Financing development in times of climate emergency

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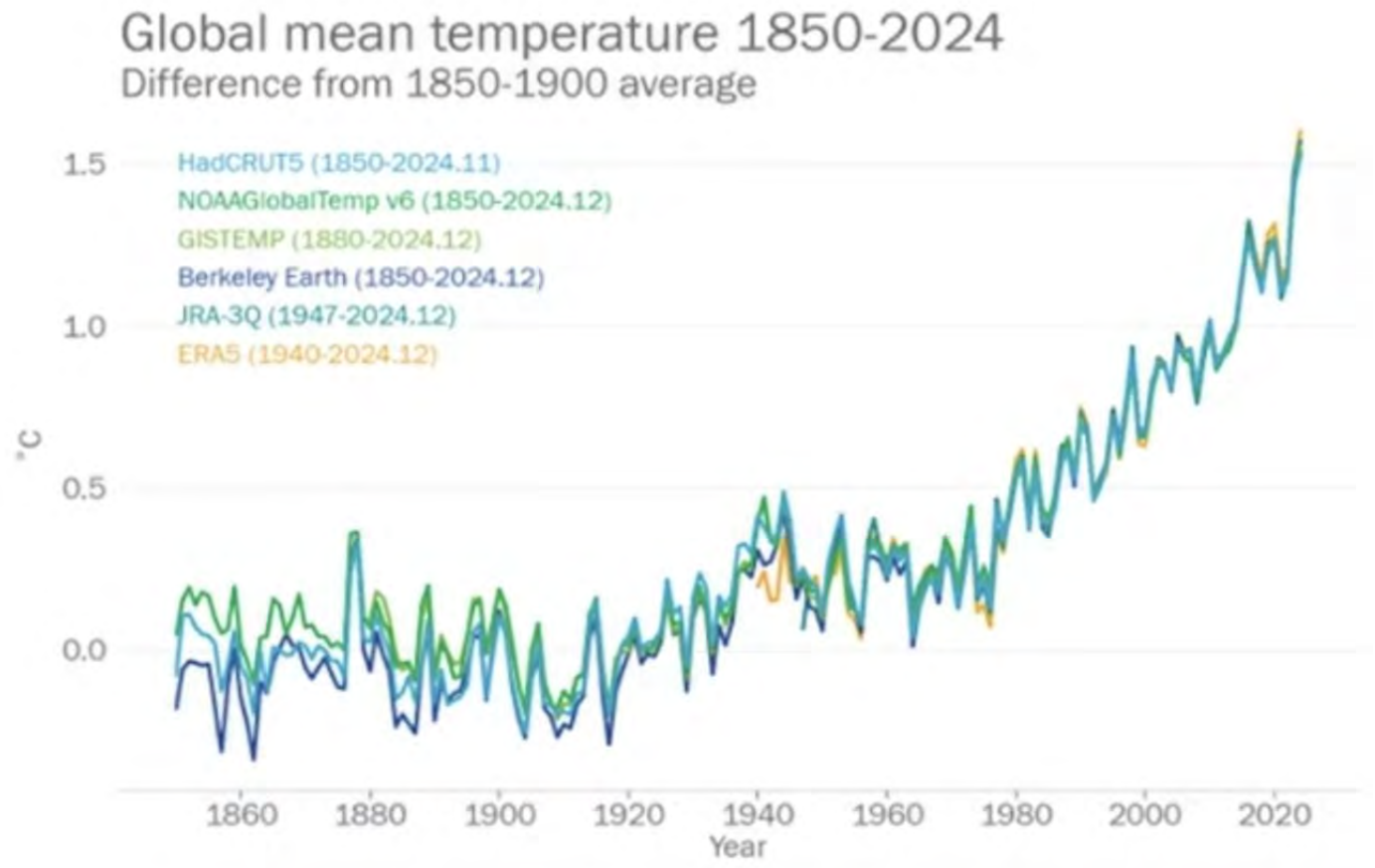
Content

- How can Keynesian approaches shed light on the climate action **economic** agenda
- **Today:** climate action as a macro-financial issue
  - (1) The investment function
  - (2) The supply of finance
  - (3) Funding and patient, and focused capital
  - (4) Climate risk and financial instability
- **Wednesday:** Financing development in times of climate crisis

