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Private financial institution perspectives on climate and nature data[1]

Michael Hugman, Children's Investment Fund Foundation

[1] This presentation was prepared for the conference. The views expressed are those of the author and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the event.

WHY A CLIMATE & NATURE SOVEREIGN INDEX (CNSI)?

Investors and macroeconomic policymakers urgently need a single, coherent framework in which to understand long-term climate and natural capital risk, at a macroeconomic, country level.

Without a fully integrated macroeconomic assessment, it is impossible to gauge company climate exposure in a framework such as TCFD or the BoE stress tests. Individual company risks can be overwhelmed by the broader risks to inputs, fixed assets and markets, and to sovereign financing shocks.

Ultimately policymakers and investors will need to undertake growth, debt and FX reserve modelling for all countries will have to incorporate climate and natural capital risks. Financial market responses to physical and transition risks may be non-linear i.e. sudden stops in capital for countries at risk if positive action is not taken today.

To provide a concrete initial solution to these challenges (whilst a broad coalition is brought together to undertake detailed macro-modelling) we believe a cross-country climate and nature sovereign index (CNSI) is urgently needed. This would capture the various structural economic and financial factors that would be later elaborated in country-specific modelling. **This requires a different approach to environmental risk index construction to those currently available**.

Such a macroeconomic framework needs to encompass natural capital as well as climate, the two are interlinked at a country/macro level, and over the next 5 years there will be a greater policy focus on natural capital. It is likely there will be a TNFD[1] to accompany TCFD in the near future.

The Bank of England stress tests and UNEP FI pilot set out a path in this direction, but the absence of robust macro modelling, with the full range of necessary real-time measures across the majority of countries, will constrain progress.

To maximise the value of this index and build towards fully fledged economic modelling the future, the index will incorporate real-time data and forward-looking projections made possible by ongoing work in geospatial modelling and remote sensing. In particular, we have focused on indicators based on modelling from the CIMP5 IPCC climate model ensemble where relevant, avoiding indicators based on older vintages of climate models.

The CNSI is complimentary to policy oriented indices such as the Yale Environmental Performance Index, as we propose a greater breadth of economic and financial indicators to provide linkages on materiality for investors (in particular in fixed income). To summarise, the proposed CNSI:

1. Uses real-time and forward projections wherever possible;
2. Covers natural capital and transition risk exposures, as well as climate risks traditionally measured in indices;
3. Makes explicit the channels of economic and financial linkages to maximise the value of the index to investors and policymakers, using a taxonomy aligned to investor needs:
    a. Biodiversity and natural capital;
    b. Physical risk (atmospheric, water and agriculture);
    c. Transition risk;
    d. Resilience.

[1] Task force for natural capital-related financial disclosures.

INDICATOR SELECTION AND STRUCTURE

This CNSI would build on the work of ND-Gain and Moody's amongst others, whilst enhancing the set of indicators to increase its applicability to portfolio risk assessment. This would create an index which would facilitate cross-country comparison, and to allow for assessment of company exposure to risks in their physical sources of production and demand.

This index would also allow the direct scoring of sovereign assets within portfolios.

The proposed set of indicators is shown in detail further below (Appendix 1) and is designed to capture overall economic and financial channels of exposure to both physical and transition risk from climate and natural capital deterioration. Indicators are chosen to be real-time or forward looking wherever possible, and to reflect the full breadth of economic and financial impacts that will have to be further developed in subsequent country-level economic modelling.

Given the inherent uncertainty of measurement of environment risk, in particular future projections, we have taken an inherently ensemble approach to index construction in two dimensions. First, from underlying data sources build on statistical models, we have taken ensemble means of those models. Second, we have included more than one approach to measuring certain key environmental risk channels such as heat and drought, in order to try and reduce uncertainty through model averaging.

1. **Biodiversity and natural capital - Degradation or loss in ecosystems/biomes (natural capital)** and ecosystem services which undermine existing economic functions e.g. pollinators, coastal biomes, water yield

    a. Level and trends of loss of natural capital, including real time deforestation data.
    b. Data on level and trends of protection of ecosystems and biomes, terrestrial and marine.
    c. Geo-spatially based estimates of long-term economic loss of natural capital degradation.

2. **Physical Risks (both chronic and acute)**

    a. Atmospheric – current trends and projected impacts of acute climate events and long-term global warming, droughts.
    b. Water – acute risks from flooding, chronic risks from sea level, impact on groundwater
    c. Agriculture – risks to food production capacity

3. **Transition risks**

    a. Energy production and exports exposed to 'inevitable policy response' in global trade policy.
    b. Capacity to adapt to positive trends in decarbonisation, ecosystem preservation.

4. **Resilience**

    a. Resilience in sovereign credit rating, fiscal space
    b. Resilience in balance of payments and FX reserves
    c. Resilience in existing socio-economics outcomes e.g. health

CALCULATION AND WEIGHTING

1. **Materiality must be embedded in the index calculation** – two countries with roughly minimal exposure to a particular risk should both score close to zero for that measure. Hence a cross sectional standardization per measure, scaled to 0-1, will be taken from each metric. All indicators are transformed such that 1 reflects maximum risk, 0 a minimum.

2. **Outliers retained** - given the widespread documentation of the non-linear impact and costs (loss and adaptation) of climate and natural capital, outliers will be retained to reflect countries that face extreme tail risk from one or more factors.

3. Where possible all **measures are scaled relative to a base** e.g. GDP, total revenue for cross-country comparability.

4. In order to avoid further complexity, in terms of arbitrarily determining country by country materiality, we have selected approximately **equal numbers of indicators across the different sub-components of the index** set out above.

5. In order to reflect the importance of non-linearities in environmental risks, we will then apply a **geometric mean**[2] in each subcomponent, and across the overall index as a whole. Geometric means penalise countries with similar simple arithmetic means but greater dispersion, as one of two very weak scores suggest particularly acute risk which should carry a higher weight.

6. In order to deliver on all of the above aims of index construction, a specific approach has been developed to achieve 0-1 scaling in a way which ensures approximately equal contributions from each indicator, where we define equal contributions as the cross sectional arithmetic average of that score between 0.3 and 0.7. This is achieved by applying the following formula to generate score S_i for country i from raw metric X_i:

$$S_i = \frac{X_i - Percentile(X,k)}{Percentile(X,k) - Percentile(X,j)}$$

   Where $k = \{1, 0.99, 0.9\}; j = \{0, 0.01, 0.1\}$

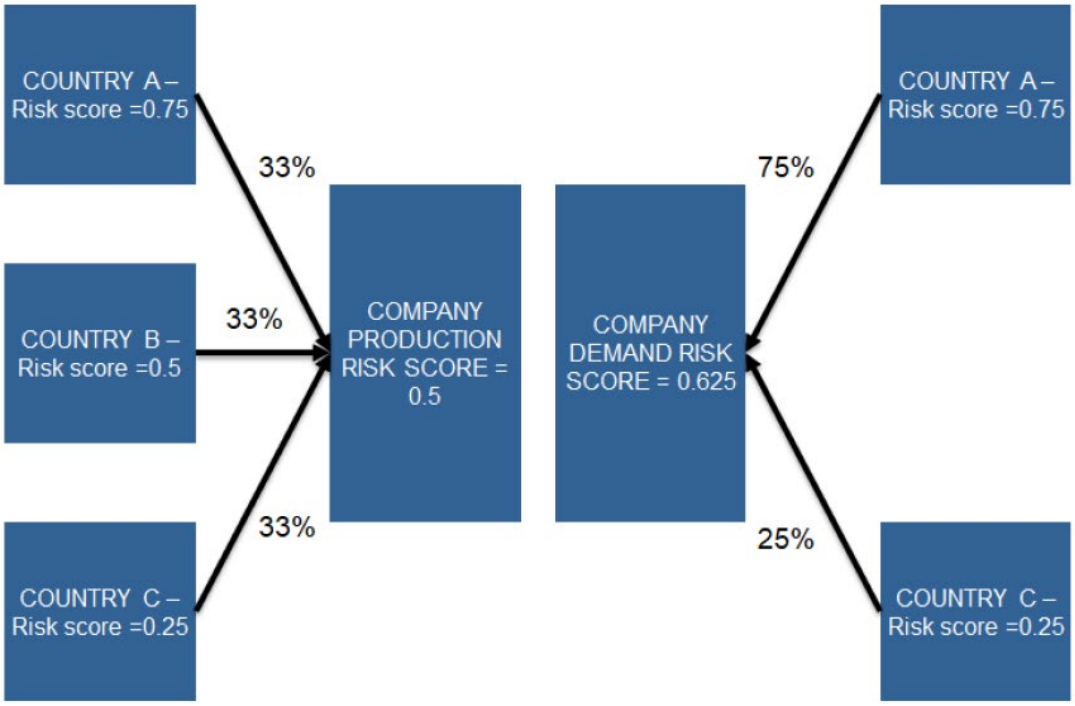
   (noting that variables must be inverted where (i) a higher score signifies lower risk (ii) where scores sits partially or entirely <0).

7. Further issues around calculation and updating are covered in Appendix 2.

[2] https://mathworld.wolfram.com/PowerMean.html

APPLICATION TO PORTFOLIOS

1. Direct score can be obtained for sovereign asset exposure as weighted sum, should be duration adjusted to reflect greater long-term risks from both physical and transition, which are non-linear in time[3].
2. For corporate exposures, Bloomberg functionality providing geographical mapping of country production and revenue mix can be used to create a spatially weighted measure of each corporates production and revenue risks:



At present, complexities and interactions/non-linearities/feedback loops present difficulties in distinguishing which exact factors will have a greater impact on production vs demand risks on each company. E.g. A manufacturer producing in a country which faces high exposure to physical or transition risks relating to the agricultural sector and wetlands may appear less exposed initially. However, over the long-run that company may face significant increases in tax burden or sovereign funding risks as indirect channels. So even though that manufacturers direct business may have less short-term environmental exposure, longer-term those risks can come through sovereign financing risk or other channels. Companies based in countries with poor energy grid mixes will have to declare under TCFD, again creating new risks for companies which initially appear moderately exposed.

Hence the proposed index would be applied uniformly as a measure of production and demand risk as a first stage application.

[3] Further work will be required on a country by country basis to look at the temporal distribution of risks and potential tipping points both in the underlying macroeconomic outcomes and in financing e.g. sudden stops and climate insolvency.

