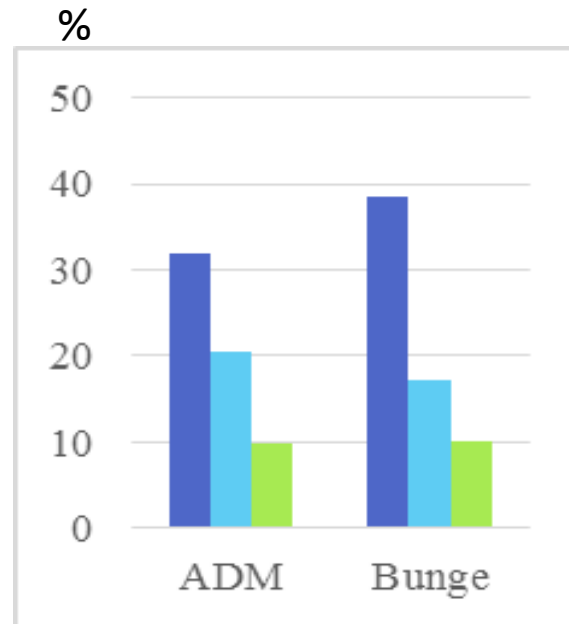
**Note: Work in progress**

# Total ownership by prevalent stockholders in the selected companies

*Selected companies represent:*

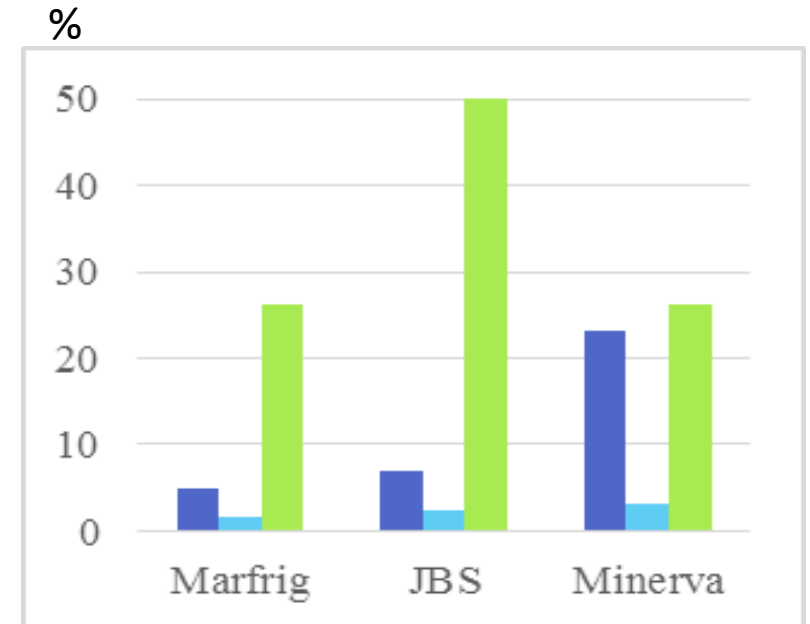


**a. Amazon, Brazil  
Soy sector**



**0% or unknown:**  
Amaggi  
Cargill  
Louis Dreyfus

**b. Amazon, Brazil,  
Cattle sector**



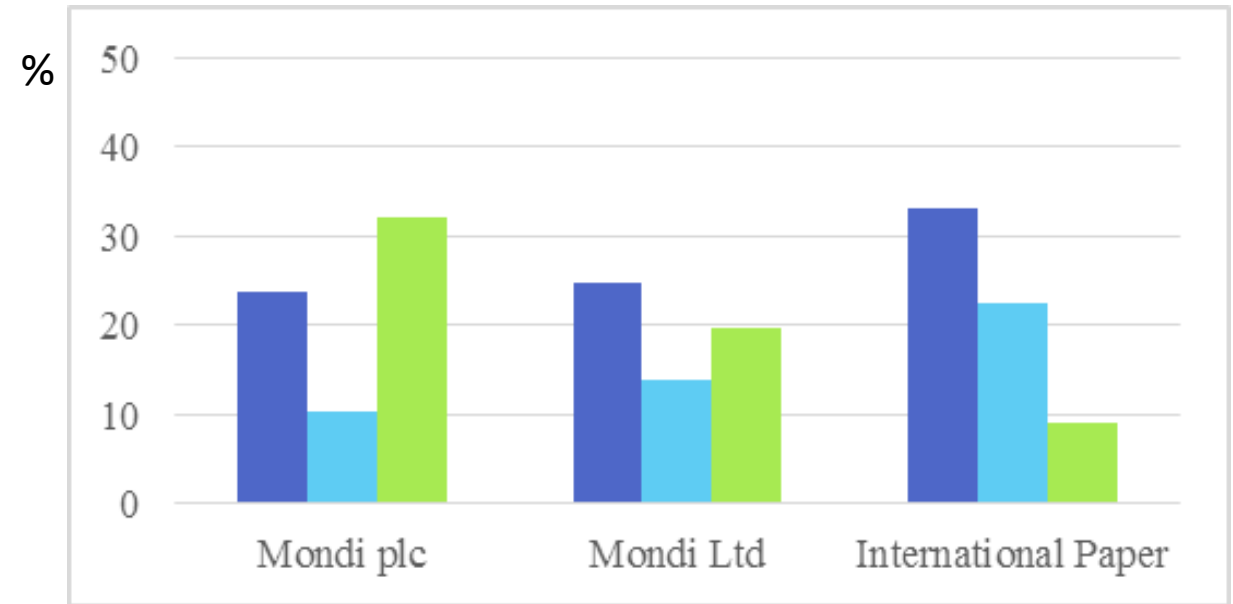
■ % owned by the 15 prevalent stockholders  
■ % owned by the "Big Three"  
■ % owned by the actual largest stockholder



# Total ownership by prevalent stockholders in the selected companies



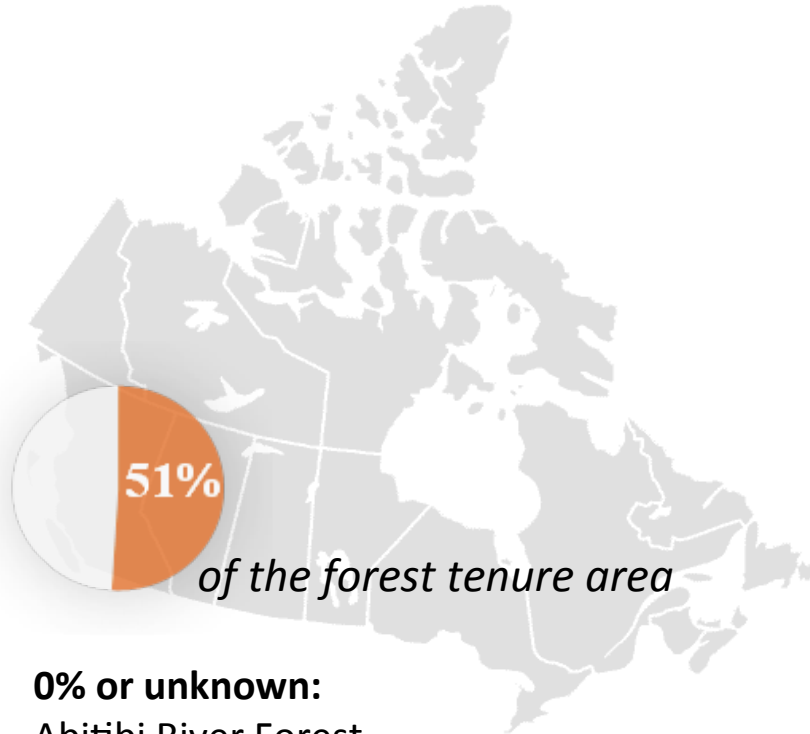
## c. Boreal forests, Russia Timber, pulp and paper sector