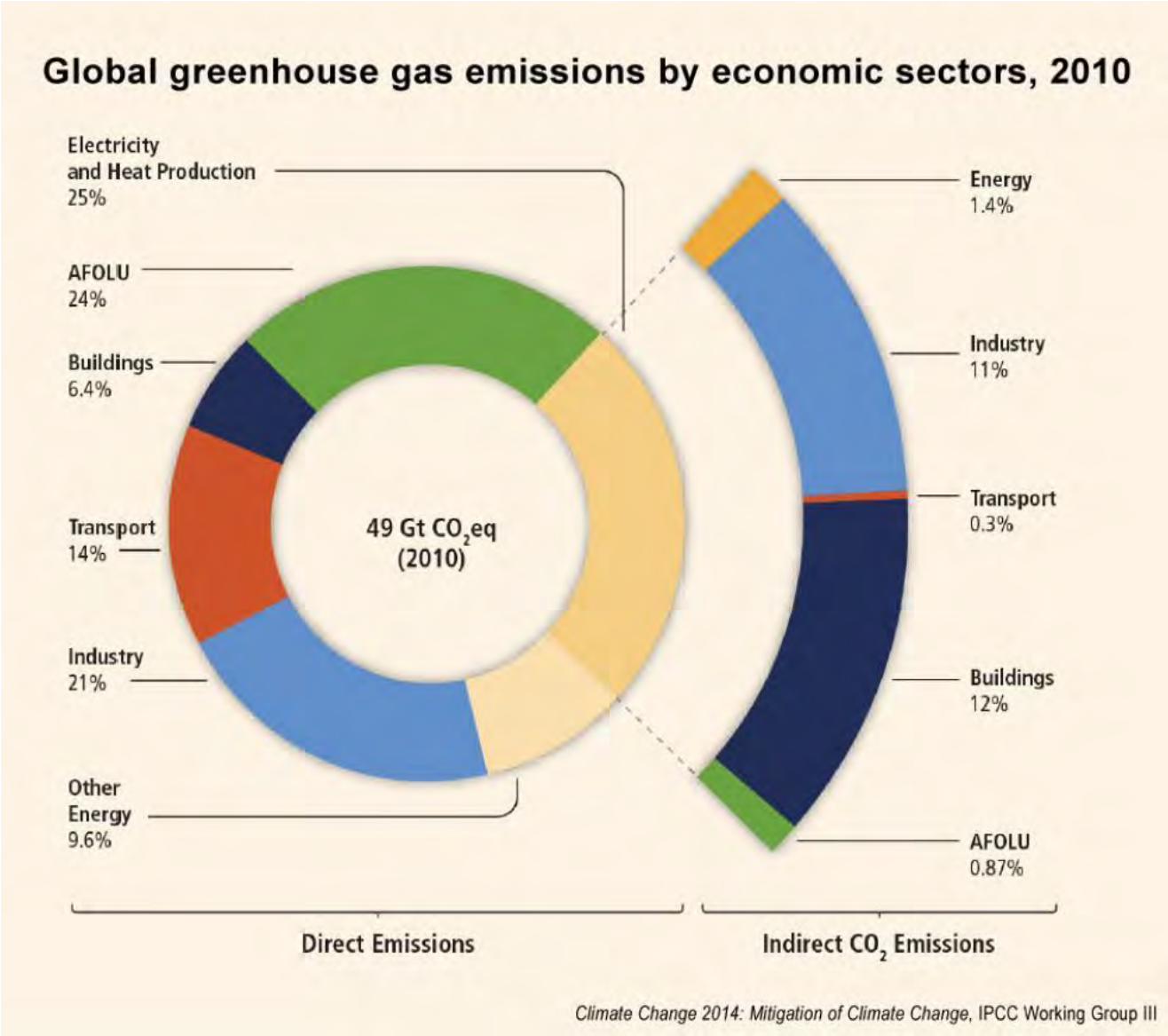
Why action is needed: beyond the moral imperative

Climate science: where are we?



Global average temperature data from six organisations show 2024 was world's hottest year on record and the first to breach the 1.5°C mark. (WMO)

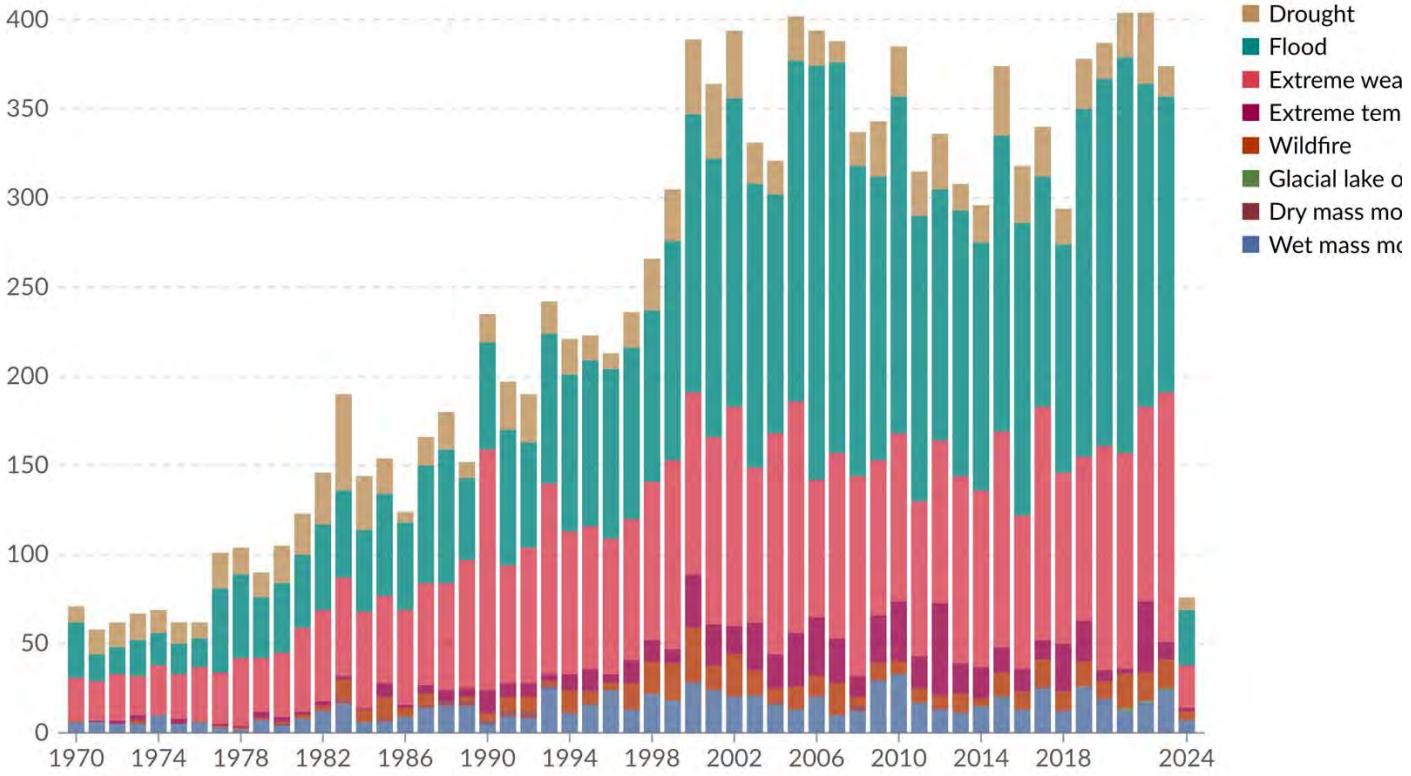
Causes


Global greenhouse gas emissions by economic sectors, 2010
Electricity and Heat Production 25%
AFOLU 24%
Buildings 6.4%
Transport 14%
Industry 21%
Other Energy 9.6%
49 Gt CO_2eq (2010)
Energy 1.4%
Industry 11%
Transport 0.3%
Buildings 12%
AFOLU 0.87%
Direct Emissions
Indirect CO_2 Emissions
Climate Change 2014: Mitigation of Climate Change, IPCC Working Group III