Appendix 1 - Indicators

	Source
NATURAL CAPITAL/BIODIVERSITY	
Forest rents as % GDP	World Bank, OECD
Deforestation trends over last decade	GFW
GLAD weekly deforestation where avaible	GFW/WRI
Land cover change	https://www.protectedplanet.net/c/world-database-on-prote
Land cover change within KPA	https://www.protectedplanet.net/c/world-database-on-prote
Land cover fragmentation	https://www.protectedplanet.net/c/world-database-on-prote
Land cover fragmentation within KPA	https://www.protectedplanet.net/c/world-database-on-prote
Land productivity	https://www.protectedplanet.net/c/world-database-on-prote
Land productivity within KPA	https://www.protectedplanet.net/c/world-database-on-prote
2050 GDP growth loss from pollination	WWF/Purdue/Minnesota
2050 GDP growth loss from coastal protection	WWF/Purdue/Minnesota
2050 GDP growth loss from water yield	WWF/Purdue/Minnesota
2050 GDP growth loss from pollinators	WWF/Purdue/Minnesota
2050 GDP growth loss from pollinators	WWF/Purdue/Minnesota
2050 GDP growth loss from pollinators	WWF/Purdue/Minnesota
Mining rents as % GDP	WDI
Mining as % exports	WDI
% terrestiral area in protected areas	IUCN
Ocean biodiversity	OHI
PHYSICAL RISK - ATMOSPHERIC	
Hurricaine/Typhoon risk	INFORMA
Projected economic loss from temperature change	Burke, Davis, Diffenbaugh (2018)
Days of extreme heat	World Bank Climate portal
Heatwave risk probability	World Bank Climate portal
Drought probability	World Bank Climate portal
% land exposed to drought by 2050	Isipedia - Lange et al 2020
% population exposed to drought by 2050	Isipedia - Lange et al 2020
Ocean carbon storage	OHI
PHYSICAL RISK - WATER	
Population impacted by riverine flood risk	WRI
Population close to sea level	WDI
Projected sea level rise risk	Coastal DEM
WRF - Scarcity & drought risk	WWF
WRF - Flood risk	WWF
WRF - Water quality and impairment risk	WWF
WRF - Ecosystem service loss risk	WWF
Freshwater withdrawal rates	Aquastat/WDI
Water productivity	Aquastat/WDI
Improved sanitation	WDI
Clean Ocean waters	OHI
Coastal protection	OHI
Extreme rainfall probability	World Bank Climate Portal

PHYSICAL RISK AGRICULTURE/FOOD	
Agri/Forestry/fisheries as % GDP	WDI
Agri/Forestry/fisheries as % exports	WDI
Agri/Forestry/fisheries as % employment	WDI
Rural population	WDI
Agri/Forestry/fisheries export taxes as % GDP	WDI
Projected change in agricultural output RCP 2.6 vs 8.	IFPRI/Harvard
Expected population change	HNPStats
Food import dependency	FAOStat
Agriculture productivity capacity	FAOStat, WDI
Sustainable Nitrogen management index	https://epi.envirocenter.yale.edu/epi-indicator-report/SNM
Malnutrition stats	WDI
Global food security index	https://foodsecurityindex.eiu.com/
Marine food security	OHI
Extreme rainfall risk	World Bank Climate portal
TRANSITION RISK	
Oil & gas as % GDP	WDI
Oil & gas as % exports	WDI
Oil & gas as % employment	WDI
Oil & gas export taxes as % GDP	WDI
Coal rents as a % GDP	World Bank
Dependency on imported energy	WDI
Current carbon intensity per capita	EDGAR, PRIMAP
share of renewables	https://www.irena.org/Statistics
Hydro share of electricity generation capacity	WDI
Electricity production from coal	World Bank
Potential for renewable investment	BNEF
Green complexity potential	Uni Oxford INET
Coastal economic health	OHI
Coastal tourism and recreation	OHI
RESILIENCE	
Debt/GDP	Moody's
Headline deficit/GDP	IMF WEO
External debt/reserves	Moody's
Interest/revenue	Moody's
external debt/exports	Moody's
Subsidies & other transfers % expenses	WDI
% population in slum dwellings	MDG/SDG
Urban concentration	WDI
% revenue from grants/aid	WDI
% health services provided from external resource	WDI
Age dependency	WDI
Infrastructure quality	WDI, WEF
WRF - sector-weighted operational risk	WWF
Disaster preparation	HFA National progress

Appendix 2 - Index Update Frequency and long-term aims

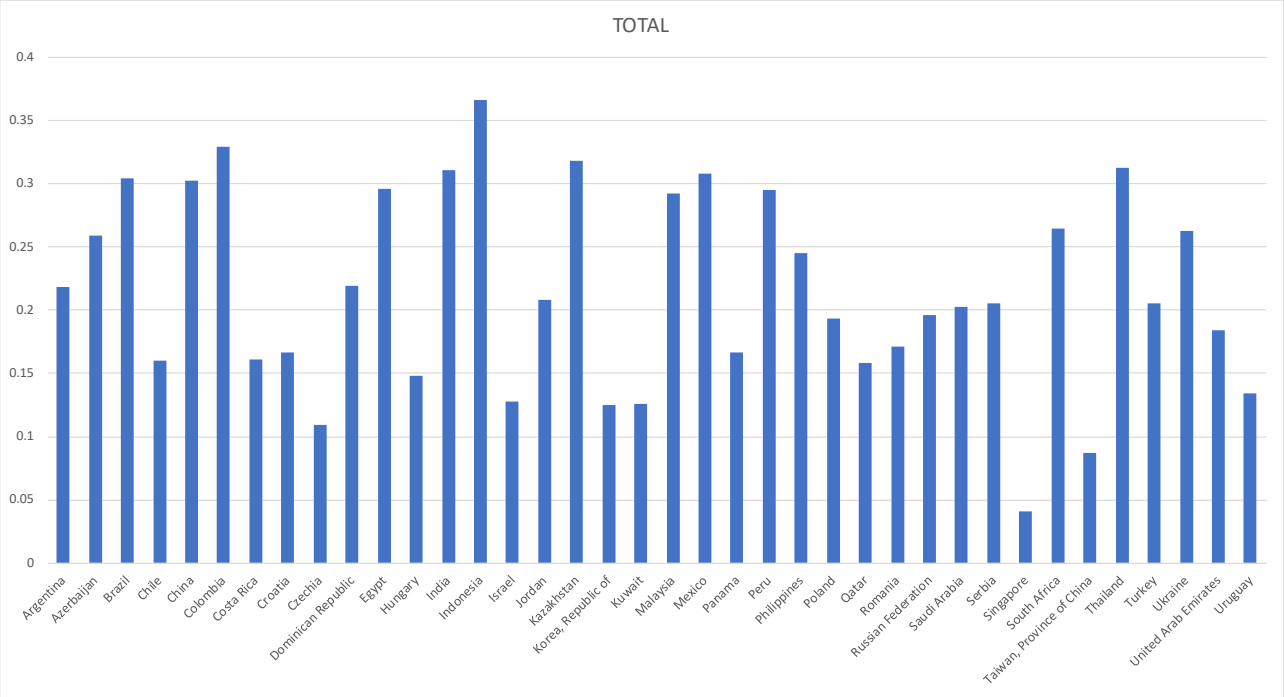
1. Initial aim to create proof of concept and index estimate.
2. Focus on ensuring initial estimate is as real-time as possible
3. Next step – increase the scope of 'real time' indicators sourced from GIS and remote sensing e.g. monitoring of biomes, KPAs etc.
4. Next step – ensure that forward looking e.g. 2050 RCP 8.5 forecasts and projections are based on models which can be updated annually and not end up stale within the index.
5. Next step – establish platform, financing and broad corporate/institutional support for hosting, maintenance and dissemination of index.

Headline index results - EM

We focus here on a sub-set of the total emerging markets universe which is captured in this data set, analysing 38 countries which are either (i) investment grade (ii) issue substantially in local current sovereign markets (iii) make up a significant portion of EM hard currency indices.

Our main findings are:

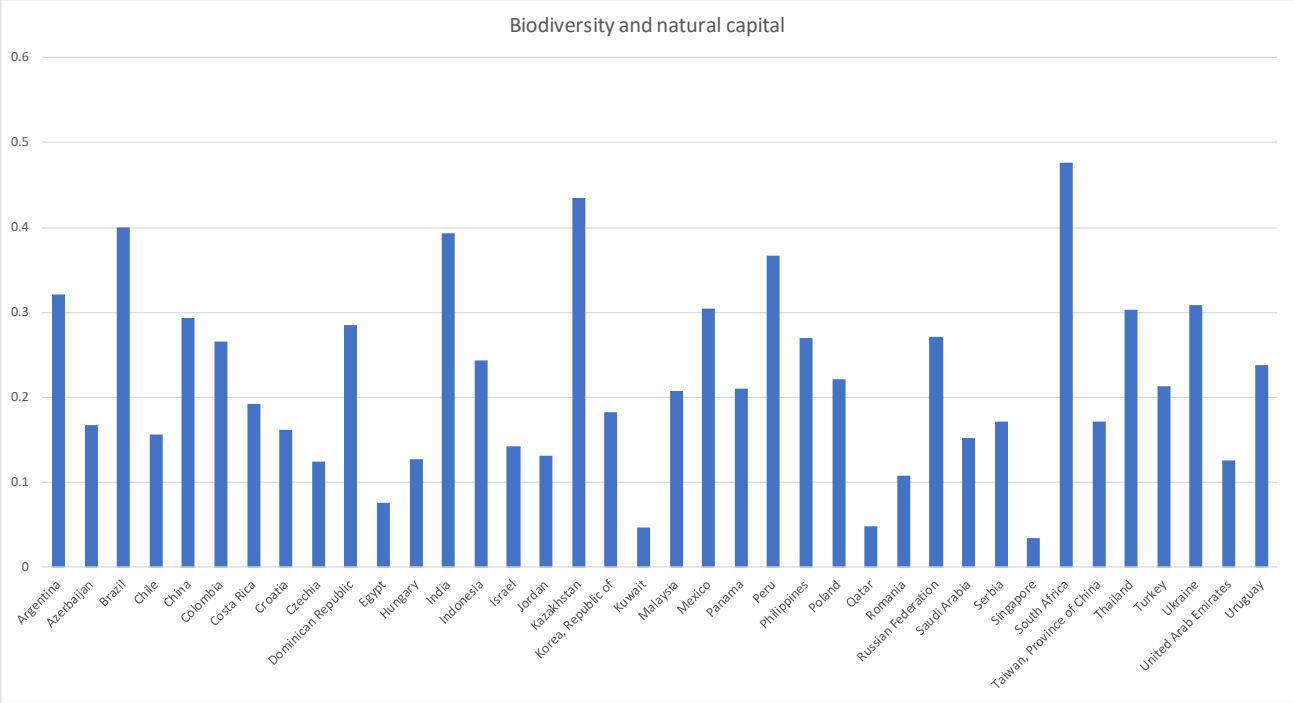
1. Outside of frontier markets and Sub-Saharan Africa in particular, risk cases are concentrated in Latin America and Southern Asia, with one or two former CIS countries also showing high and sustained risk across the sub-categories.
2. Despite this geographical pattern, countries with strong institutional policy responses such as Chile, Singapore, Uruguay and Costa Rica were able to demonstrate much lower forward-looking risk.
3. Central European markets, including Russia, see specific weaknesses offset by the drastically less negative implications of atmospheric and agricultural physical risk trends in that region.