0% or unknown:  
Ilim  
Segezha

- % owned by the 15 prevalent stockholders
- % owned by the "Big Three"
- % owned by the actual largest stockholder

# Total ownership by prevalent stockholders in the selected companies

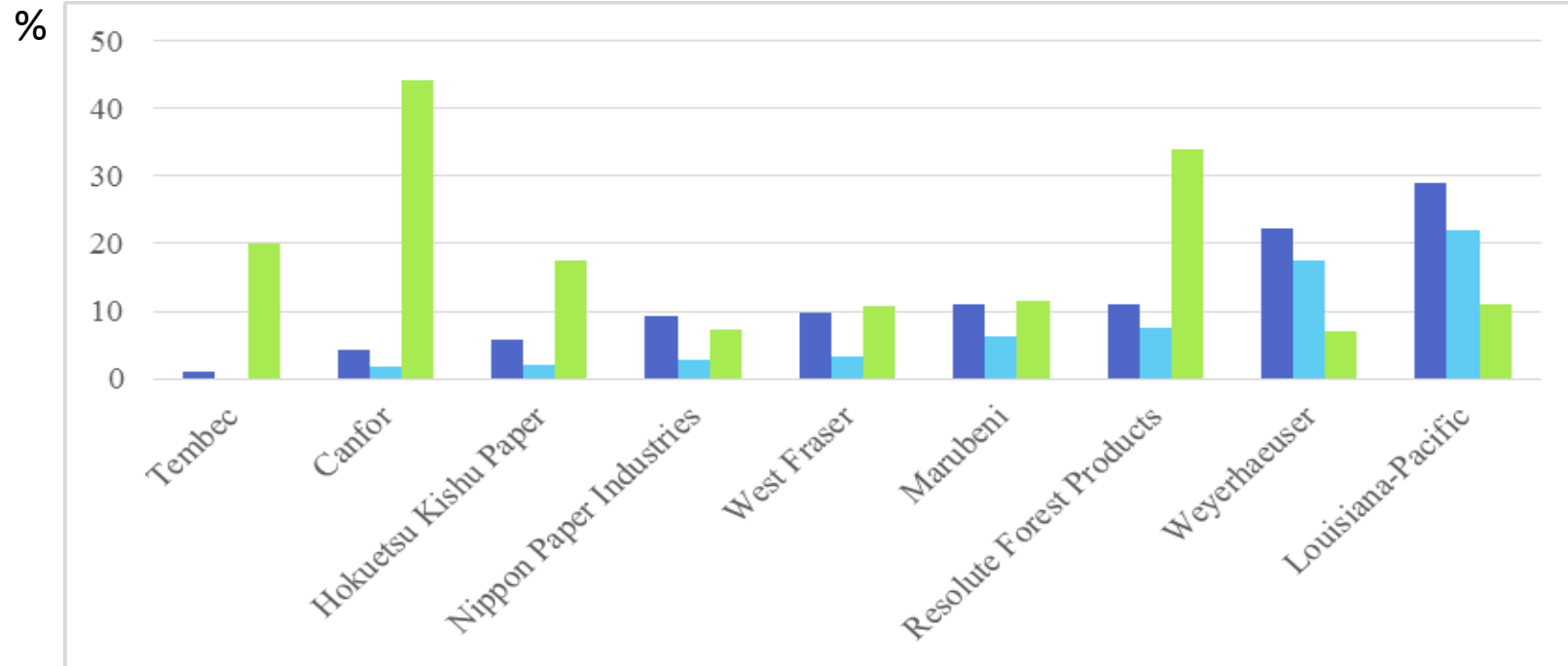


## 0% or unknown:

Abitibi River Forest Management  
Ainsworth  
Arbec Forest Products  
Boisaco  
Canadian Kraft Paper  
Cassiar Forest Corporation  
Northland Forest Products

Conseil des montagnais du Lac-Saint-Jean  
Sakâw Askiy  
Tolko

## d. Boreal forests, Canada Timber, pulp and paper sector



■ % owned by the 15 prevalent stockholders  
■ % owned by the "Big Three"  
■ % owned by the actual largest stockholder