Consequences: Extreme climate events

Global reported natural disasters by type, 1970 to 2024

The annual reported number of natural disasters, categorised by type. The number of global reported natural disaster events in any given year. Note that this largely reflects increases in data reporting, and should not be used to assess the total number of events.



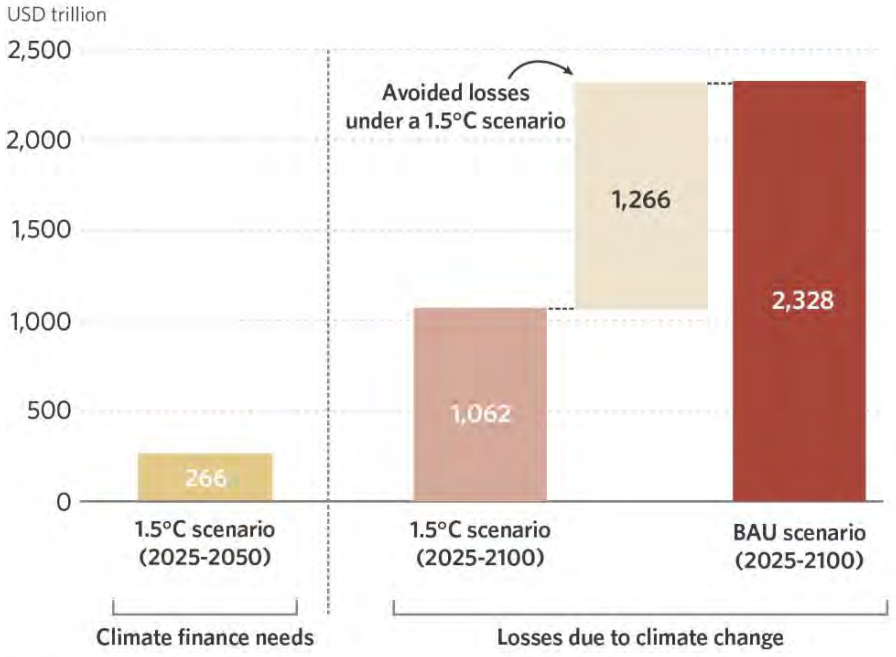
Data source: EM-DAT, CRED / UCLouvain (2024)

OurWorldinData.org/natural-disas

Note: Data includes disasters recorded up to April 2024.

The cost of inaction: beyond solidarity

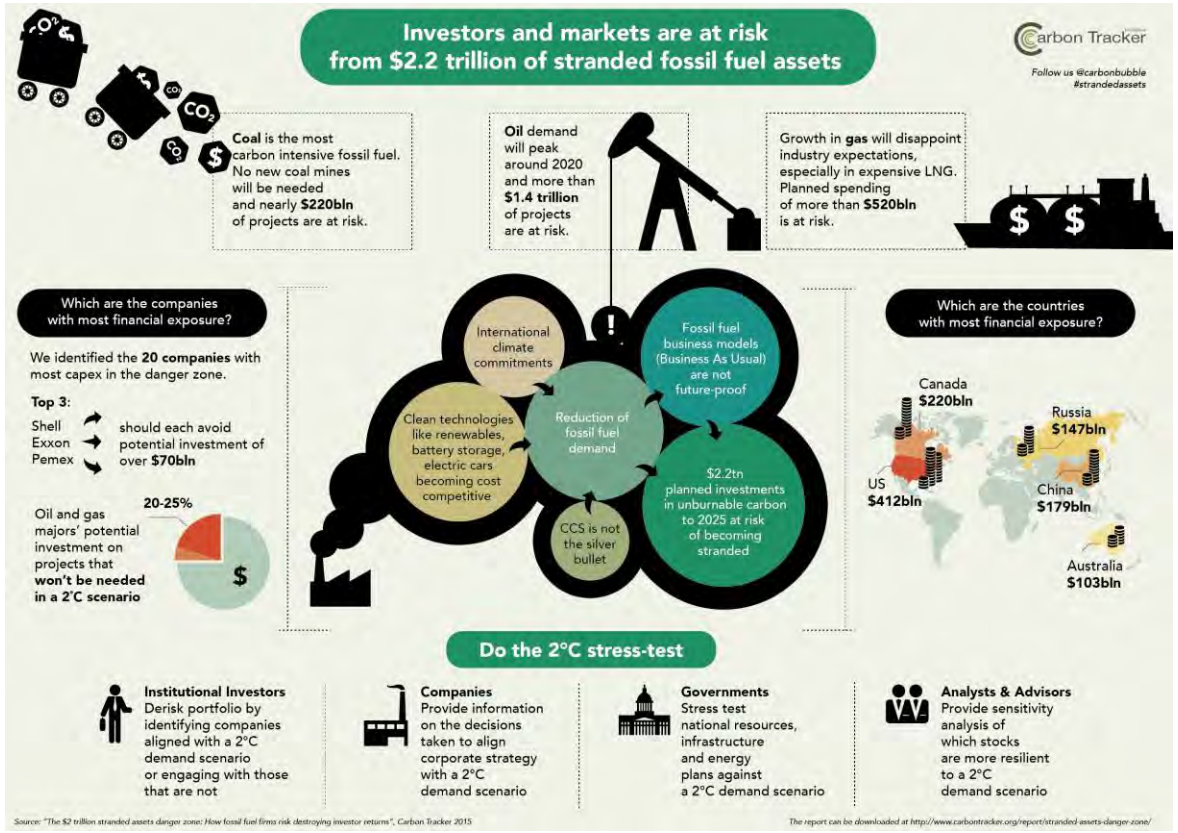
Figure ES4: Cumulative climate finance needs vs. losses under 1.5°C and BAU scenarios