Sub-component index results - EM

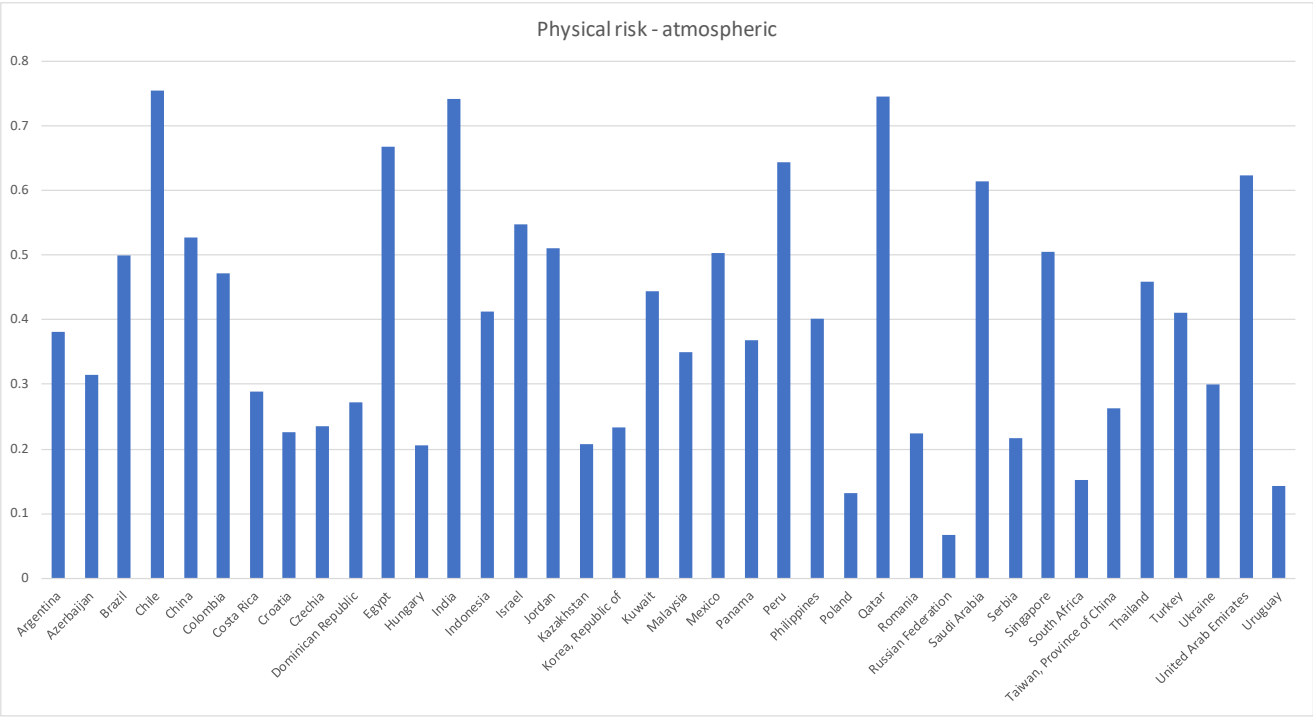
Biodiversity and natural capital:

1. There is a strong association of countries with significant mining industries to greater biodiversity risk, which shows up in both current and forward-looking projections.
2. This is further exacerbated when combined with industrial farming and soft commodities, with Brazil, Peru and South Africa displaying the highest risk scores.
3. The high risk measure for India is concentrated in the very severe risk the country faces from the deterioration in ecosystems relating to water asset decline.
4. By construction, GCC countries with minimal natural capital endowments have limited risk, although by definition then very little opportunity for improvements via policy or investment.



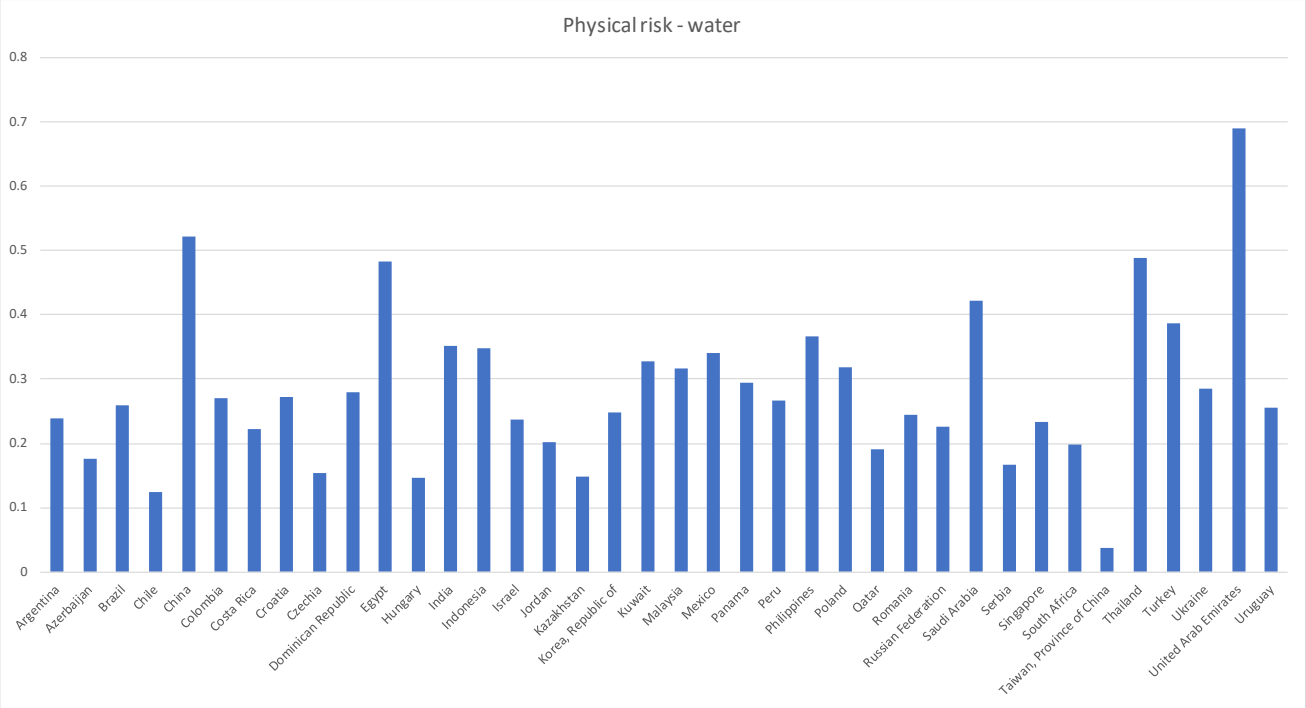
Physical risk – atmospheric

1. In contrast, CGC countries are amongst the highest risk from physical atmospheric risks, given their proximity to thresholds for economically feasible temperatures.
2. Some parts of Southern Asia are also at risk from this feature, in particular India.
3. A third set of countries also exposed are those on the Pacific coast of Latin America, where temperature changes are set to be significant, and pollution is also a material problem.



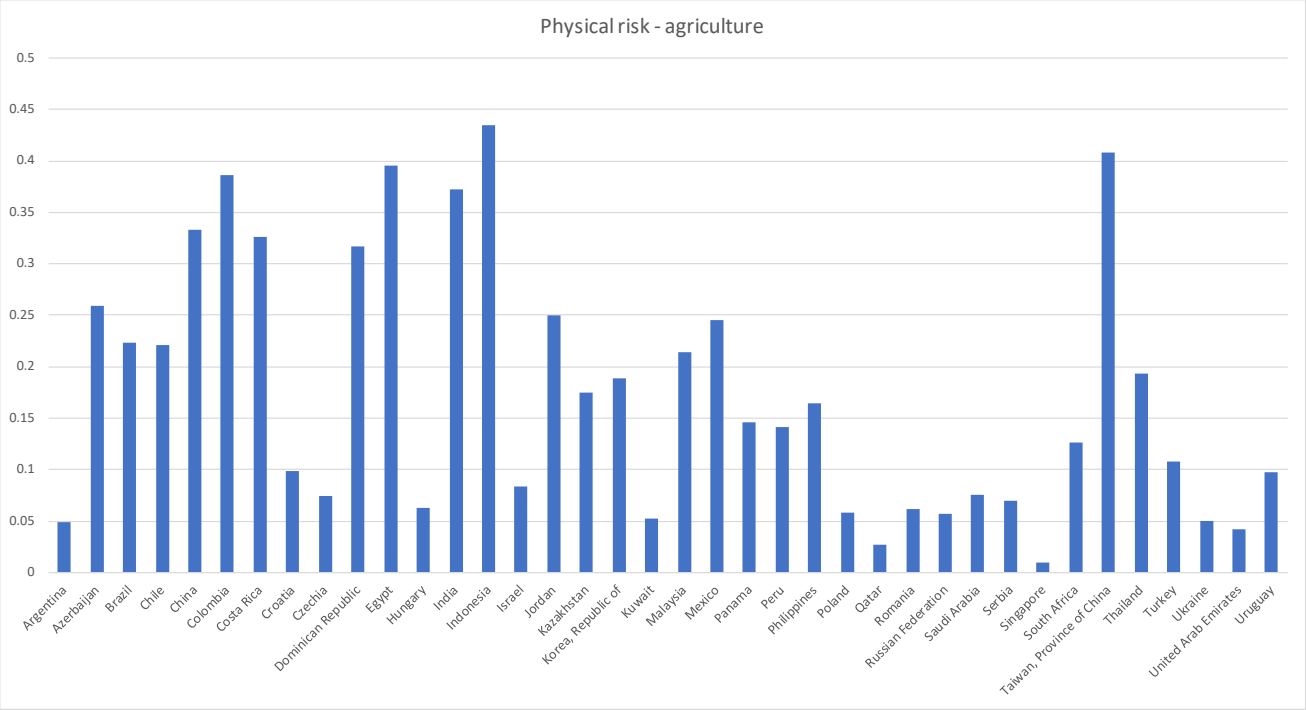
Physical risk – water

1. Unsurprisingly, GCC countries appear exposed to broad water risks.
2. Alongside the Gulf countries, China and Thailand also exhibit significant risks. In China, coastal areas are amongst the most exposed globally to sea level and other maritime risks, whilst inland there are significant areas of water stress and damage to water quality.