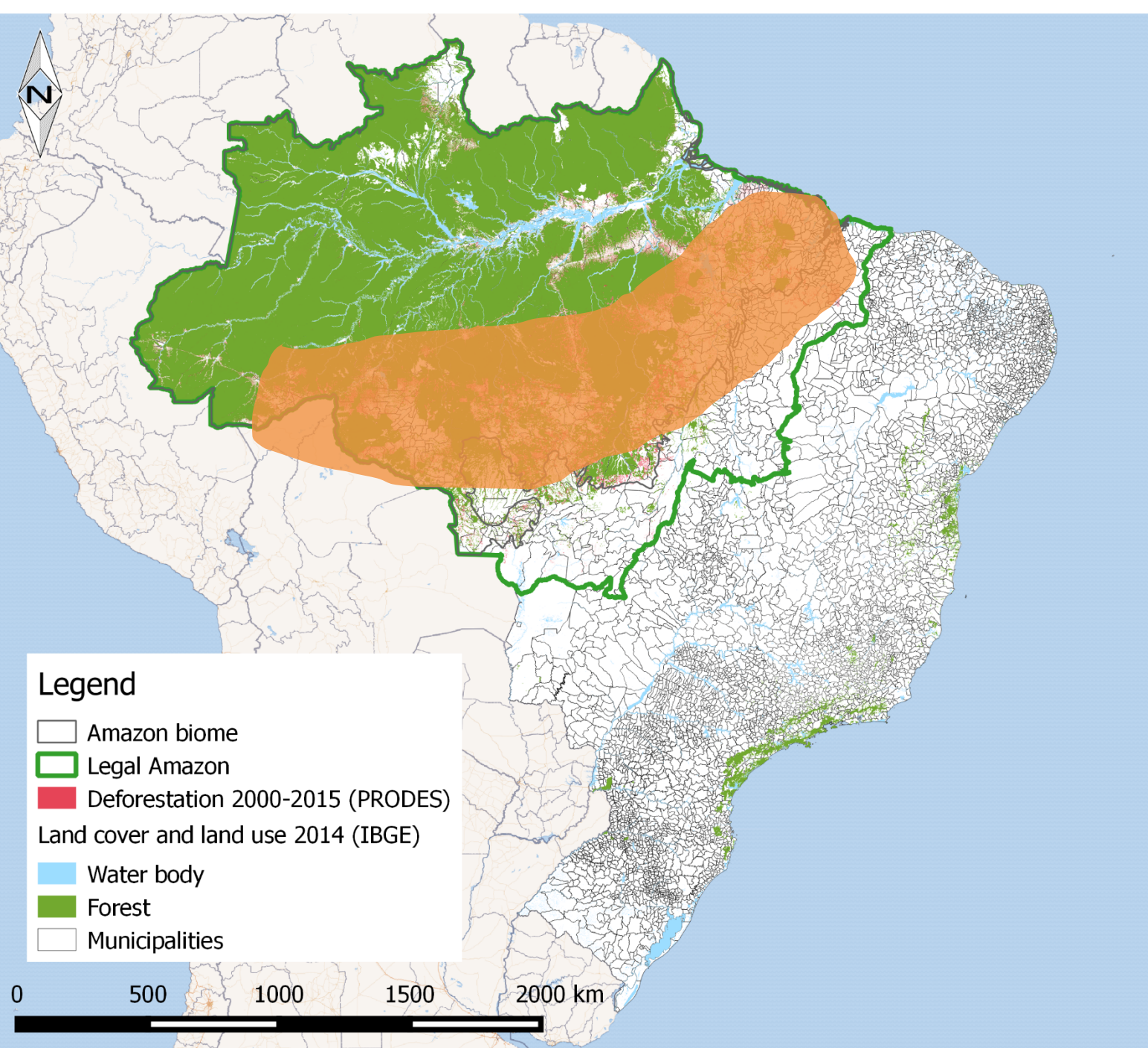


**‘Financial Giants’ reach the 10%-threshold in**

- 3 of 6 companies\* in the Amazon**
- 4 of 18 in Canadian boreal forests**
- 2 of 4 in Russian boreal forests**
- In 6 of the 30 companies, the ‘financial giants’ collectively represent the largest single stockholder.**