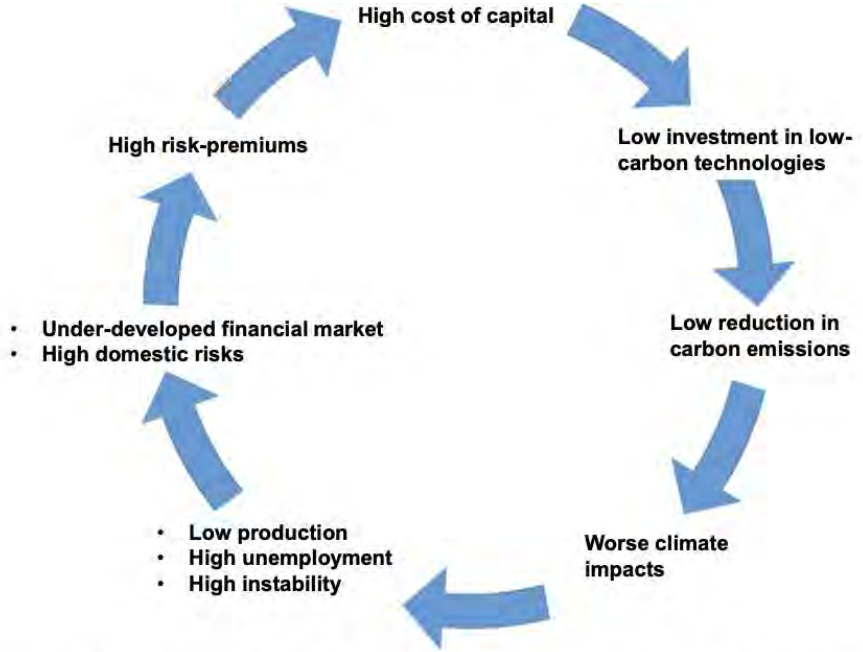


Source: Climate Policy Initiative

Report Click any below to see more info	Economic costs			Social costs			
	Impacts on productivity	Damage to assets and capital	Global flow of currency	Health and well-being	Loss of nature & biodiversity	Conflict and migration	Global and local inequalities
OCED, 2015							
The Economist, 2015							
IRENA, 2017							
ILO, 2019							
OCED, 2019							
Kalkuhl & Wenz, 2020							
NRDC, 2021							
Swiss Re Institute, 2021							
World Bank, 2021							
Deloitte, 2022							
EEA, 2022							
NGFS, 2022							
Oxford Econ., 2022							
AON, 2023							
NOAA, 2023							