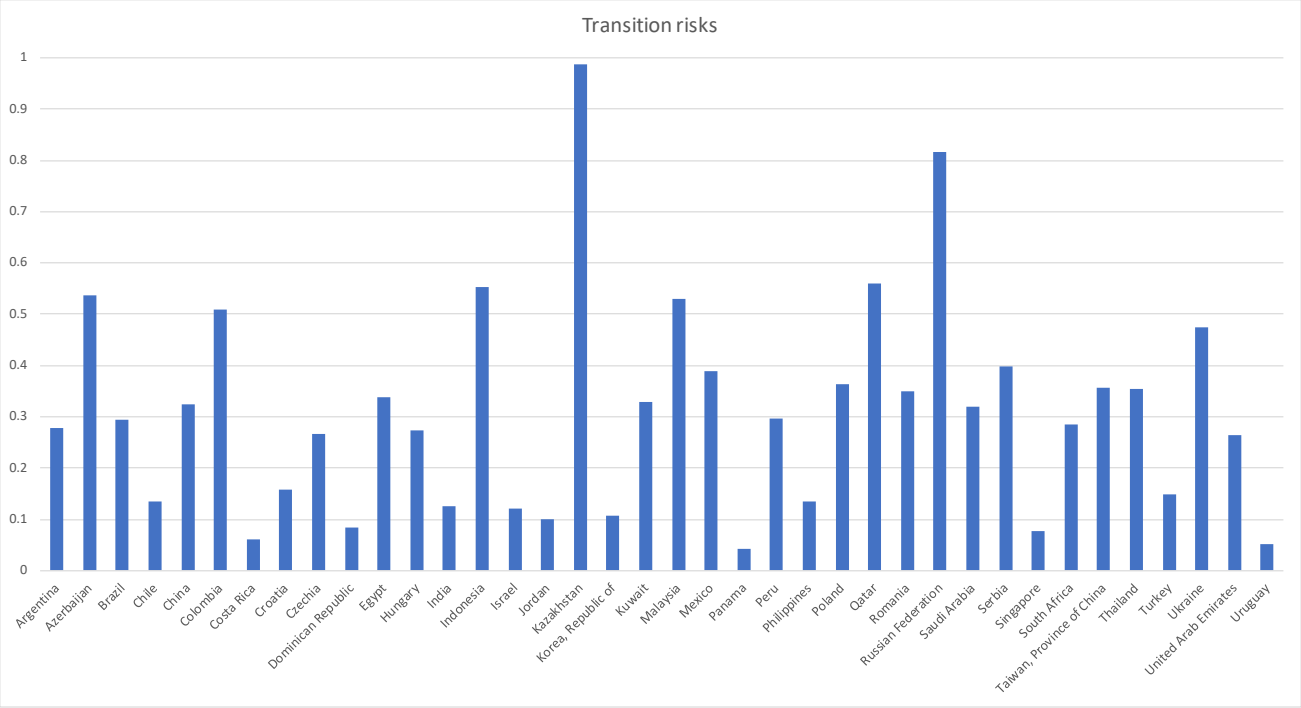
Physical risk – agriculture

1. Southern Asia, in particular India and Indonesia again look very exposed. In India this is particularly via the large, informal rural economy which itself faces risks from both temperature and water scarcity. In Indonesia exposure is clearly via the impact of industrial soft commodities production.
2. Also broadly exposed to risk are the soft commodities sectors of Colombia and the Carribean region.



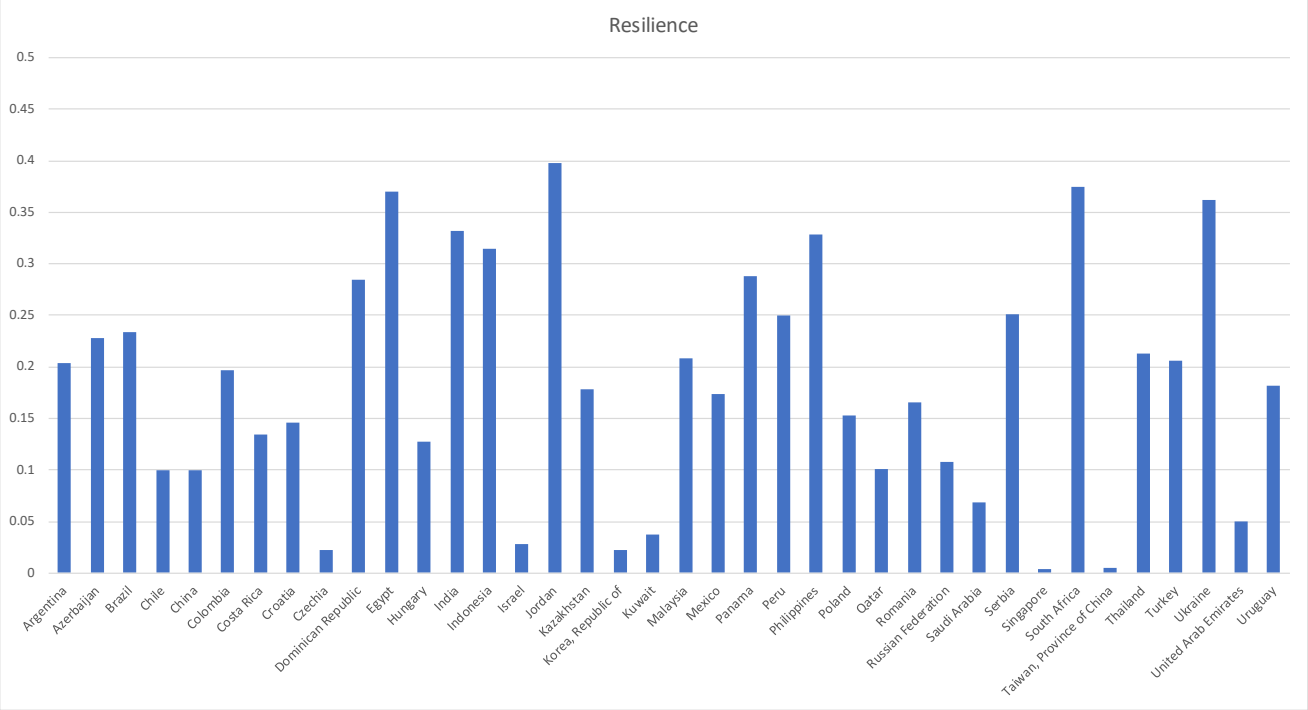
Transition risks

1. Transition risk scores are dominated by the hydrocarbons producers, in particular those also producing a lot of coal.
2. In general, few emerging markets have sufficient investment and R&D to suggest any positive transition dynamics outside China and Israel and in specific sectors such as tourism, outsourced services and trade.



Resilience

1. Interestingly, there is a strong correlation between those countries with weak indicators in terms of fiscal and financial resilience, which also have relatively weaker scores on their physical resilience in e.g. infrastructure.
2. Relatively older populations in Latin America together with weak infrastructure also drag investment grade markets such as Peru and Mexico towards weaker scores.

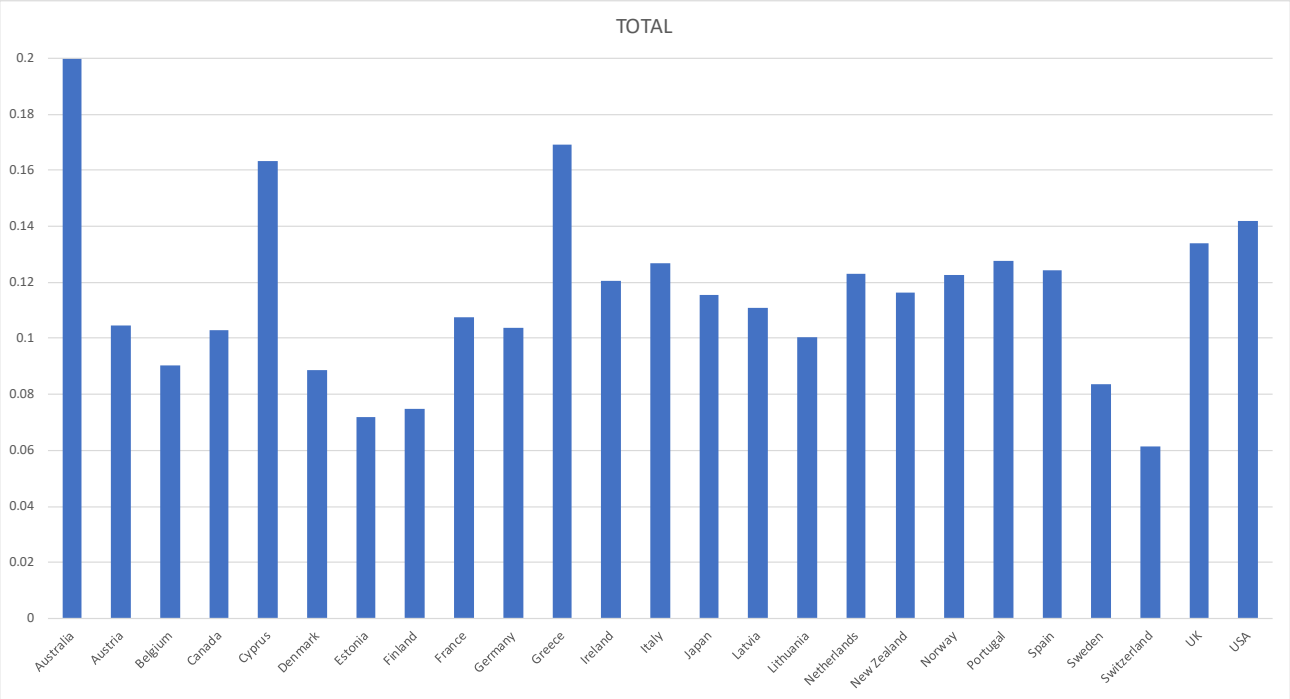


Headline index results - DM

We focus here on developed markets as classified by IMF/World Bank but excluding those which are classified as emerging markets for fixed income investment purposes e.g. Singapore. We include those developed markets which are IG and HY, also including the Baltic states.

Our main findings are:

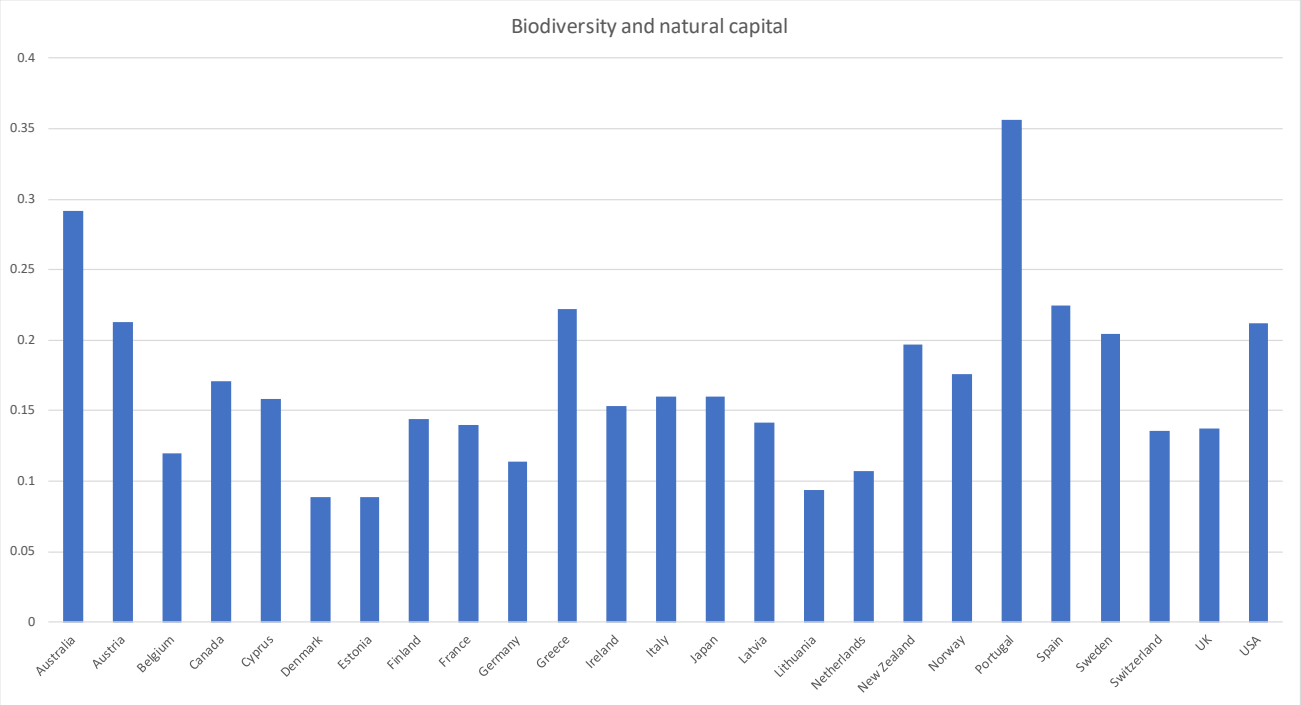
1. Australia is the stand-out DM risk market on the total score, together with the smaller and economically less resilient Mediterranean countries.
2. The US and UK also score poorly on several metrics such as atmospheric and flood risk.
3. Switzerland has the best score on our overall index, with the Nordic and Baltic countries also scoring very well across the board, with the exception of somewhat higher exposure in Norway.