**\* Publicly listed companies, 16 of 30 in sample.**

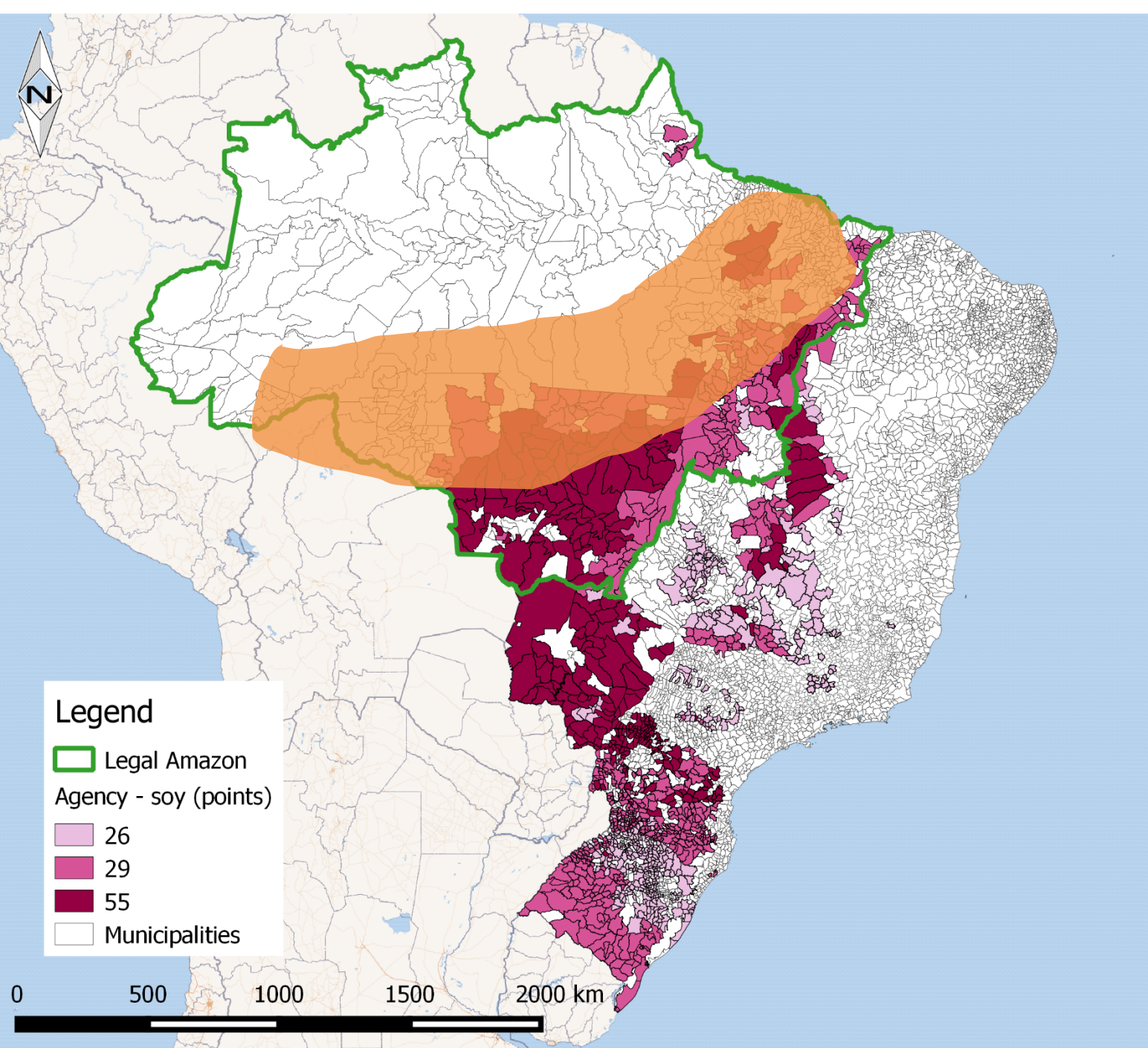




**Map 5.** Forest cover and deforestation in the Brazilian Amazon, 2000-2015

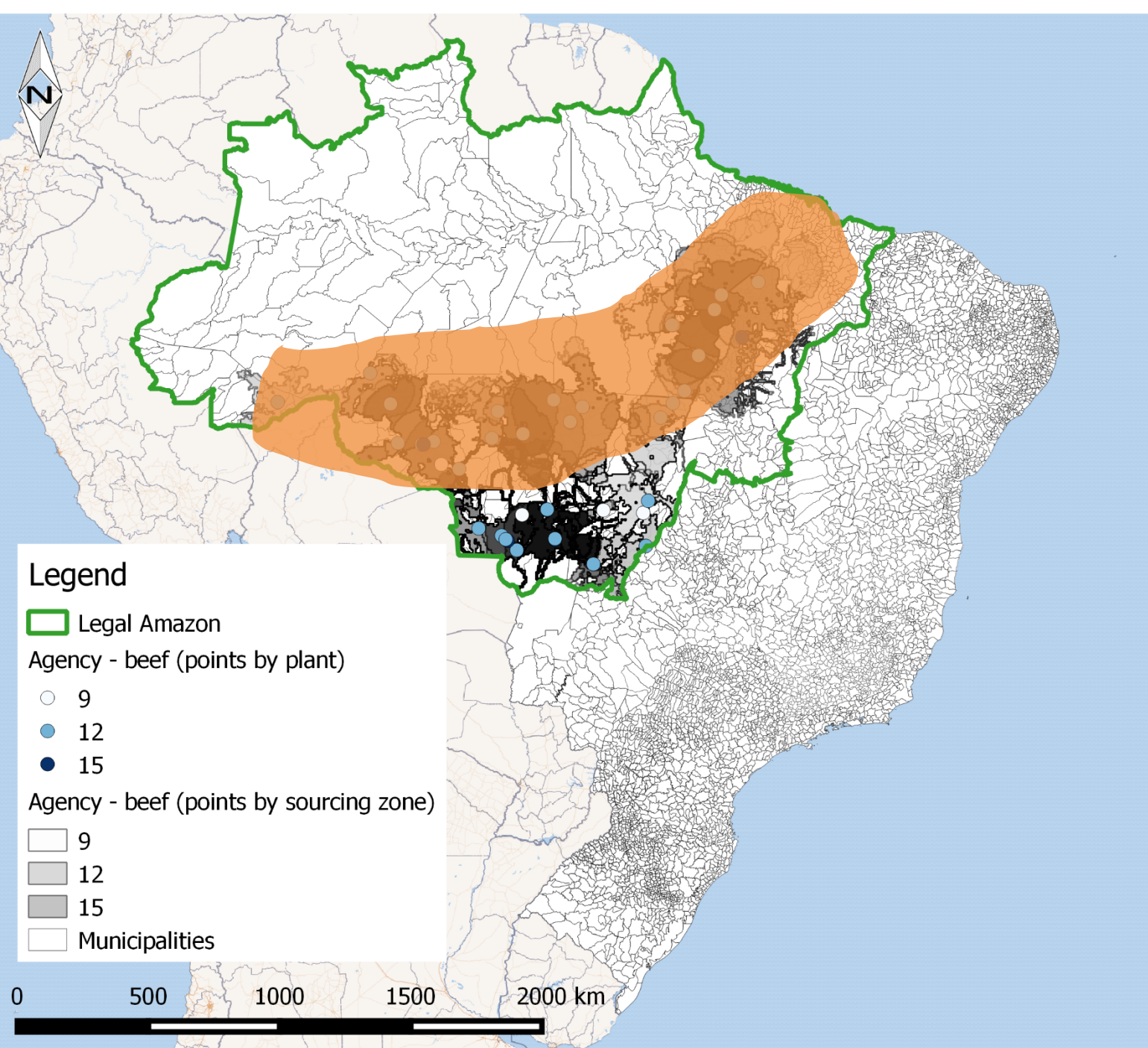
Source of data: PRODES 2016, IBGE 2015, IBGE 2017, INPE 2017, Global Forest Watch 2017





**Map 2. Soy agency map:**  
Scoring of financial giants'  
potential agency in the soy  
sector in Brazilian  
municipalities

Source of data: Trase.earth 2017, Orbis 2017,  
IBGE 2017, INPE 2017



**Map 4. Beef agency map:**  
Scoring of financial giants' potential agency in the beef sector in Brazilian municipalities (scores by sourcing zones are overlaid when zones are overlapping)

Source of data: Imazon 2017, Orbis 2017, IBGE 2017, INPE 2017





# What does Japanese stock ownership in "sleeping giants" look like?

## a) Tipping elements – Amazon and boreal forests

Amazon: soy, beef

Boreal: wood, pulp, paper

## b) Borneo deforestation

Palm oil, timber



# Data extraction

Strategic selection of companies (sectors, impact)

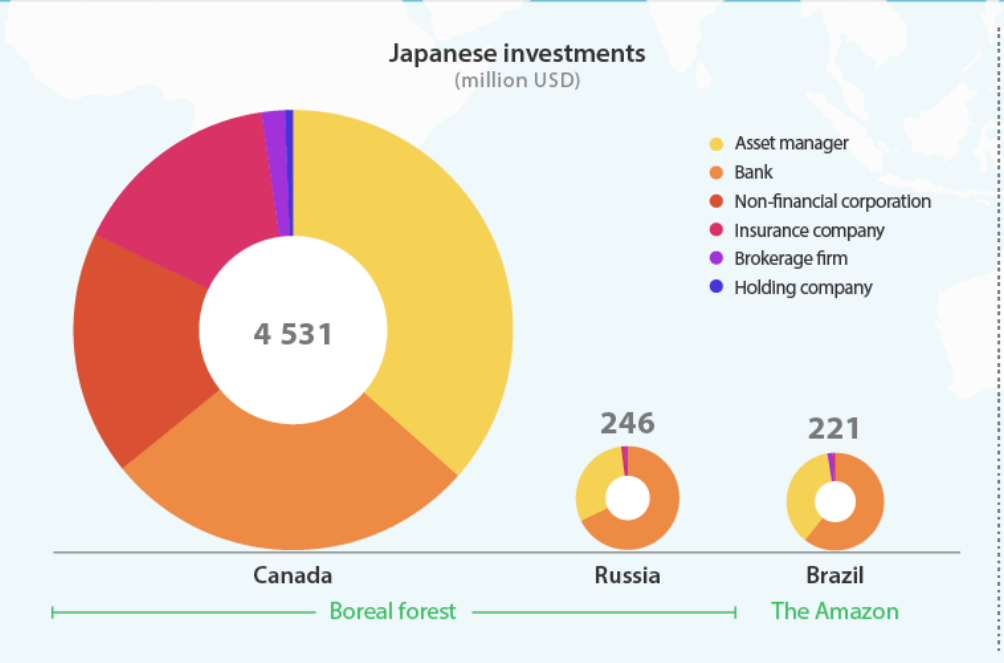
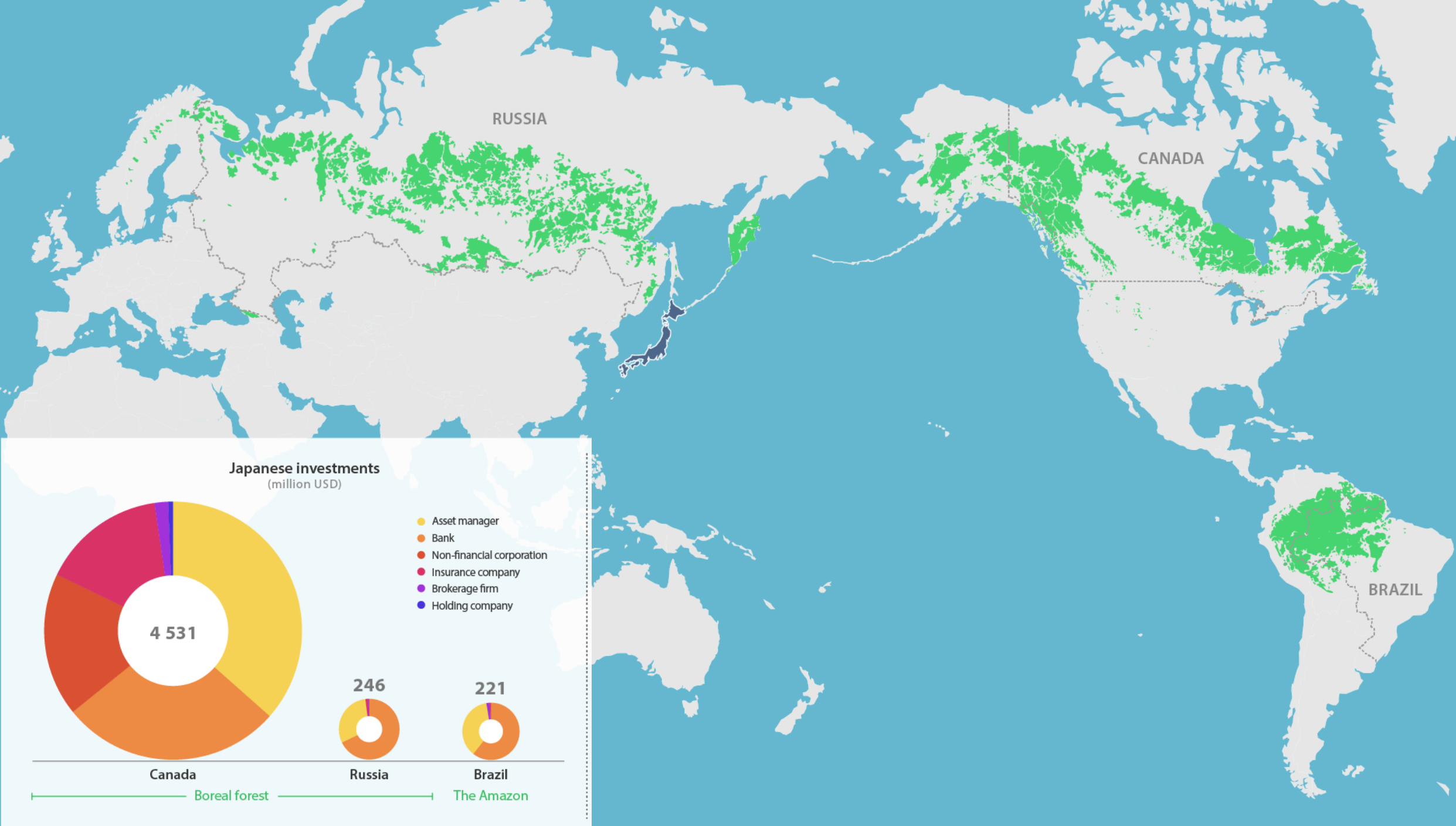
Borneo: 26% of total area of concessions , 18 million ha (2017)