Other consequences of inaction: stranded assets and macro-financial impacts

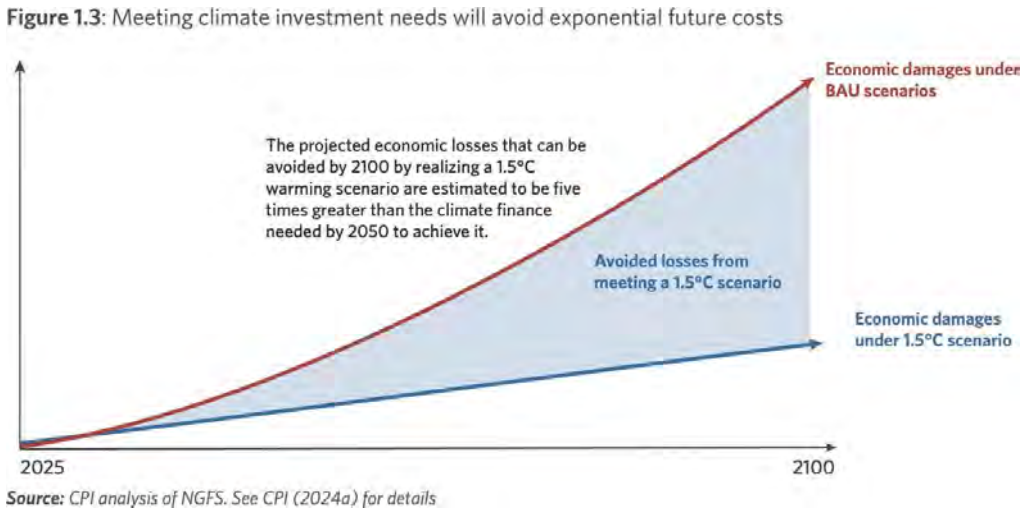




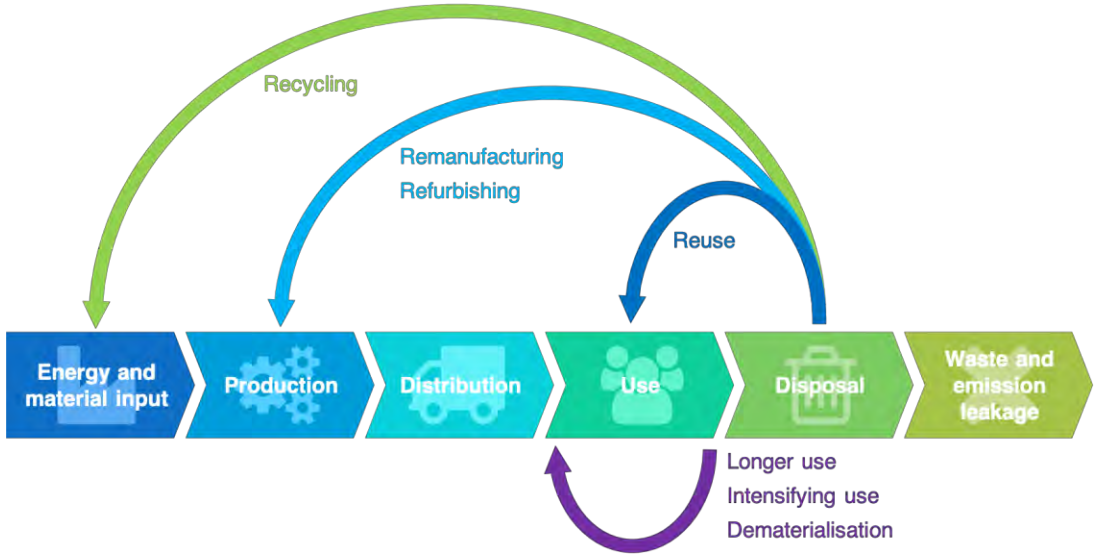
nent trap at the macroeconomic level. The figure shows the set of self-reinforcing mechanisms and relate racterised by the high cost of capital. The strength of these links is strongly linked to local conditions implying uld be exacerbated (or less relevant) in some economies.

The paths ahead

Two basic scenarios



Decarbonize, restore, preserve and make it circular

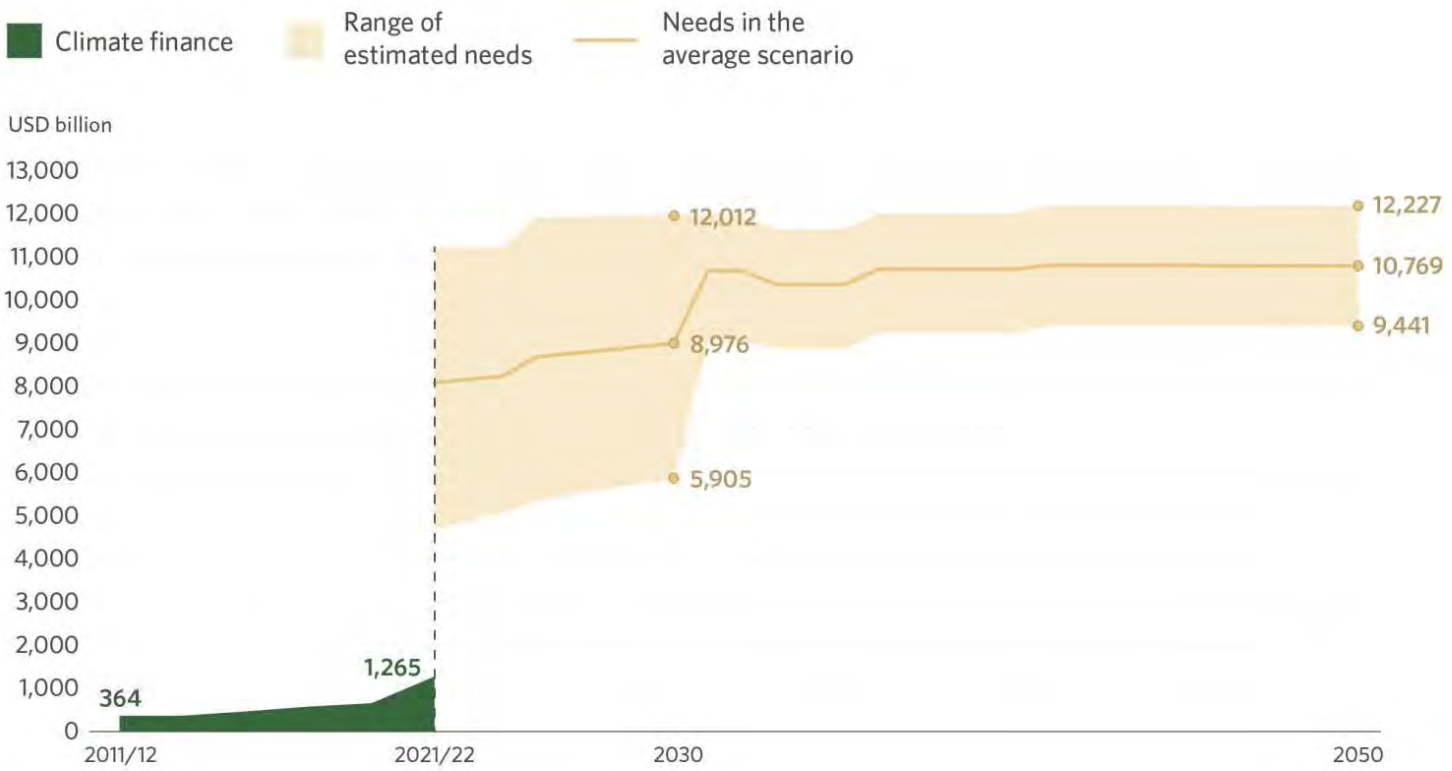


(1) The investment function: beyond “animal spirits”