Sub-component index results - DM

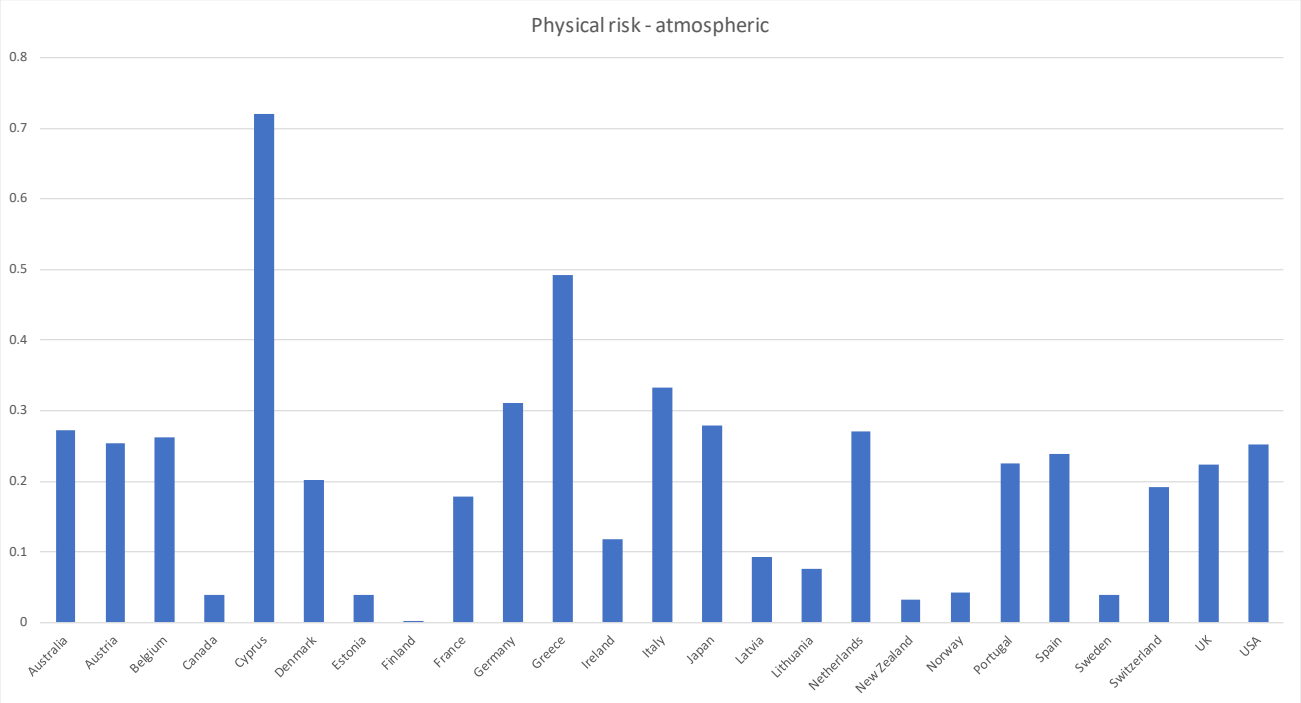
Biodiversity and natural capital:

1. In Europe, Portugal stands out as having seen much more negative trends materialising in deforestation and land use, whilst also showing greater long-term vulnerability to economic loss from coastal biome erosion.
2. Australia is exposed across a wide range of indicators, with falling land productivity projected to continue up to 2050.



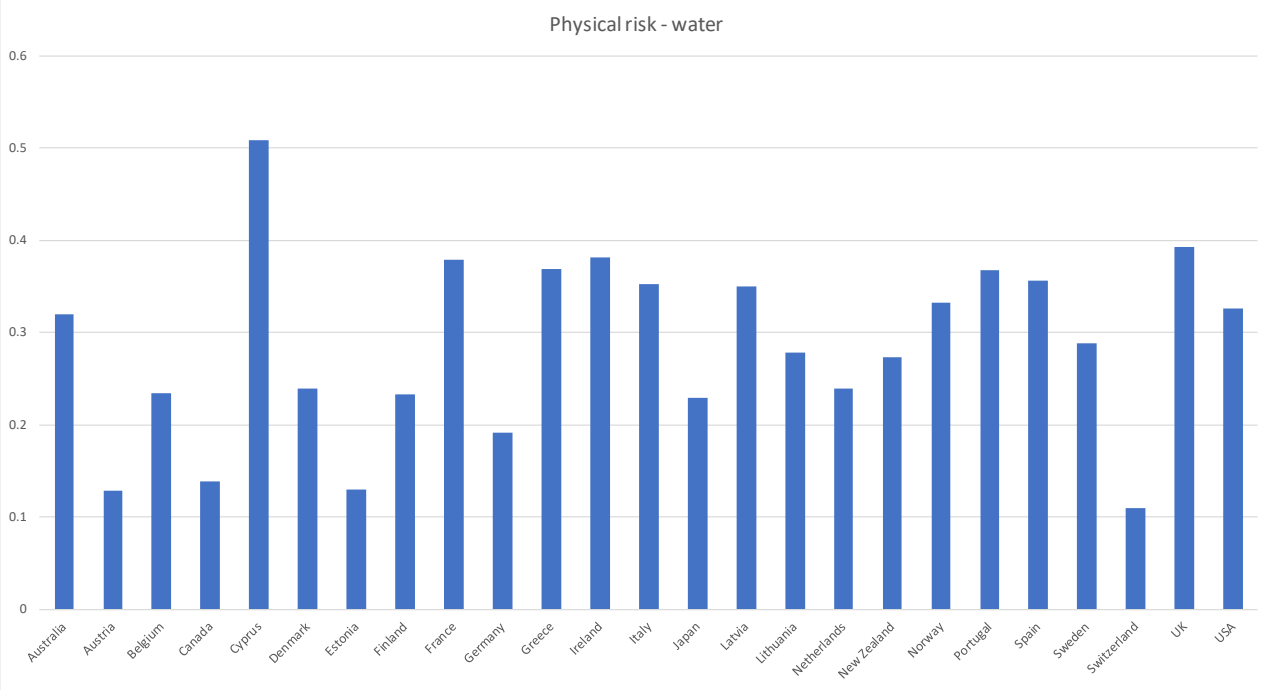
Physical risk – atmospheric

1. Here the greatest exposure and risk is clearly in the Mediterranean, with Greece and Cyprus particularly exposed to the impacts of temperature through several channels, especially drought.
2. Italy faces exposure to similar risks, albeit somewhat more moderately, but with additional exposure to risk from storms and flooding.



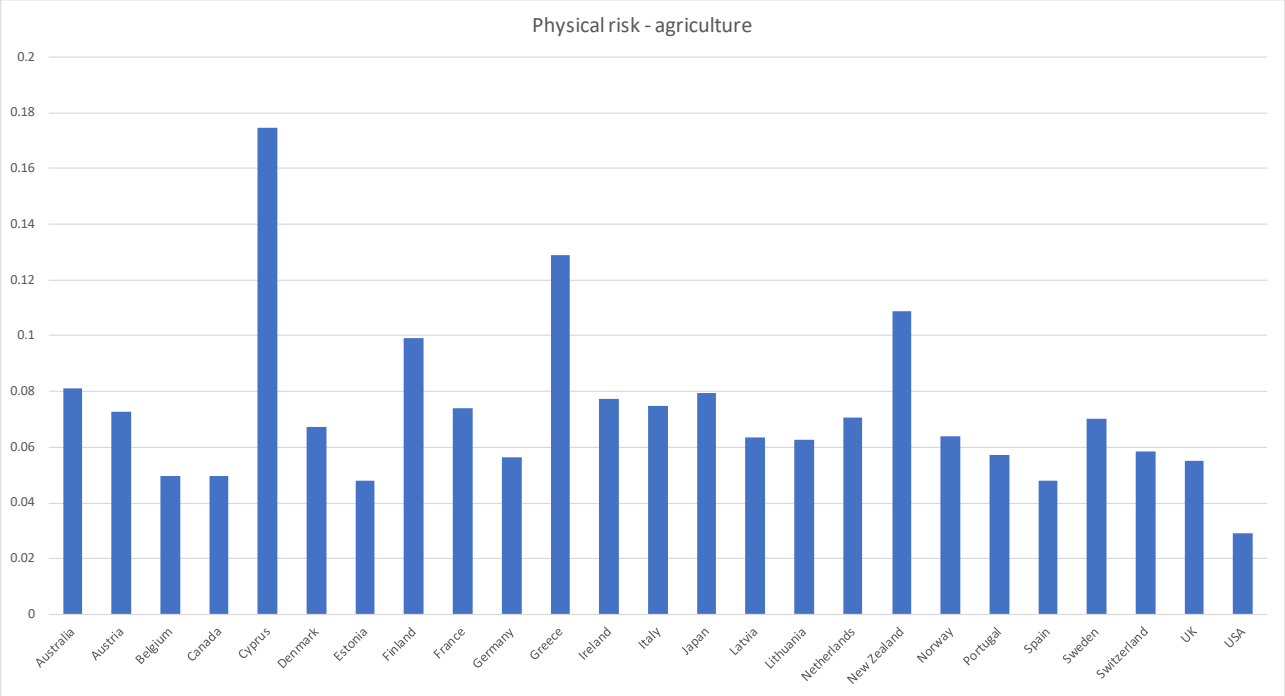
Physical risk – water

1. Water risk is also high across many Southern European countries given the stress on domestic water assets anticipated together with higher temperature captured in the prior subcomponent.
2. A number of developed countries face particularly high exposure to water risk from flooding and seal level changes, the UK being a prominent example.