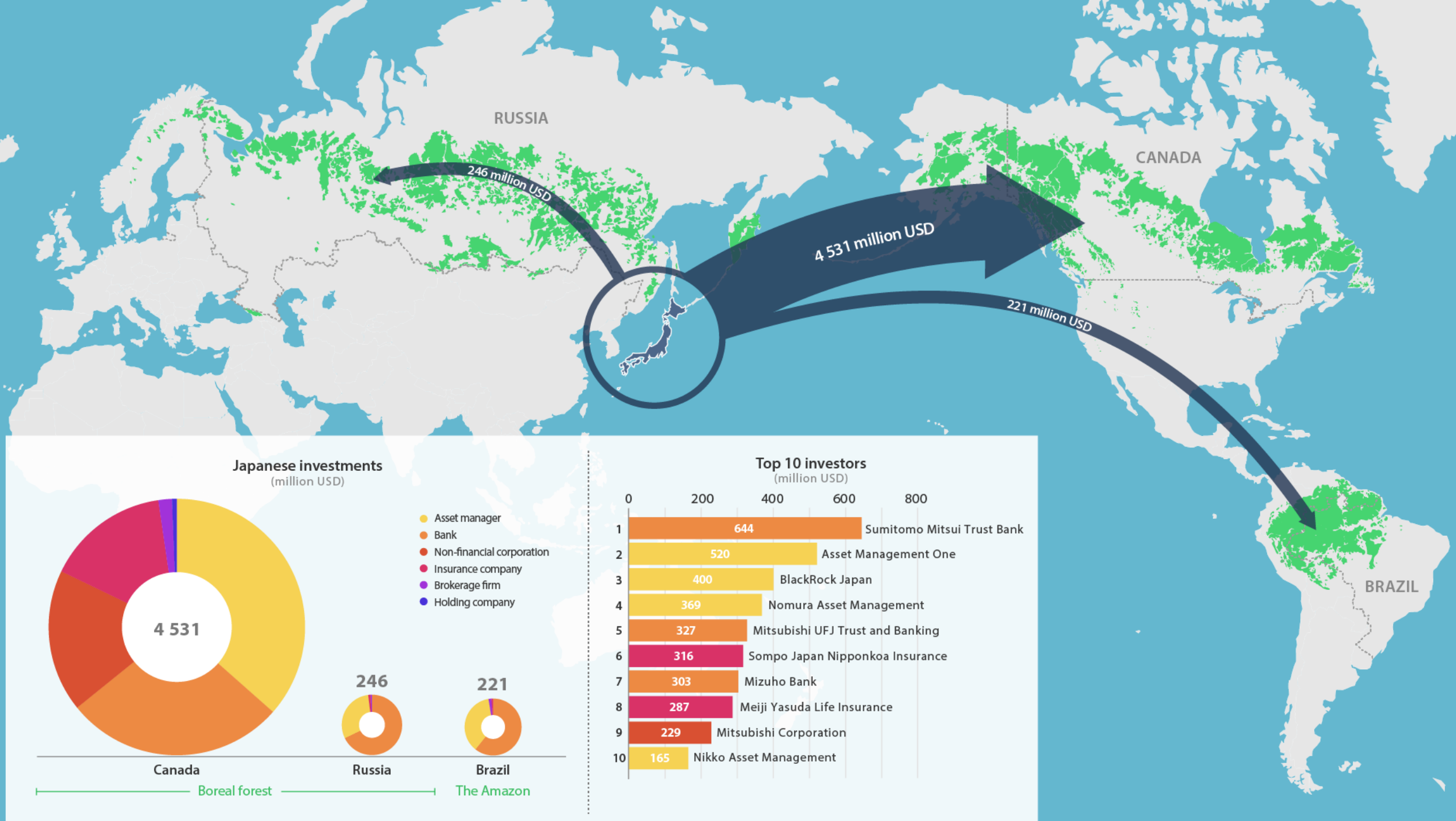
Stock ownership (publicly listed, *Eikon Thomson Reuters*)