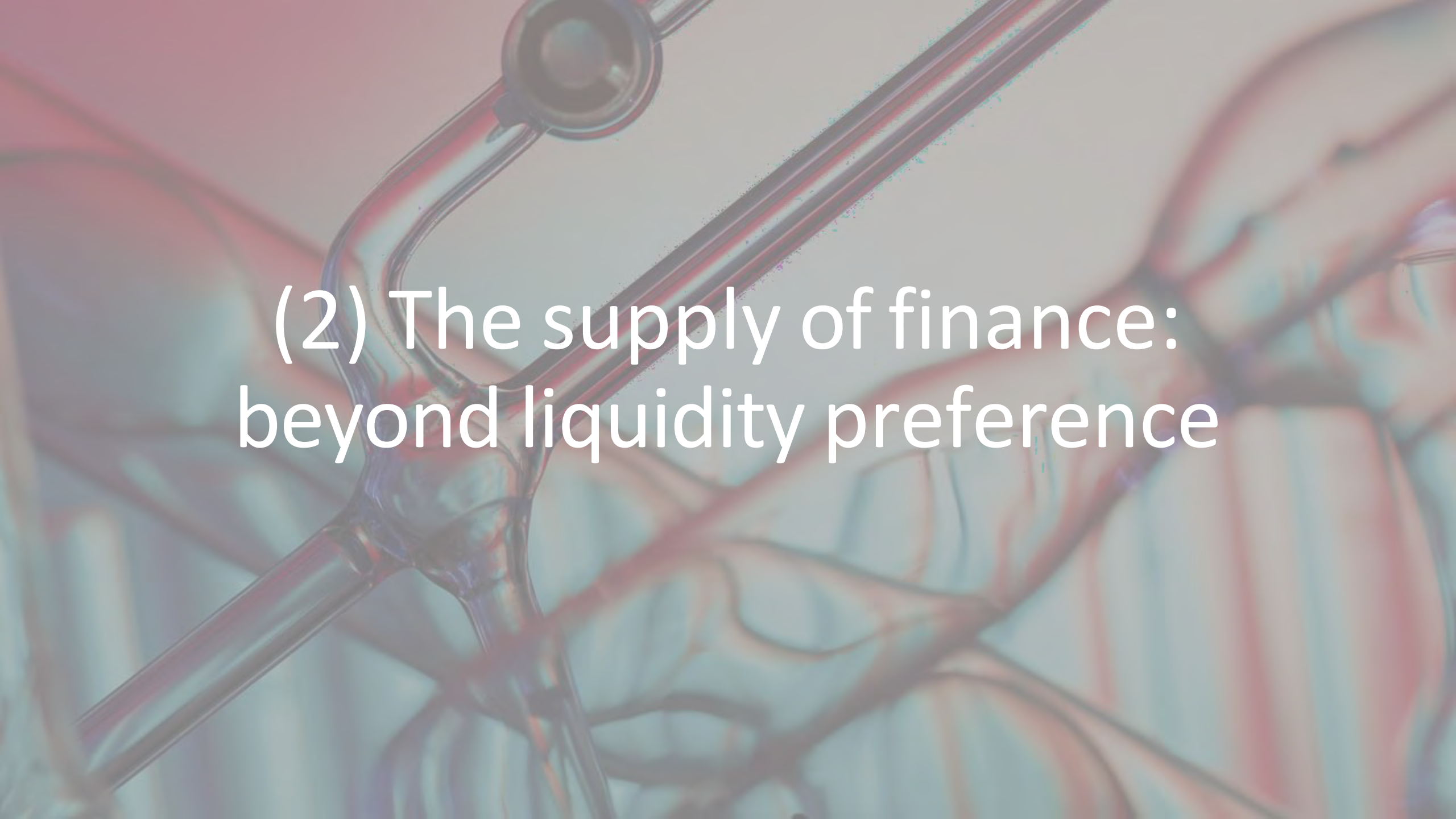
Average global climate finance needs are estimated at USD 9.7 trillion between 2023 and 2050, moving from an average USD 8.6 trillion per year up to 2030 and rising to USD 10.7 trillion in the two decades after that.

Investment needs: Mind the gap

Figure ES3: Global tracked climate finance and average estimated annual needs through 2050



Source: Climate Policy Initiative



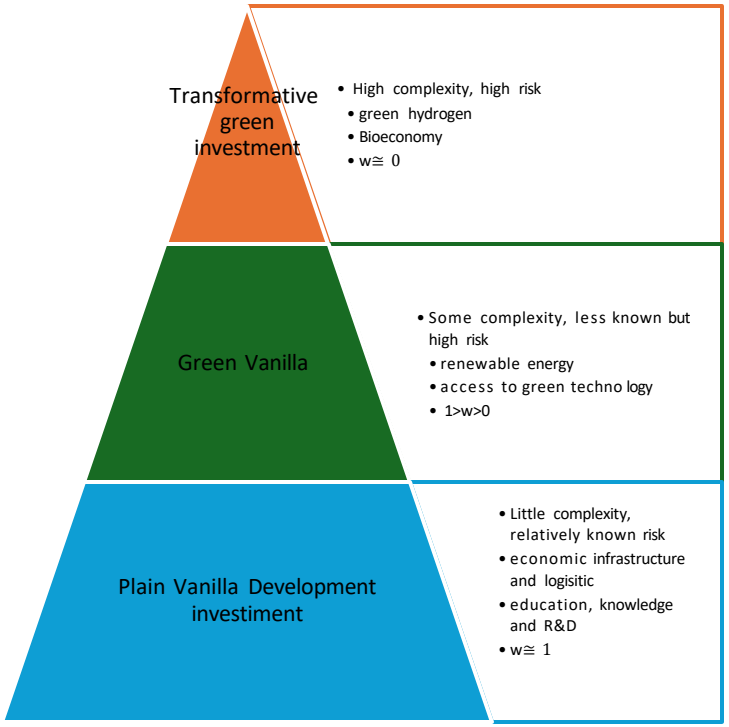
(2) The supply of finance: beyond liquidity preference

Two types of climate risks

- Transition risk
  - Abrupt changes in regulation imposing caps on emissions
  - Examples:
    - Non-tariff trade barriers
    - Mainstreaming climate risk in banks stress tests
    - Imposition of carbon emission on carbon intensive production