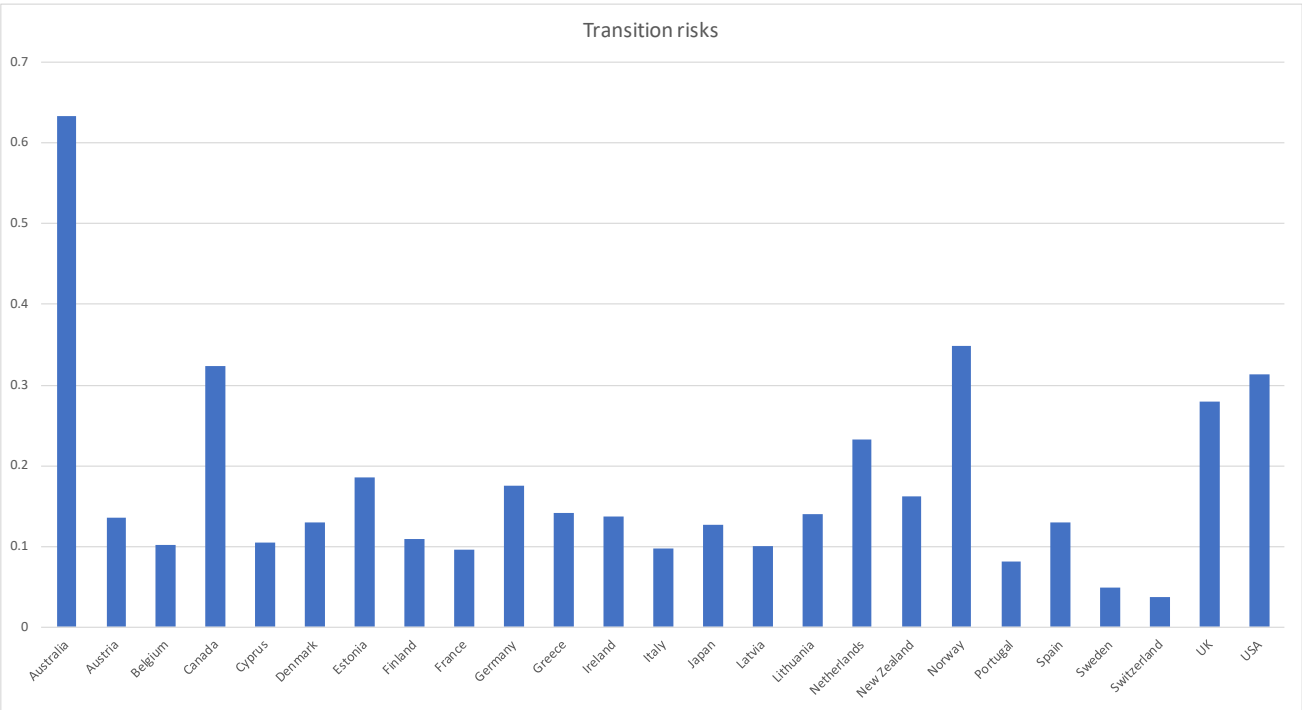
Physical risk – agriculture

3. Again, the countries of Southern Europe with material agricultural sectors – Cyprus and Greece – see this risk interact with their poor scores for other forms of physical risk.
4. New Zealand shows some exposure, despite the lower projected impact of global climate change, the sheer scale of agriculture in New Zealand's economy raises the risk score.



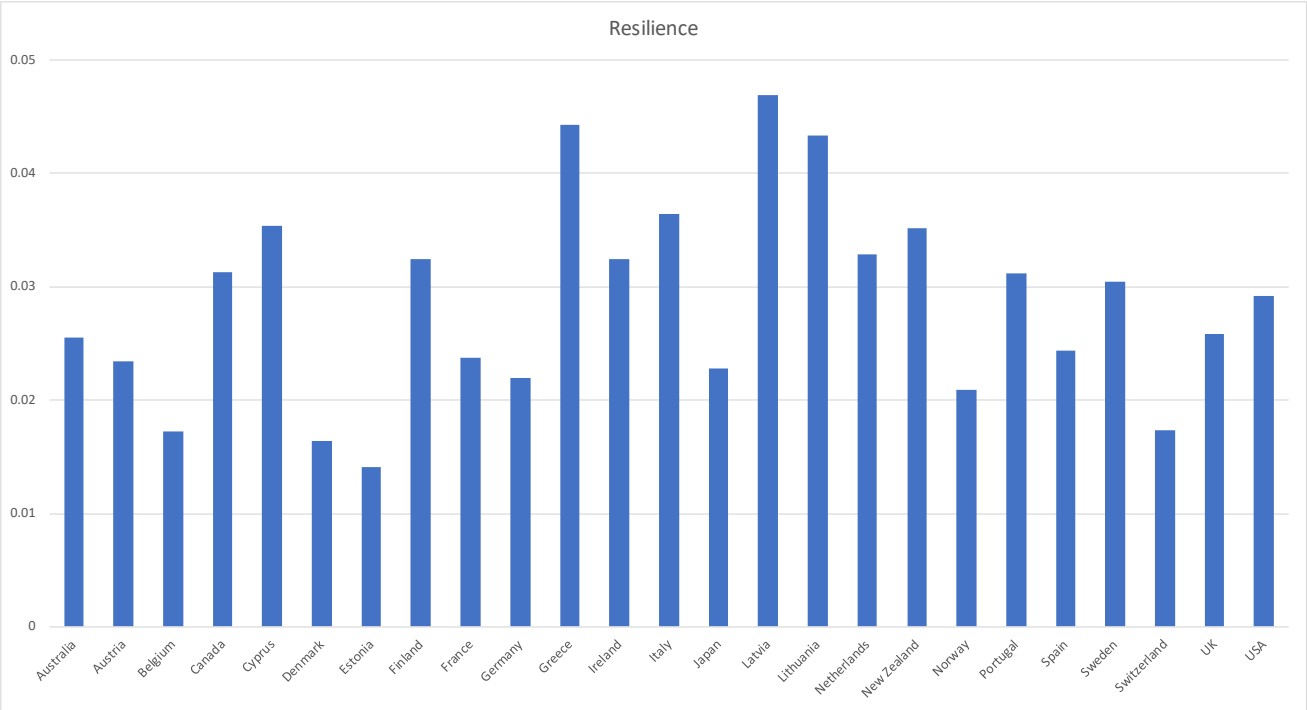
Transition risks

1. Australia, with its highly commodity intensive economic model, is by far and away the most exposed economy in aggregate to the transition risk indicators we score.
2. Other economies with material hydrocarbons exposure similarly flag risks here, but at less than half the relative magnitude of Australia.



Resilience

3. In general the resilience risk score for most of DM is neglible relative to EM, even for high yield markets such as Greece given the umbrella provided by the EU financially and in terms of resilient infrastructure and services.



Implications for our ESG scores

The ESG scoring process at NinetyOne has the same status as other areas of research into traditional drivers of asset returns, with investment professionals responsible for research and scoring with support from centralised ESG data and expertise. Regular meetings are held to discuss and update scorecards, and crucially our process focuses on forward-looking rates of change, especially in policy but also in medium-term risks.

Consequently, it is very positive to see the high degree of correlation between our positive research scores for countries like Chile, Singapore and Costa Rica. Likewise, challenging dynamics in our ESG assessment of environmental policy in countries like India and Indonesia are reinforced by the CNSI.

However, the CNSI also challenges positive scores in our process for countries such as Thailand and Peru, as well as frontier markets such as Vietnam. Whilst our overall ESG scores are based on a view on the forward-looking change and delivery of policy, clearly the hurdle to effectively mitigating environmental risk and achieving climate goals is going to be higher in countries with more challenging initial conditions. Our ongoing engagement with those

Opportunities and implications for green and SDG bond issuance

As discussed earlier in the report, this CNSI should be seen not only, or principally, as a measure of risk, but also of the opportunities available to allocate capital to the highest marginal returns

available in environmental investment. Given the CNSI metrics, we note a number of potential opportunities and urgent trends which need to be developed in climate and SDG bond markets:

1. Chile has been an active early issuer in EM green bond markets, and given specific risks around physical risk for the country, such instruments would seem to offer investors a strong opportunity to contribute to future sustainable growth.
2. A number of other larger emerging markets have been discussing and laying the ground-work for green and SDG bond issuance, and we believe the CNSI offers strong guidance on the priorities that governments should focus on in growing these markets:

    a. For India and China, which have made strong progress in renewable energy, there is further upside from additional financing in those areas (with China also set to improve its green bond taxonomy.) However, bond issuance focused on water infrastructure appears if anything an equally high priority in terms of allowing investors to provide capital to high marginal growth investments.
    b. A number of countries in Latam America are actively looking to follow Chile, with Brazil, Colombia and Peru developing plans. Issuance to address biodiversity as well as climate would appear to be of very high marginal value for those countries, tied into address the physical risk to their agricultural sectors.
    c. Similarly in Indonesia and Malaysia, planned green bond issuance should be complimented by issuance designed to address risks to natural capital and the agricultural sector. Such bonds could also tie into SDGs related to inclusive growth and sustainable infrastructure.
    d. Issuance in GCC and former CIS would appear to be best focused on addressing transition risks over the medium-term related to hydrocarbons tied together with atmospheric physical risk, and again Colombia also looks like a strong candidate for such issuance.

Private financial institution perspectives on climate and nature data

September 2021

Michael Hugman
Director – Climate Finance

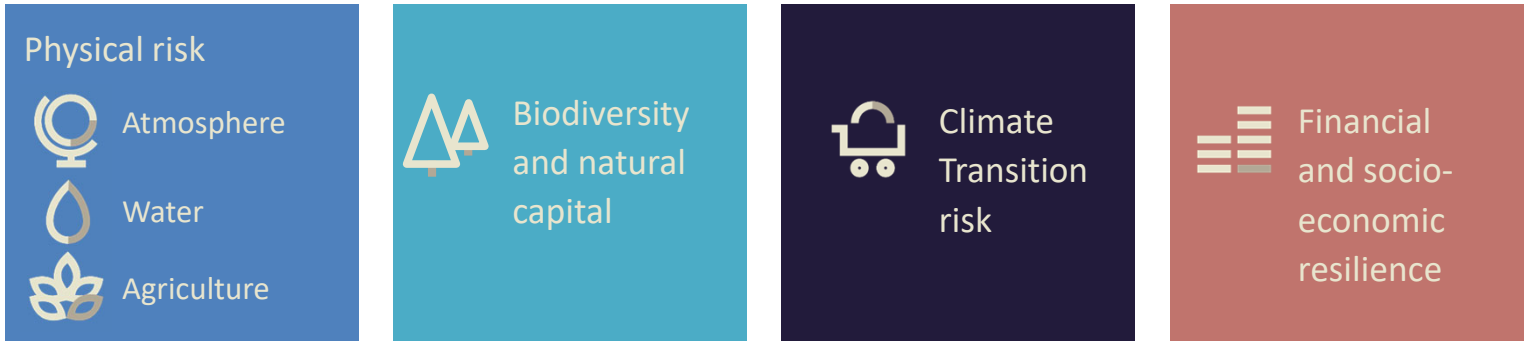
Children's Investment Fund Foundation

Overview

- Two case studies of NGOs and private investors collaborating to solve sustainable data challenges:
  - WWF Climate and Nature Sovereign Index
  - Assessing corporate climate transition plans
- Common challenges addressed:
  - Loss of information – traditional data sets often reflect a single common factor
  - Forward-looking information scarce despite being vital in a regime of persistent structural breaks
  - Applications:
    - Impact/KPIs
    - Engagement
    - Portfolio risk management when facing systemic risk

WWF Climate & Nature Sovereign Index

- Real-time and forward-looking projections
- Spans natural-capital and transition-risk exposures, plus ‘traditional’ climate risks
- Makes explicit the economic and financial linkages
- Taxonomy aligned to investors’ needs:



For illustrative purposes only.
Source: Ninety One and WWF. As at July 2020.