Snapshot: 2018-12-31

**Note: all data work in progress**









# Singapore ownership "tipping elements"

Table 2: Singapore investments in the TE19 (2017-12-31), per Biome



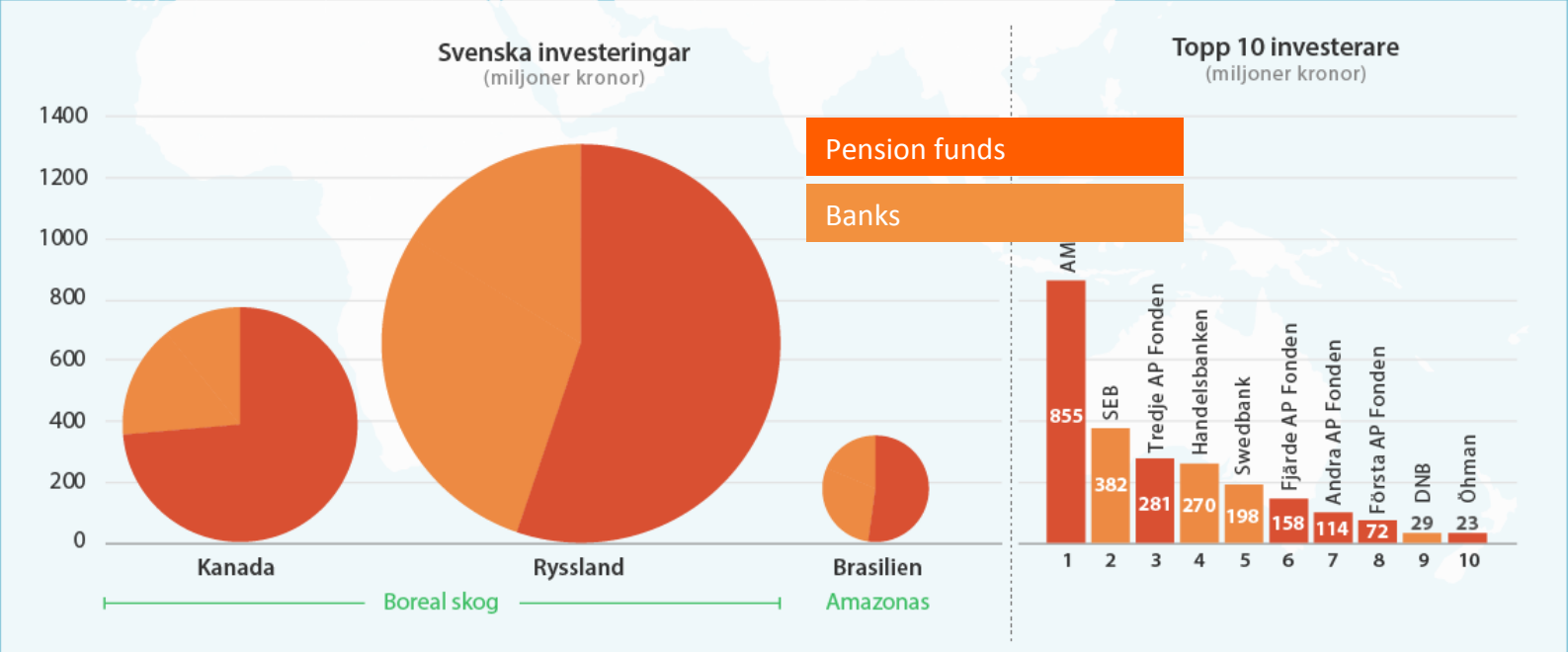
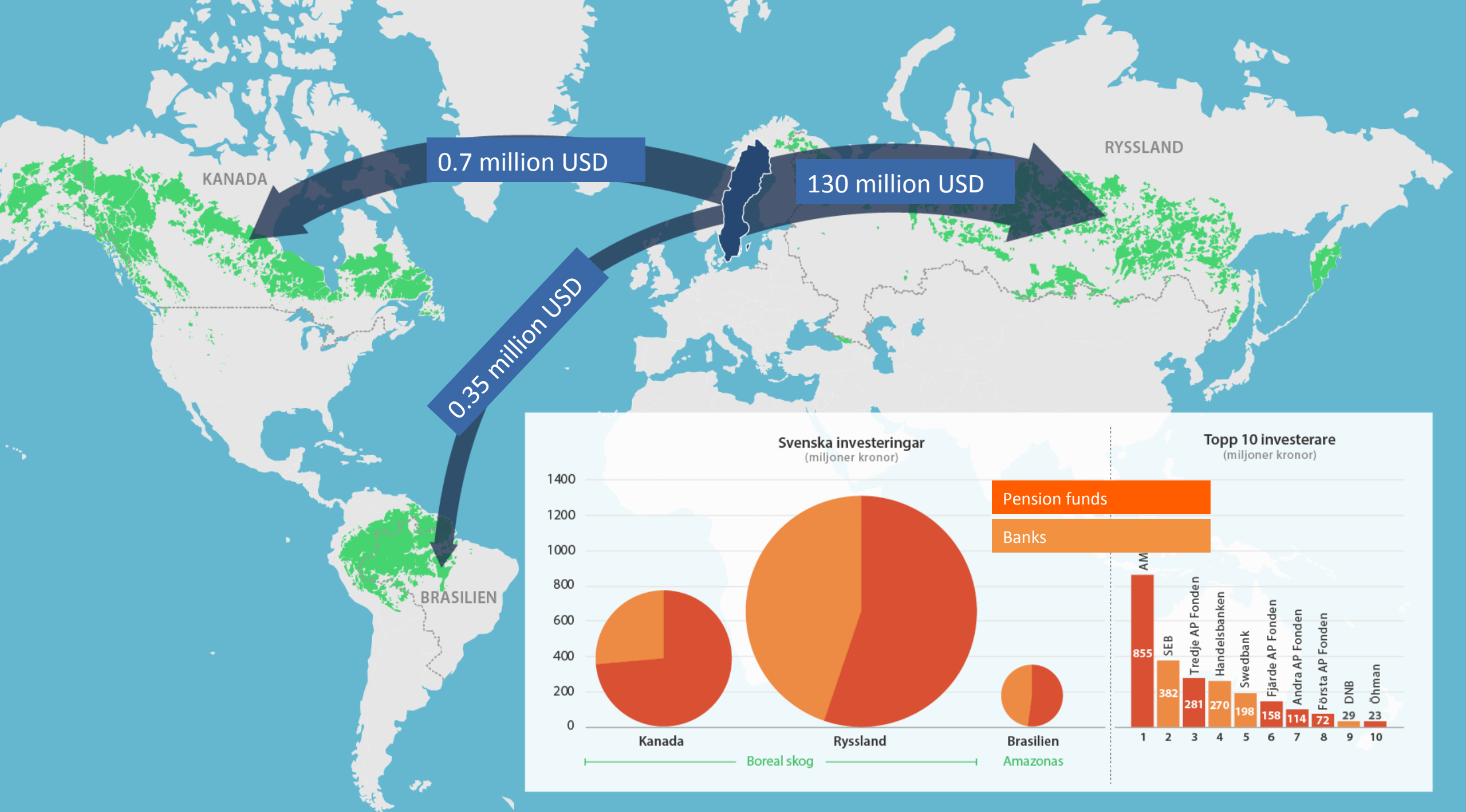
Biome of interest	Investment Manager sub-type	# investors	Total Value (USD)	% all Singapore TE19 investments
Boreal, Canada	Asset Manager	8	\$211,026,395.92	77.2094%
	Brokerage Firm	1	\$1,895,157.94	0.6934%
	<b>TOTAL</b>	<b>9</b>	<b>\$212,921,553.86</b>	<b>77.9028%</b>
Amazon, <u>Brasil</u> (beef)	Asset Manager	2	\$23,074,768.65	8.4425%
	<b>TOTAL</b>	<b>2</b>	<b>\$23,074,768.65</b>	<b>8.4425%</b>
Boreal, Russia	Asset Manager	6	\$20,333,976.44	7.4397%
	<b>TOTAL</b>	<b>6</b>	<b>\$20,333,976.44</b>	<b>7.4397%</b>
Amazon, <u>Brasil</u> (soy)	Asset Manager	4	\$16,545,627.33	6.0536%
	Bank	1	\$440,880.00	0.1613%
	<b>TOTAL</b>	<b>5</b>	<b>\$16,986,507.33</b>	<b>6.2150%</b>