- Physical risk
  - Destruction of economic infrastructure (impacts on governments and corporations)
  - Rising insurance premia leading to rapid debt-deflation in real state business
  - Disruption of ecosystems reducing the profitability of agriculture and other economic sectors

Some investment needs are very uncertain and complex



📌 Perceived Risk with Confidence Weighting

We define:

$$\text{Perceived Risk} = \sum_i w_i \cdot p_i \cdot L_i$$

or in continuous form:

$$\text{Perceived Risk} = \int_\Omega w(\omega) \cdot p(\omega) \cdot L(\omega)\, d\omega$$

where:

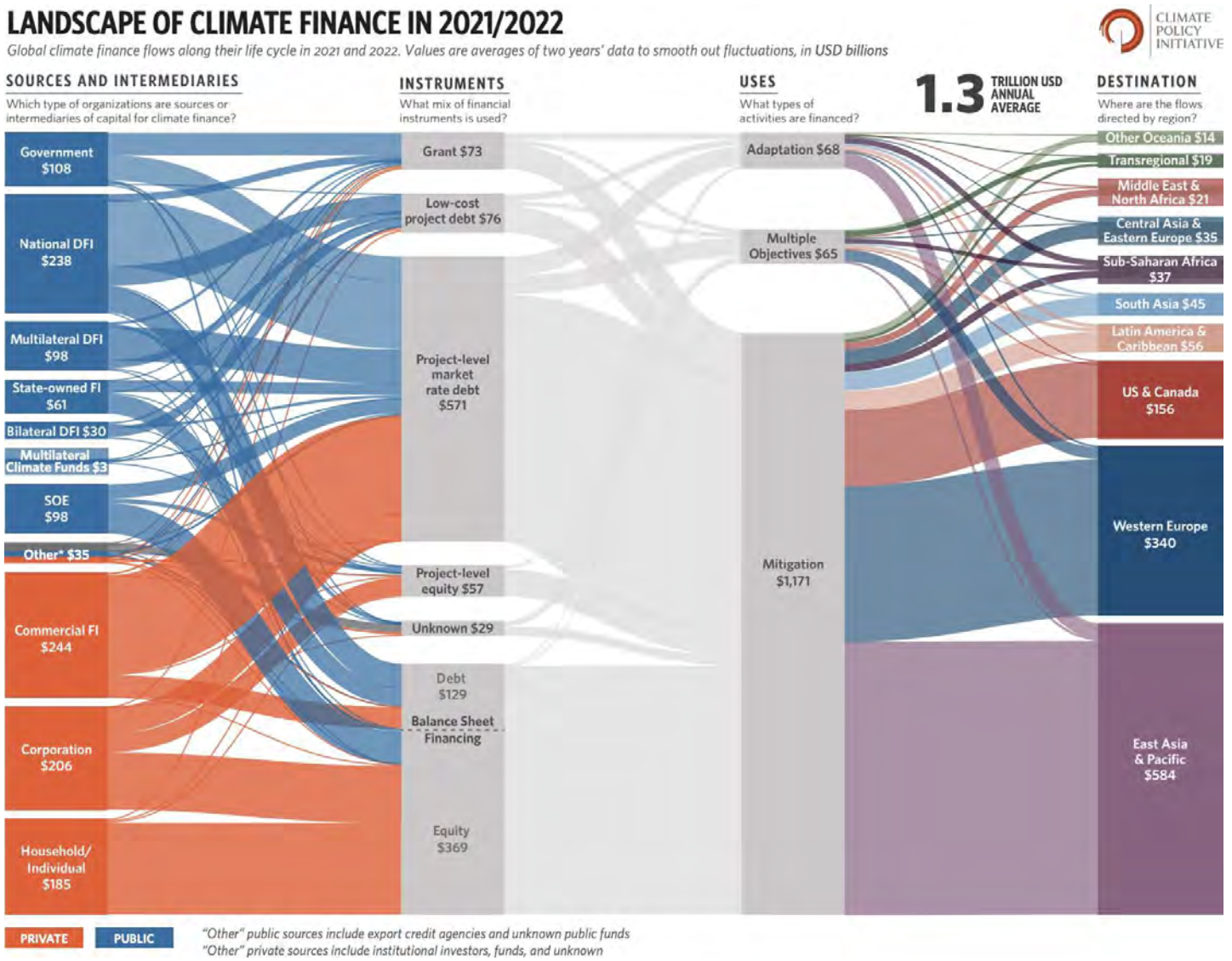
- p_i or $p(\omega)$ is the objective or estimated **probability** of event i or state ω,
- L_i or $L(\omega)$ is the associated **loss**,
- w_i or $w(\omega) \in [0, 1]$ is a **confidence weight**, representing the **degree of trust** in the reliability of the information or model regarding that event or state.

📎 Interpretation of w:

- $w = 1$: full confidence in the information (risk is taken at face value).
- $w = 0$: no confidence; the information is ignored in the perceived risk.
- $0 < w < 1$: partial trust; risk is discounted proportionally.

(3) Patient, and focused capital: beyond funding

A tale of three stories



(4) Climate risk and financial instability: beyond Minsky

A Minskian climate-related financial instability: a “perfect storm” - leading to a very high CRt – generating stranded assets and starting a debt deflation process and a financial crisis

New Dimensions

- **Climate Risk (CR_t)** reduces effective cash flow.
- **Cost of Inaction (θ_t)** increases future liabilities and debt needs.