Index includes 85 indicators, including many forward-looking and novel data points

Biodiversity and natural capital

Annual deforestation trends - 10y
2y real-time deforestation trends
Total land cover change
Land cover change in protected areas
Total land cover fragmentation
Land cover fragmentation in protected areas
Total change in land productivity
Change in land productivity in protected areas
GF economic growth risk - pollination
GF economic growth risk - coastal erosion
GF economic growth risk - water yields
GF economic growth risk - forestry services
GF economic growth risk - marine fishing stocks
GF economic growth risk - other ecosystem services
Mineral rents (% GDP)
Mining Exports (% Goods Exports)
Protected area coverage % landmass
Ocean hazard index - biodiversity

Physical risk - atmospheric

Natural Hazard Risk (0-10) (10 = highest risk)
2050 GDP loss from RCP8.5 temperature change
World Bank 2050 median projected days of extreme heat under RCP 8.5
WB annual probability lethal heatwave by 2050 at RCP 8.5
Land area exposed to drought RCP 8.5 by 2050
Population exposed to drought, 2050 under RCP8.5
World Bank 2050 drought risk indicator
Ocean health index carbon storage potential
OECD Population exposure to particulate matter, µg/m3
OECD Population exposed to pollution levels above WHO guidelines, %

Physical risk - water

Population impacted by riverine flood risk (0-5) (5=highest risk)
Population close to sea level
Climate central projection of economic cost of Sea Level Rise
Freshwater withdrawal as % total water assets (Aquastat)
Water productivity ($ GDP per unit water, Aquastat)
WWF Water Risk Filter - drought risk
WWF Water Risk Filter - basin flooding risk
WWF Water Risk Filter - water quality measure
WWF Water Risk Filter - ecosystem risk
Access to sanitation WDI
Projected 2050 extreme rainfall deviation
Ocean health index - clean water score
Ocean health index - Coastal Protection

Physical risk - agriculture

Agriculture, Forestry & Fishing, Value Added (% GDP)
Agricultural Exports (% Goods Exports)
Employment in Agriculture (% Total)
Rural Population (% Total)
IFPRI/Harvard modelling of climate impact on crop volume production
Population growth % (2050 vs 2020)
Sustainable Nitrogen Management (100 = target)
Prevalence of undernourishment (% population)
Global food security index
Ocean health index - marine food security
World Bank 2050 growing season change

Bold = forward-looking/real time

Transition risks

Oil rents (% GDP)
Natural Gas rents (% GDP)
Fuel Exports (% Goods Exports)
OECD environmentally aligned tax % GDP
OECD environmentally aligned tax % revenue
Coal Rents (% GDP)
Net Energy Imports (% Energy Use)
Carbon intensity (CO2 Emissions per $1k of GDP)
Carbon intensity (GHG Emissions per $1k of GDP)
Demand-based CO2 emissions per capita, t per capita
Production-based CO2 productivity, USD/kg CO2
Ex-Hydro Renewables Production (% total electricity production)
Hydro Production (% total electricity production)
Production from Hydrocarbons (% total electricity production)
Climatescope score on renewable energy potential
Green complexity index - proximity density
Number of environmental patents, thousand patents relative to PPP GDP
Ocean health index - livelihoods
Ocean health index - tourism

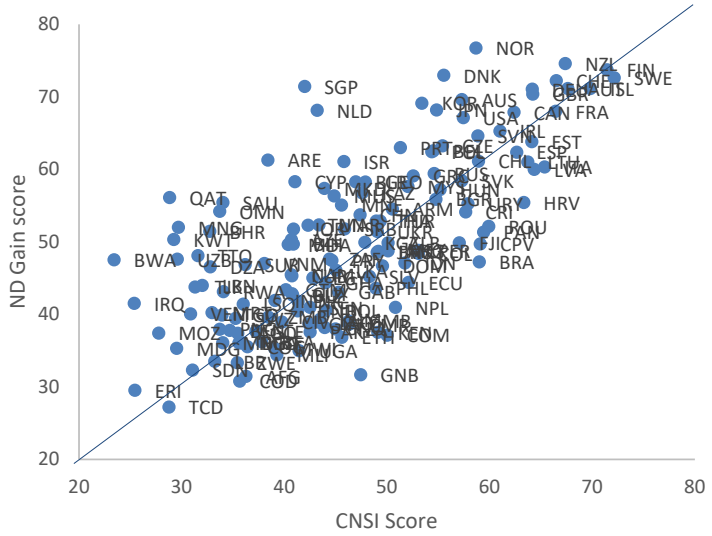
Resilience

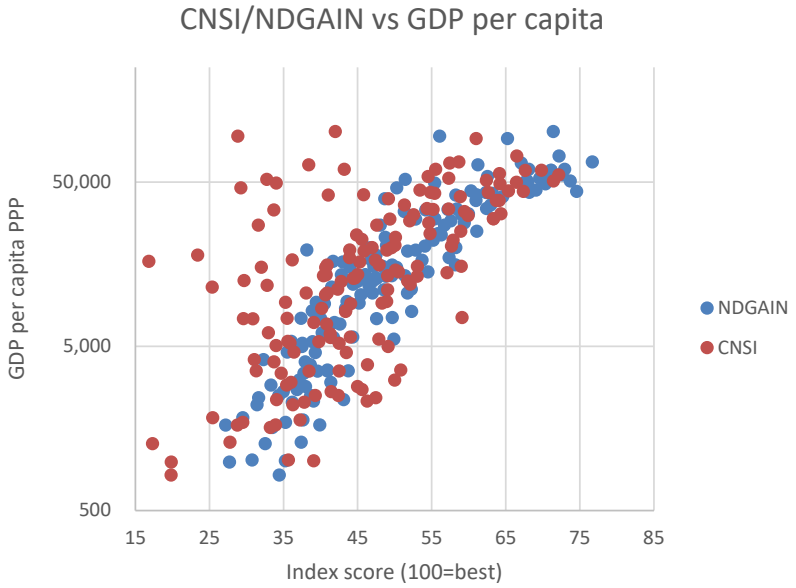
Gross government debt/GDP
Headline deficit 2021 IMF WEO
External debt/reserves
Government interest/revenue
External interest/CA receipts
WDI Subsidy + transfers % total government spending
Urban population living in slums (% Total)
Rural Population (% Total)
Aid Dependency (0-10) (10 = highest risk)
External Health Expenditure (% Total)
Age Dependency Ratio (% Working age population)
Physical Infrastructure (0-10) (10 = highest risk)
WRF Operational water risk
Disaster Risk Reduction (0-10) (10 = highest risk)

Source: Ninety One, Jan 2021

How does it compare to other climate risk indices?

CNSI latest climate modelling + transition risks, highlights greater dispersion in climate related risks

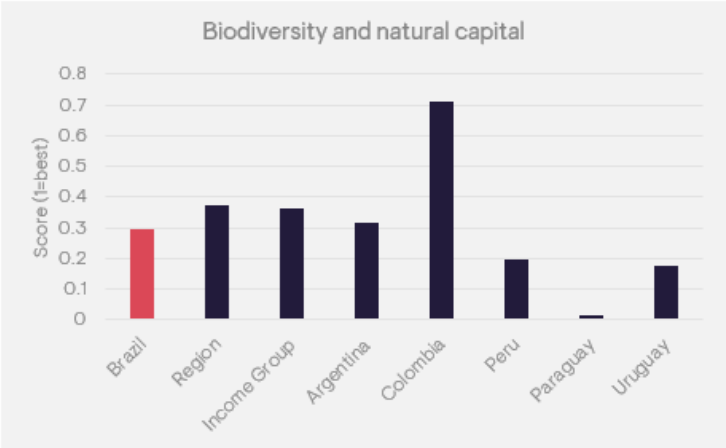


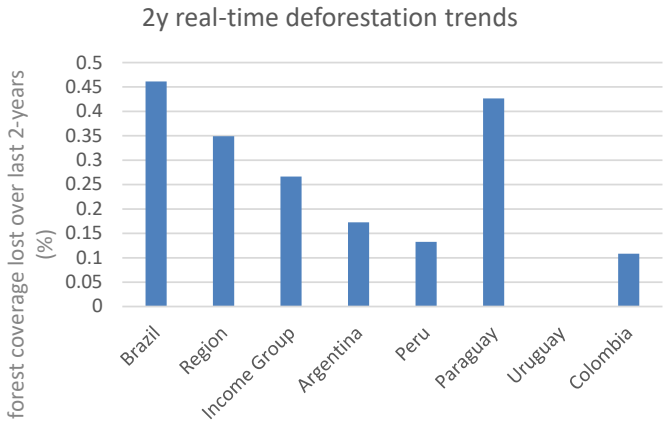


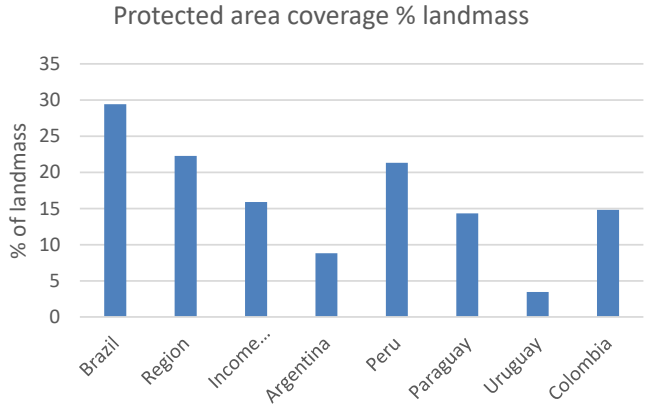
Climate risks still correlated with income levels, but much less so than traditional indices

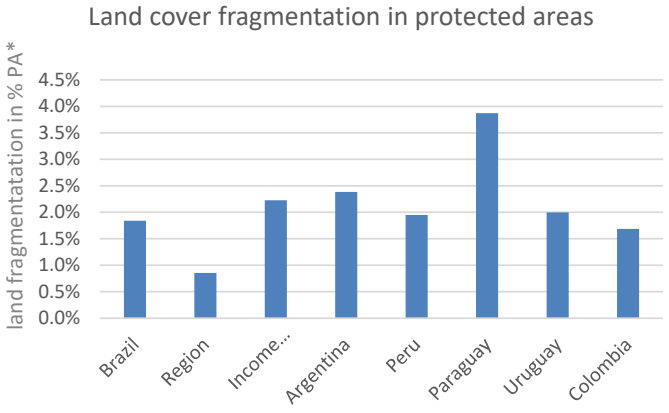
Source: Ninety One, WWF, Notre Dame Global Adaptation Initiative, Haver. Jan 31 2020