# Singapore ownership "tipping elements"

Table 3: Singapore investors in the TE19 (2017-12-31) – investor type, value (SGD) of shares held, % total Singapore investments, % total investments in TE19

Investor Name <sup>(1)</sup>	Investor Sub-Type	Total Value (USD)	% Investor Portfolio	% Singapore Shares <sup>(2)</sup>	% Total TE19 Shares <sup>(3)</sup>
Ichigo Asset Management International, Pte. Ltd.	Asset Manager	\$204,207,449.30	5.59%	74.7146%	0.1973%
Eastspring Investments (Singapore) Limited	Asset Manager	\$26,169,984.48	0.07%	9.5750%	0.0253%
Vanguard Investments Singapore Pte. Ltd.	Asset Manager	\$18,542,943.02	0.93%	6.7844%	0.0179%
BlackRock (Singapore) Limited	Asset Manager	\$12,358,299.98	0.37%	4.5216%	0.0119%
Aberdeen Asset Management (Asia) Ltd.	Asset Manager	\$4,432,920.77	0.00%	1.6219%	0.0043%
Wellington International Management Company Pte. Ltd.	Asset Manager	\$3,868,823.81	0.25%	1.4155%	0.0037%
Dynamic Technology Lab Pte Ltd.	Brokerage Firm	\$1,895,157.94	0.34%	0.6934%	0.0018%









**Japanese ownership is (compared to SE and SG):**

**More diverse (asset managers, insurance inst, etc)**

**Considerably larger in total (250 million vs. 5 billion USD)**

**Boreal forests in Canada**



# Borneo data

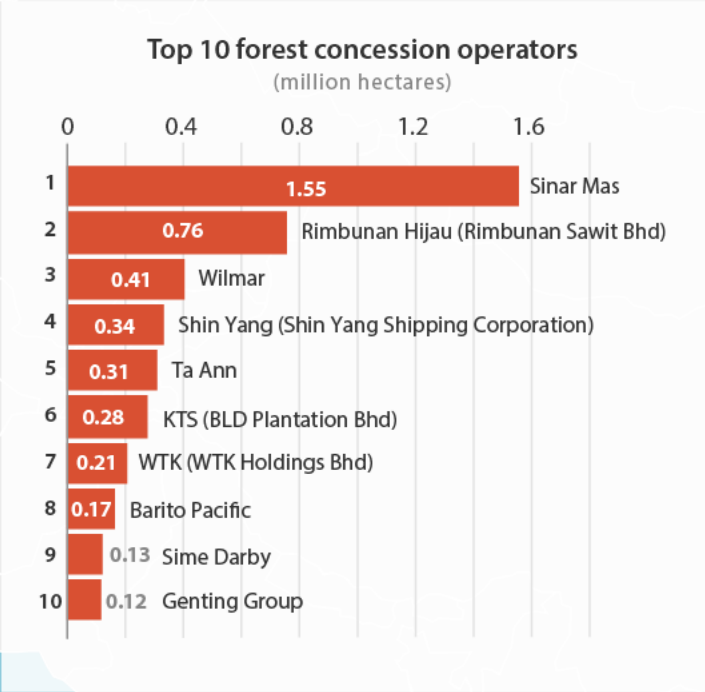
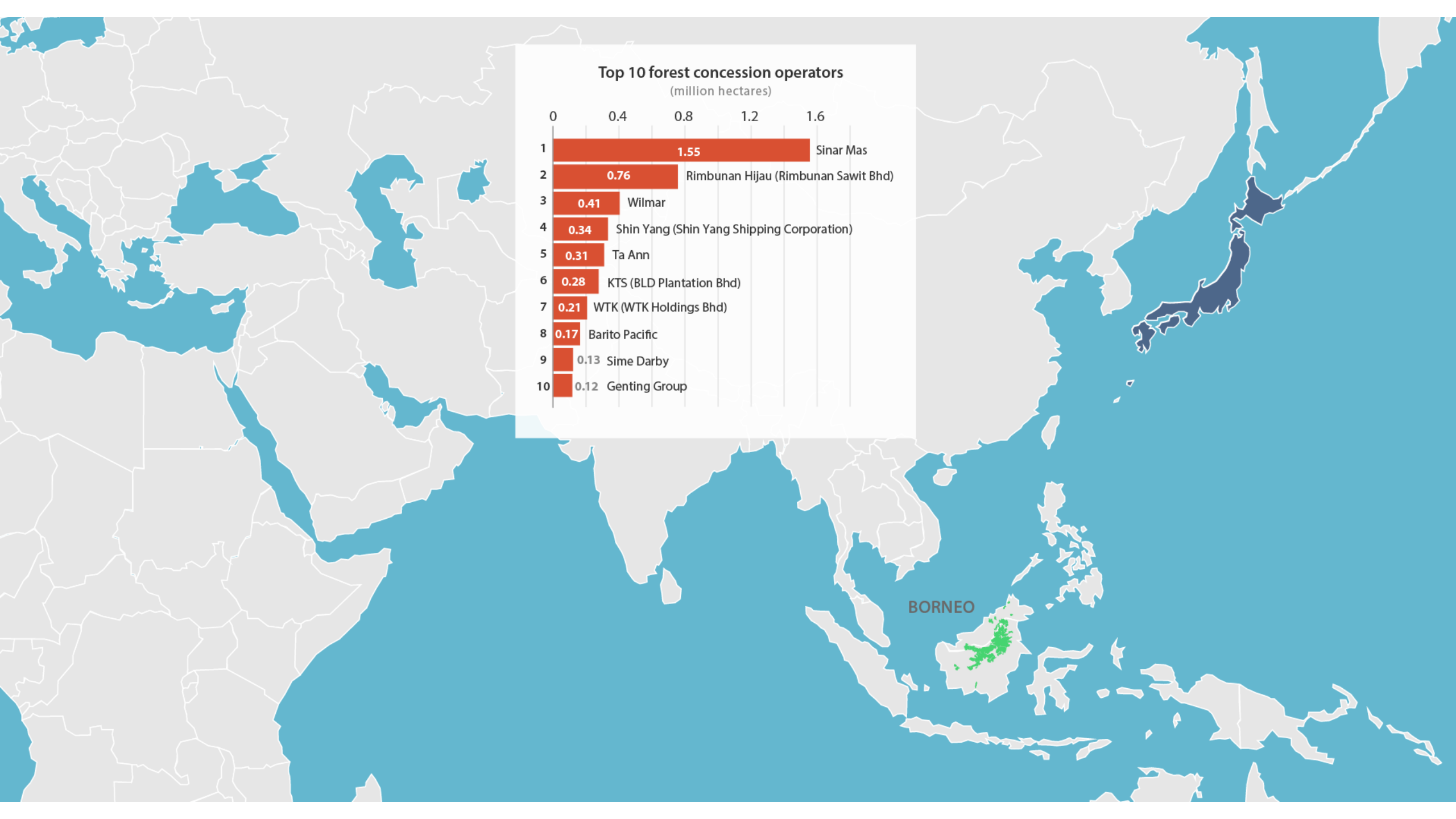
Global Forest Watch data (2014)