Climate-Adjusted Fragility

- Adjusted cash flow:

$$CF_t^{adj} = CF_t(1 - CR_t)$$

- New fragility condition:

$$CF_t(1 - CR_t) < CC_t$$

Debt Acceleration via Inaction

- Debt growth becomes sensitive to climate inaction:

$$\frac{dD_t}{dt} = f(I_t, r_t, \theta_t), \quad \frac{\partial f}{\partial \theta_t} > 0$$

Climate-Driven Financial Instability

$$\frac{dD_t}{dt} > \frac{d}{dt}[CF_t(1 - CR_t)] \Rightarrow \text{Amplified fragility via climate stress}$$

Core Logic

- Financial systems evolve from stability to fragility due to rising debt and over-optimism.
- Three types of financial units:
  - **Hedge**: $CF_t \geq CC_t$
  - **Speculative**: $CF_t \geq \text{interest only}$
  - **Ponzi**: $CF_t < \text{interest payments}$

Mathematical Formulation

- Investment condition:

$$\Pi_t \geq r_t D_t$$

- Fragility condition:

$$CF_t < CC_t$$

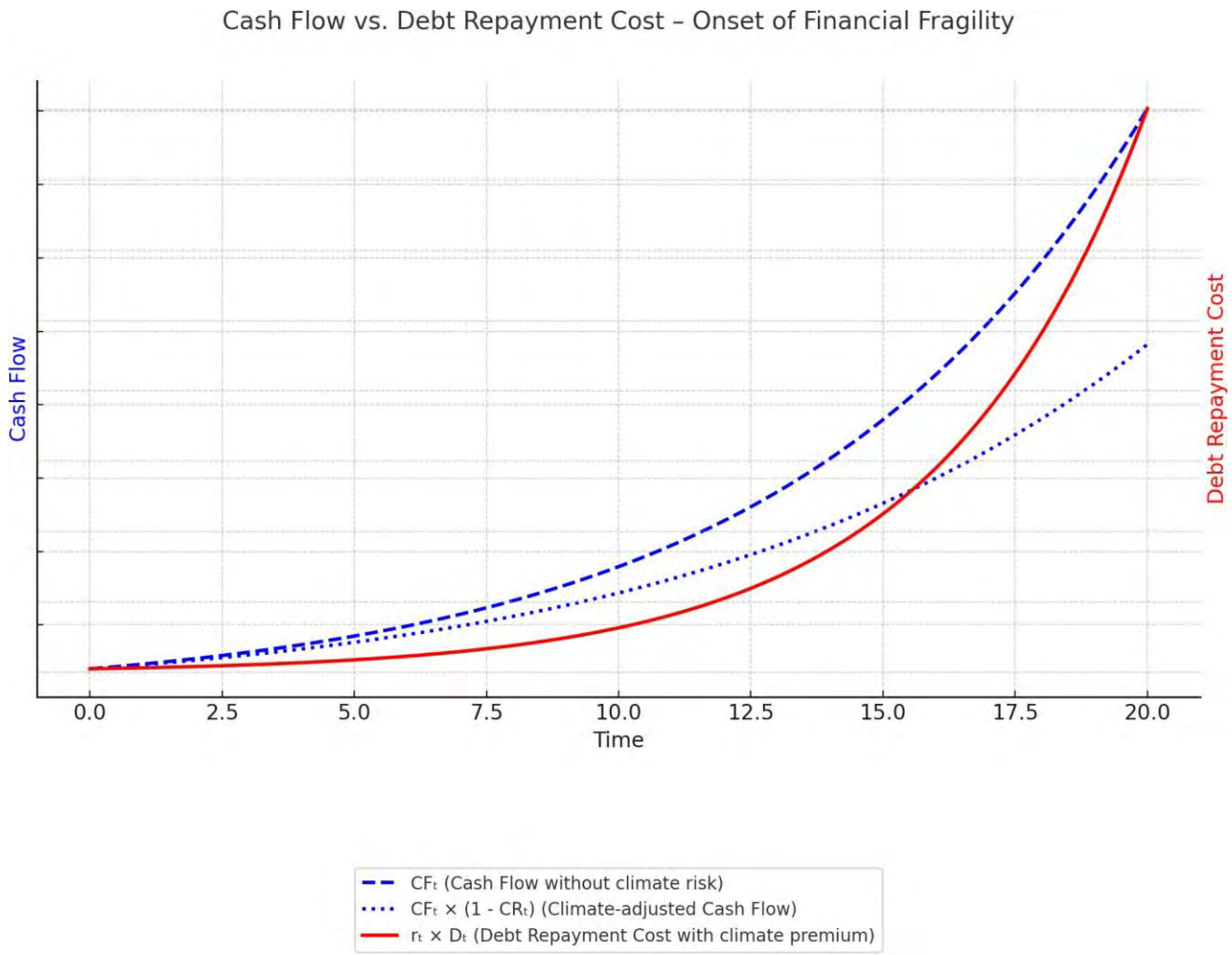
- Systemic instability over time:

$$\frac{dD_t}{dt} > \frac{dCF_t}{dt} \Rightarrow \text{Growing fragility}$$

Key Mechanism

Success → Optimism → Leverage ↑ → Fragility ↑ → Crisis

Climate risk as a source of financial stability



So: can (climate make) it happen again ?

Stranded assets -> assets that at some time prior to the end of their economic life, are no longer able to earn an economic return (i.e. meet the company's internal rate of return), as a result of changes associated with the transition to a low-carbon economy (lower than anticipated demand / prices).

Yes, climate risk can lead to stranded assets and a debt-deflation process

In addition, increasing extreme climate events lead to higher cost of innaction that have fiscal and corporate finance implication

It is already happening in developing countries that are financing climate-related debt crisis

Conclusions:

Macro-financial issues brought up by the climate crisis

- **Investment needs** are incredibly high, and some of them are “transformative” – with high levels of uncertainty and “complexity” (not **risk**)
- **Finance requirements** are accordingly high too, and some of them are perceived to be less attractive than “business as usual” (carbon-intensive sectors)
- **Patient capital** is critical, but **private funding mechanisms (e.g.** very limited scope of green securities and underdeveloped carbon credit markets)
- **Climate risk, stranded assets and financial instability**