Brazil – Biodiversity & Natural Capital and selected indicators



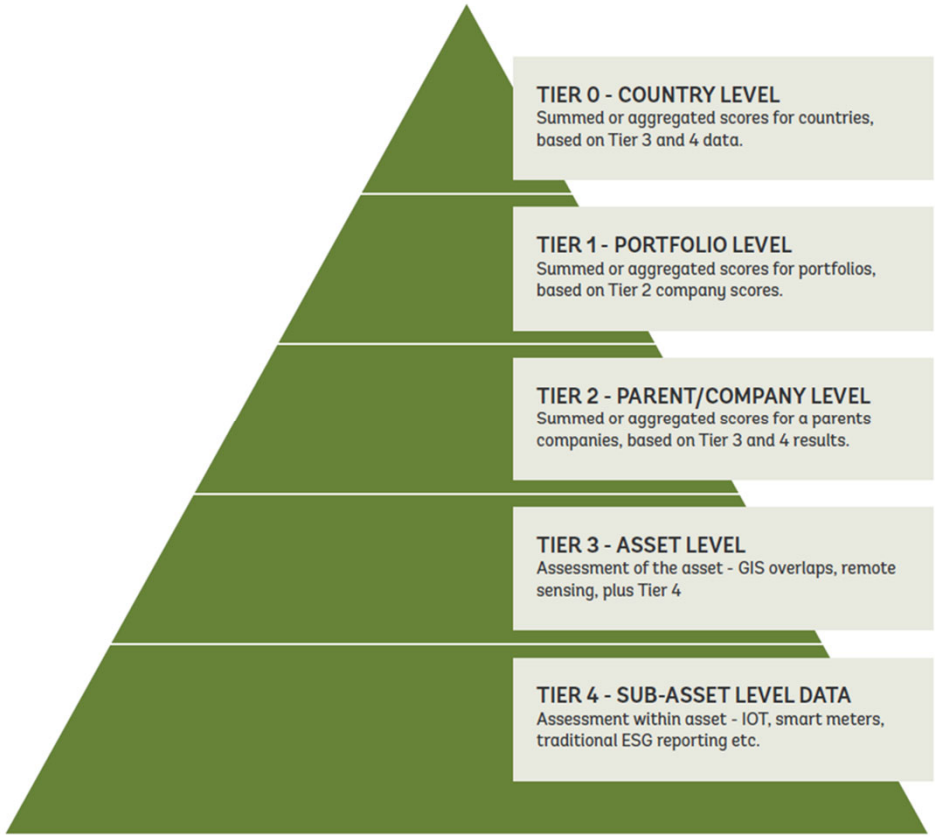






*over five year period to end 2015

Geo-spatial ESG: project ,corporate, portfolio and sovereign risk analysis



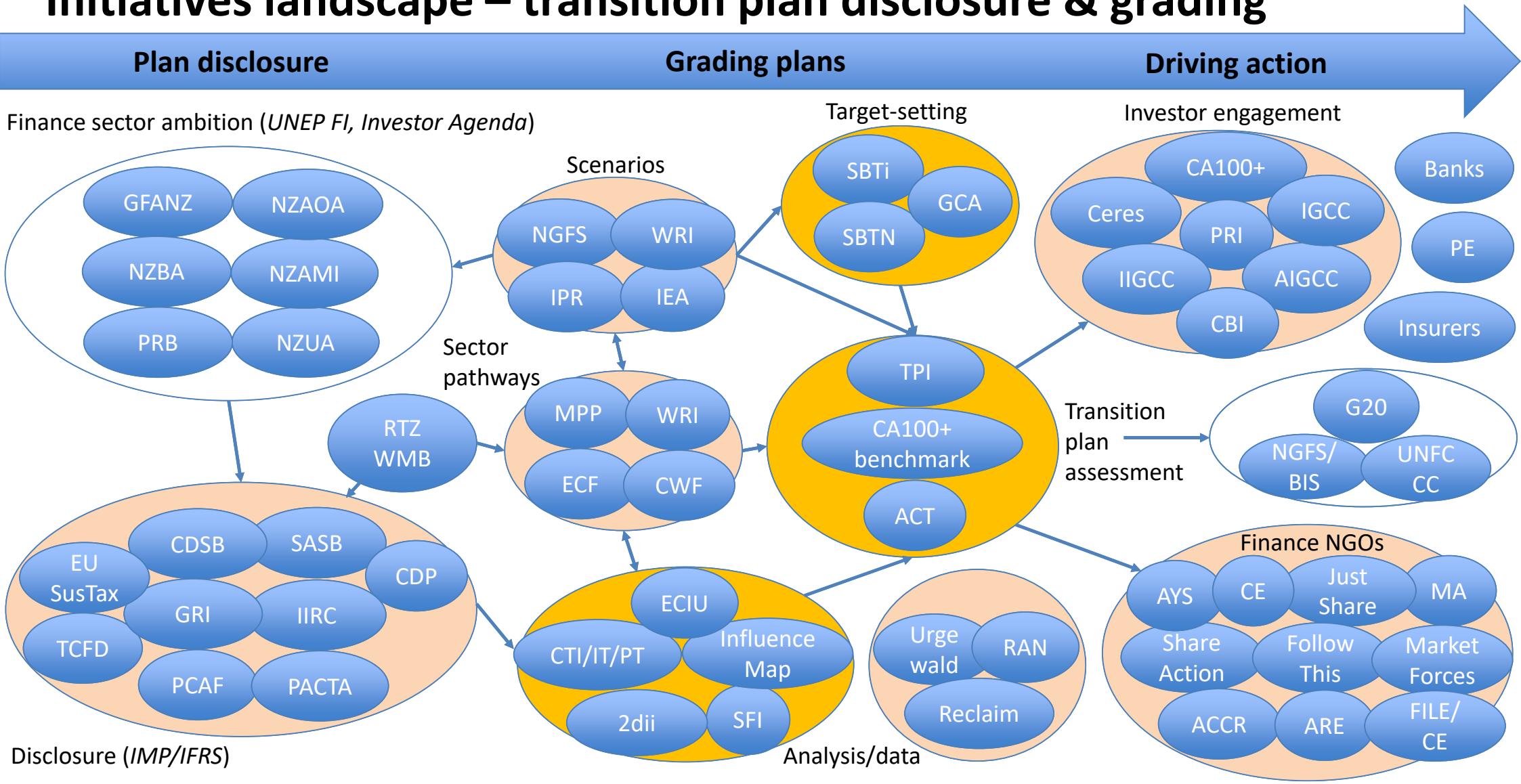
Source; WWF

Essential disclosure in a corporate climate action plan

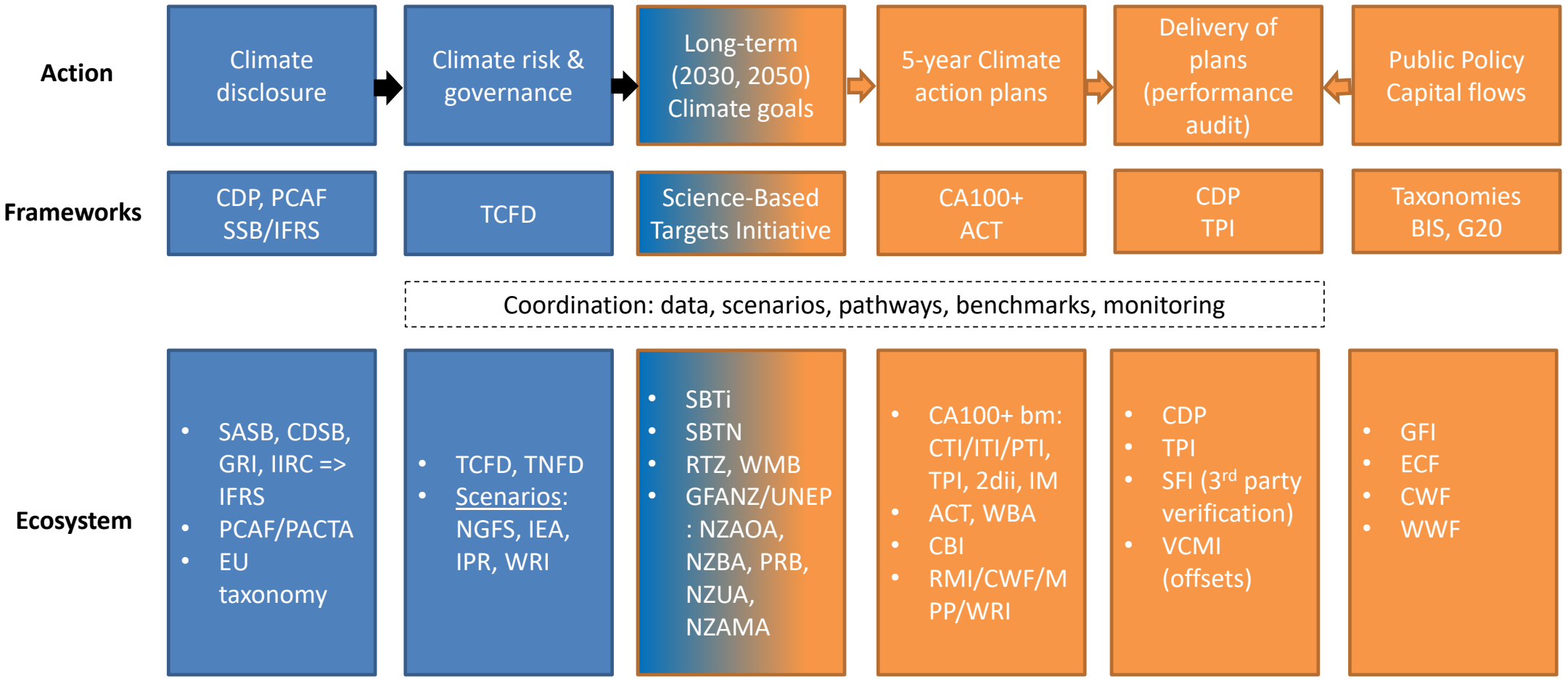
- Short-term targets required: 5 year and 5-10 year plan*
- Average absolute Scope 1-3 emissions reduction of 7-8% pa to 2030
- Phase out fossil fuel use and production, no financing of new supply
- Executive compensation, strategy and lobbying aligned with plan*
- Necessary capex commitments*
- End deforestation, credible use of offsetting only if strictly necessary
- Independent auditing of emissions*
- Annual performance reporting to shareholders

* Indicator included in CA100+ net-zero company benchmark: https://www.climateaction100.org/progress/net-zero-company-benchmark/

Initiatives landscape – transition plan disclosure & grading



Climate action plans are key to financing the transition



Overview

- Two case studies of NGOs and private investors collaborating to solve sustainable data challenges:
  - WWF Climate and Nature Sovereign Index
  - Assessing corporate climate transition plans
- Common challenges addressed:
  - Loss of information – traditional data sets often reflect a single common factor
  - Forward-looking information scarce despite being vital in a regime of persistent structural breaks
  - Applications:
    - Impact/KPIs
    - Engagement
    - Portfolio risk management when facing systemic risk