**Wood-fibre and oil-palm concessions**

**Aggregated by company group**

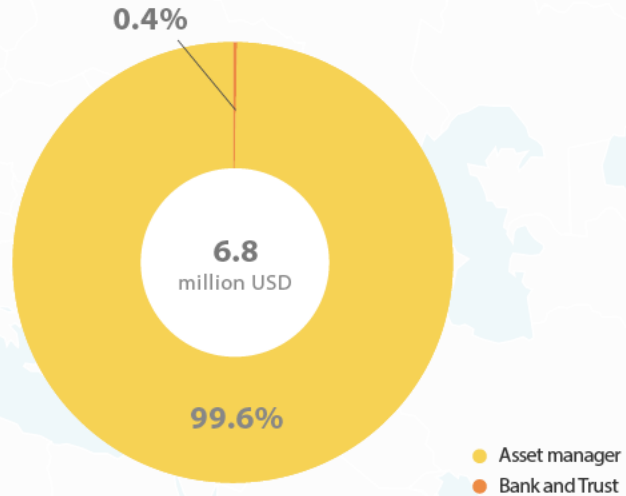
**Top 19, publicly listed = 26% of total concession area**





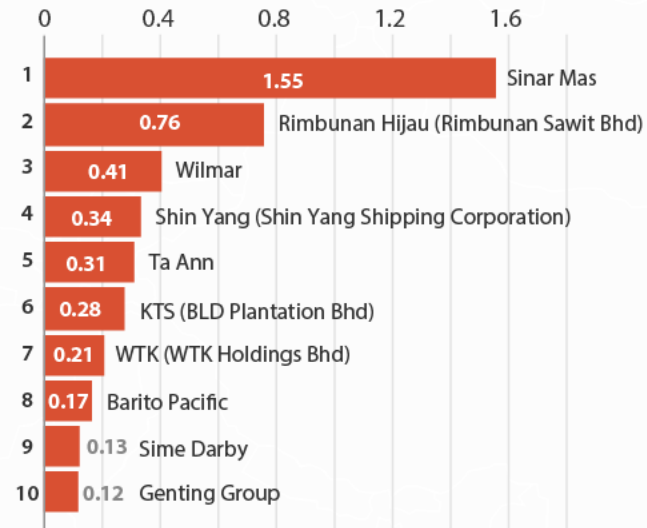


### Japanese investments



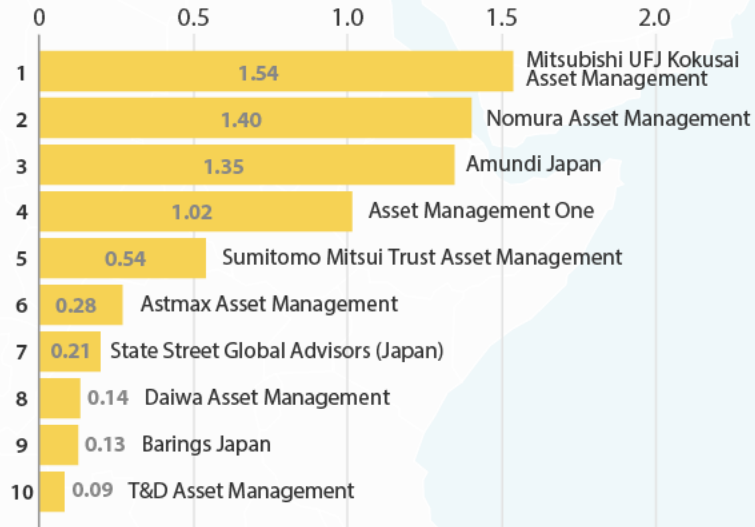
### Top 10 forest concession operators

(million hectares)



### Top 10 investors

(million USD)



BORNEO

6.8 million USD

Sing

Table 3: Singapore-based investors in Borneo-based companies (as of 2018-12-31) – investor name, type, value (USD) of shares held, % total Singapore-based investments, % total investments


Table 2  
wood-f

oil and  
type



Investor Type	Investor Name <sup>(1)</sup>	Investor Sub-Type	Total Value (USD)	% Investor Portfolio	% Singapore Shares <sup>(2)</sup>	% Total Shares <sup>(3)</sup>	Total BORNEO Shares <sup>(2)</sup>
	Global Cocoa Holdings Ltd	Corporation	\$864,697,134.11	100.00%	31.4889%	2.5653%	
	Kuok (Singapore) Limited	Corporation	\$623,414,787.93	68.76%	22.7024%	1.8495%	
	Hong Lee Holdings Pte. Ltd.	Corporation	\$405,409,920.24	93.29%	14.7635%	1.2027%	
	GIC Private Limited	Sovereign Wealth Fund	\$296,689,170.18	0.44%	10.8043%	0.8802%	
	King Fortune International, Inc.	Corporation	\$112,798,400.00	100.00%	4.1077%	0.3346%	109%
	FIL Investment Management (Singapore) Ltd.	Asset Manager	\$104,021,413.45	1.20%	3.7881%	0.3086%	883%
	Aberdeen Standard Investments (Asia) Limited	Asset Manager	\$76,143,428.33	0.28%	2.7728%	0.2259%	850%
	Monetary Authority of Singapore	Bank	\$70,095,601.39	15.12%	2.5526%	0.2079%	219%
	J.P. Morgan Asset Management (Singapore) Limited	Asset Manager	\$50,613,106.97	1.63%	1.8431%	0.1502%	087%
TOTAL							15%
	Sampoerna Forestry Ltd.	Corporation	\$29,044,854.59	100.00%	1.0577%	0.0862%	



A satellite image of Earth from space, showing the western coast of South America and the eastern coast of Africa. The image is dark blue with white outlines of continents and some cloud cover. A small green line is visible in the upper left corner.

**Converging trends: window for climate action is closing, increased financial influence in “tipping elements” in the climate system.**

**This is an opportunity for individuals in the financial sector, to show pivotal climate leadership.**





# Thank you!

**Will Steffen, Beatrice Crona, Alice Dauriach, Bert Scholtens, Ami Golland, Amar Causevic**

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